The 4th Meru University of Science and Technology

International Conference on

INNOVATIVE RESEARCH FOR COMMUNITY EMPOWERMENT:

Addressing Global Challenges and Sustainable livelihoods

Meru, 25th to 27th June 2025

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KEYNOTE SPEAKER:	Dr. Beatrice Muganda Inyangala Principal Secretary, State Department for Higher Education and Research
VENUE:	Meru University of Science and Technology, Main Campus

CONFERENCE PROCEEDINGS

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THE 4th MERU UNIVERSITY OF SCIENCE AND TECHNOLOGY

CONFERENCE ON INNOVATIVE RESEARCH FOR COMMUNITY EMPOWERMENT:

Addressing Global Challenges and Sustainable livelihoods

Meru, Kenya
25th to 27th June 2025

VENUE: MAIN CAMPUS, NCHIRU

Conference Sub-themes

Agriculture: Innovations in Sustainable Agriculture for Food Security and Rural Development

Pure and Applied Sciences: Scientific Research and Technological Innovations for Sustainable Environmental and Societal Solutions

Business and Economics: Entrepreneurship and Innovation for Economic Empowerment and Sustainable Development

Education: Innovative Educational Practices for Sustainable Development and Community Transformation

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Computing and Informatics: Digital Transformation and Technological Innovations for Community Empowerment

Engineering: Innovative Engineering and Infrastructure Solutions for Sustainable Communities

Precision Agriculture

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AGRICULTURE PRE-CONFERENCE PAPERS

1. Assessment of nutritional knowledge, attitude, and practice of mothers or caregivers with children under five years and relationship to child nutritional status

Josphat Kiplangat Koech[1], Erick Awuoche[1] , Alfred Mugambi Mariga[1], and Rebbeca Ebere[1]

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Subtheme: Innovations in Sustainable Agriculture for Food Security and Rural Development

Abstract

Malnutrition results from a mismatch between nutrient need and intake such as protein-energy in children in many developing countries. In the entire world, undernutrition is believed to be responsible directly or indirectly for at least two-thirds of deaths in children under the age of five years. Interventions that address child malnutrition are needed and should focus among others on enhancing the knowledge, attitude, and practices of mothers or caregivers of these children. However, nutritional knowledge, attitude, and practices of mothers or caregivers of children are unknown in Meru county. Thus, this study aims to determine mothers' or caregivers' knowledge, attitudes, and practices related to nutrition and how this affects the nutritional status of their children aged 0-5 years. The study will adopt a cross-sectional analytical study design and will be carried out in four major hospitals in four Sub-counties in Meru County; namely Miathene level four Hospital, Muthara level four hospital, Githongo level four hospital, and Meru teaching and referral hospital in Tigania West, Tigania East, Imenti Central and Imenti North, respectively. Data will be collected by anthropometric measurements and the researcher administered questionnaires and focus group discussions. Anthropometric measurements will be analyzed using WHO anthro which will convert raw anthropometric data into anthropometric indices of WAZ, WHZ, and HAZ and compare them with the WHO reference data. Data collected in the questionnaire will be statistically analyzed for frequency, descriptive statistics, correlation, and chi-square to evaluate associations in SPSS. It is envisaged that data from this study will provide important information especially when designing and implementing malnutrition mitigating initiatives or programs.

Keywords: *WHO, WAZ, WHZ, HAZ, anthropometric.*

2. Utilization of Fruit and Vegetable Waste for Lactic Acid Production

Tabitha Khamala[1]*, George N Mungai[2] and Erastus K Mwangi[3]

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Subtheme: Innovations in Sustainable Agriculture for Food Security and Rural Development

Abstract

Lactic Acid(LA) is an organic acid with molecular formula ($CH_3CH(OH)COOH$) and mass of 90.08 g/mol. Lactic acid has been studied extensively owing to its biological significance and wide industrial applications. It is used in the pharmaceuticals, food preservation industries, and in making organic based lactic acid polymers, polylactic acid (PLA). This study investigated lactic acid production from fruit and vegetable waste (banana, mango, pineapple, orange, and cabbage) through anaerobic fermentation, while optimizing conditions to enhance yield. The fruit peels acted as carbon source for Lactic Acid Bacteria(LAB). Fermentation was carried out for 72 hours at 34°C, 37°C, and 40°C, using 1:1 and 1:2 substrate-to-water ratios. The lactic acid produced was characterized and quantified using liquid chromatography-mass spectrometry (LCMS/MS) and UV-VIS spectrophotometry. Lactic acid extract had consistent retention time with the pure standard at 3.691 minutes and gave maximum absorption at 410 nm, confirming lactic acid production. The pH of the fermented medium dropped from a range of between 4.3-4.7 to between 3.2-3.7 for both substrate-to-water ratios, signifying lactic acid production. Ratio 1:1 produced higher lactic acid concentrations compared to 1:2 ratio, and more yield was achieved at 37oC compared to other temperatures. The lactic acid yield for ratio 1:1 was 859.1 mg/L, 1304.7 mg/L, and 692.4mg/L at 34 oC, 37 oC and 40 °C, respectively. Ratio 1:2 yielded 486.9 mg/L, 590.2 mg/L, and 436.9mg/L lactic acid at 34 oC, 37 oC and 40 °C, respectively. Statistical analysis showed that temperature, substrate-to-water ratio, and fermentation time impacted lactic acid production ($p < 0.05$). These findings showed fruit and vegetable waste's potential as a sustainable and low-cost source of lactic acid. Large-scale lactic acid production from waste looks promising in terms of sustainability, enhancing waste reduction, recycling and utilization as well as promoting an economical and eco-friendly alternative to chemical production methods.

Keywords: *Lactic Acid, Fruit and vegetable waste, Anaerobic fermentation, substrate-to-water ratio, sustainability*

3. The inter-relationships between community-based conservation governance arrangements and lion conservation in Amboseli ecosystem, Kenya

Margaret Wangui Muriuki[1]*, Thuita Thenya[2], Jane Mutheu Mutune[3]

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Subtheme: Innovations in Sustainable Agriculture for Food Security and Rural Development

Abstract

Livestock predation by lions poses huge costs to the poor, leading to retributive killing. Protective conservation is considered an underlying cause. There is, however, scarcity of literature on the effects of governance arrangements on lion conservation. Using mixed methodology including key informant interviews, focused group discussions, and household surveys, governance capacity of community-based lion conservation in the Amboseli ecosystem was evaluated. The results indicate that the effects of policy arrangement approach variables including discourse, financial capital, natural capital, rules monitoring, on lion conservation are serially mediated by linking capital and congruence. The community lacks financial capital, which they acquire by collaborating with well-linked NGOs. Congruence was a strong positive predictor of lion conservation, indicating the importance of stability in community based conservation (CBC) policy arrangements. Residents of Selengei group ranch had positive perceptions of lion conservation compared to other areas due to the diversity of actors involved. The discourse of coexistence between lions and people is largely shared by NGOs, the state agency, Kenya wildlife service, community leaders and people who benefit most from conservation but not by majority of the community who feel left out in decision making and benefit sharing. Compliance to the rules and natural capital had significant negative relationship with lion conservation. Moreover, natural capital had a significant and negative indirect effect on lion conservation through linking capital and congruence. Communities perceive local-level organizations, which are major links to the larger institutional context to be imposing downward natural resource access restrictions, and rules directly related to lion conservation resulting in negative attitudes toward conservation. Communities should therefore be meaningfully involved in formulation and implementation of rules to increase legitimacy, and control of conservation and its benefits to avoid opportunistic behaviors particularly lion killing. Involvement of diverse actors to inject more resources in CBC is also recommended.

Keywords:- *Wildlife protection, Wildlife protection.*

4. Precision agriculture adoption in smallholder vegetable farming systems in Developing Countries: A review

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Subtheme: Innovations in Sustainable Agriculture for Food Security and Rural Development

Abstract

Precision Agriculture (PA) technologies have the potential to transform smallholder vegetable farming in developing countries, by improving yields, improving resource use, and enhancing climate change. However, despite these benefits, many farmers have not adopted these technologies. This review examined the main challenges that prevent smallholder vegetable farmers in developing countries from using PA technologies. The study used a systematic approach to analyze 60 peer-reviewed articles, government reports, and case studies published between 2010 and 2025. The review found that several factors limited adoption, including high costs, lack of locally adapted technologies, low digital literacy, weak extension services, and poor policy support. In addition, the results indicate that smallholder farmers also struggle with limited access to modern equipment, financial resources, and training. However, the study found that affordable, simple PA technologies, farmer education and strong collaboration among governments, researchers, and private sectors can improve adoption rates. Practical solutions such as mobile-based advisory services, low-cost soil sensors, and community-based learning programs have shown promising results. For PA to benefit smallholder vegetable farmers, it is crucial to develop policies that support research, provide financial incentives, and strengthen agricultural extension services. This review highlights the need for tailored solutions that fit local conditions and farmers' needs, ensuring that PA contributes to food security, sustainability, and economic growth in developing countries.

Key words: *Barriers, Innovation, Resource efficiency, Climate, Soil Sensors, Yield*

5. Morpho-physiological *responses of water leaf (Talinum triangulare. jacq*) plant to urea and azomite

Tabitha Mutemi[1,2*], Peter Masinde[1], Richard Kirigiah[1], Peter Amoako Ofori[2,3], Efoo Bawa Nutsukpo[2], Lord Abbey

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Subtheme: Innovations in Sustainable Agriculture for Food Security and Rural Development

Abstract

Indigenous leafy vegetables offer a sustainable solution due to their high nutritional value, climate resilience, and low input requirements. Waterleaf, a widely consumed indigenous vegetable, is facing overexploitation driven by high demand for its nutritional benefits, putting the species at risk of extinction. This study evaluated the effects of urea and Azomite supplementation on the growth and physiology of waterleaf to determine optimal fertilization strategies. The experiment consisted of 12 treatments with varying urea levels (0, 50, 100, 150, 200, and 250 kg N/ha), each with or without Azomite, arranged in a completely randomized design with five replications. Plants were grown in pots filled with Pro-Mix BX soilless substrate under greenhouse conditions. Results indicated that high urea rates (≥100 kg N/ha) suppressed plant growth whereas 50 kg N/ha significantly ($P < 0.05$) enhanced plant height (58%), leaf length (58%), number of leaves (192%), number of shoots (300%), and stem girth (21%) compared to the control. The combination of 50 kg N/ha with Azomite further improved these parameters, increasing plant height (90%), leaf length (91.0%), number of leaves (218%), number of shoots (250%), and stem diameter (30%). Physiologically, this treatment significantly increased photosynthetic rate (89%) and transpiration rate (245%). In conclusion, 50 kg N/ha was optimal for waterleaf growth, with Azomite supplementation providing additional benefits. These findings offer a sustainable fertilization strategy for smallholder farmers and urban growers. Further field trials are recommended to validate these results under open-field conditions, paving the way for scalable cultivation to strengthen food systems and improve livelihoods.

Keywords: *Waterleaf, Leafy vegetable, Underutilized crop, Fertigation, Sustainable agriculture*

6. The Kikuu river sand dams and sustainable development

Faith Gaceri[1]*, Kiogora Mworia[1], Robert Muriungi[1], Benson Mutuma[1], Rosemary Matheka[1]

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Subtheme: Innovations in Sustainable Agriculture for Food Security and Rural Development

Abstract

Sand dams have been broadly used as water harvesting technologies in semi-arid regions and are constructed to enhance water accessibility and availability during the dry seasons. Sand dams' effectiveness relies on proper interactions between natural and human-made features. However, there are few studies that have documented these characteristics and elements comprehensively. This study was aimed at identifying and describing natural and human-made features with a specific focus on sand dams along River Kikuu, Makueni county, Kenya. Field observational surveys were conducted at twenty-one (21) sand dam sites using GIS mapping and geospatial analysis using QGIS software for data analysis. The recorded elements were sand dam wall heights, sand accumulation depths, and surrounding land cover characteristics. The findings of the study revealed that the sand dams varied in terms of dam heights, length, usage and adjacent natural as well as human modifications, highlighting the longevity and local applicability of sand dams as reliable water access infrastructures in water-scarce regions. Additionally, the study also provides basis for informing future initiatives when it comes to planning, construction, placement, and comparisons of sand dams implemented in similar arid and semi-arid regions.

Key words: *Sand dams, Seasonal rivers, Semi-Arid environments, Water resources*

7. Harnessing precision agriculture technologies for the management of fall armyworm (*Spodoptera frugiperda*) in maize production systems

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Subtheme: Innovations in Sustainable Agriculture for Food Security and Rural Development

Abstract

The Fall Armyworm (Spodoptera frugiperda) is a highly destructive pest that poses a significant threat to maize production, particularly in sub-Saharan Africa and other tropical regions. Traditional control methods face challenges such as late detection, resistance to pesticides, and environmental hazards. Precision Agriculture (PA) offers promising solutions through the integration of digital technologies for early detection, targeted intervention, and sustainable pest management. This review explores the application of PA tools—such as remote sensing, geographic information systems (GIS), drone surveillance, mobile-based scouting, and AI-powered decision support systems in the monitoring and control of Fall Armyworm in maize fields. The methodology involved a comprehensive literature search using electronic databases including Scopus, Web of Science, Google Scholar, and CAB. Peer-reviewed articles, technical reports, and institutional publications from 2010 to 2024 were screened. Selected studies were critically reviewed and synthesized based on relevance, technological approach, effectiveness, and scalability. The review highlights key findings, identifies current gaps in research and practice, and discusses challenges facing the adoption of PA technologies in smallholder farming systems. It concludes by proposing recommendations to enhance integration of PA in Fall Armyworm management, including capacity building, cost reduction strategies, and supportive policy frameworks.

Key words: *Fall Armyworm, Remote Sensing, Pest Management, GIS, Drone Surveillance.*

8. Effect of different sources of pyrolineous acid on tomato plant growth and physiological indices

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Subtheme: Innovations in Sustainable Agriculture for Food Security and Rural Development

Abstract

Pyroligneous acid (PA), or wood vinegar, is a byproduct generated through the pyrolysis of biomass under limited oxygen supply and has gained attention for its potential agricultural applications. This study investigated the chemical characteristics and plant growth effect of wood vinegar (pyroligneous acid, PA) derived from Pine Wood Pinus strobus (PWPA) and Rice Oryza sativa husk (RHPA). Tomato (Solanum lycopersicum 'Scotia') plants treated with varying concentrations of PA (0, 0.25%, 0.5%, and 1%) were evaluated for morphological, physiological, and photosynthetic responses under greenhouse conditions. Application of PWPA at concentrations of 0.25% and 0.5% significantly ($p < 0.05$) enhanced both shoot and root biomass, with the 0.5% treatment yielding the highest root dry weight of 2 g and photosynthetic rate of 1.13 µmol m^{-2} s^{-1}.Conversely, RHPA treatments, particularly at 0.5% and 1%, resulted in reduced biomass accumulation and photosynthetic activity. Leaf pigmentation (SPAD values) and chlorophyll fluorescence parameters remained relatively stable across treatments, with slight declines observed under 1% RHPA. Overall, wood vinegar from PWPA demonstrated superior biostimulant effects compared to RHPA, promoting higher biomass and enhanced photosynthetic efficiency at lower concentrations. These findings suggest that the feedstock source and application rate of PA significantly influence plant growth responses, highlighting its potential as a sustainable biostimulant in agriculture.

Key words: *Pinus strobus, Oryza sativa, Pyroligneous Acid, Solanum lycopersicum.*

AGRICULTURE CONFERENCE PAPERS

9. Galvanizing household food security post-harvest: a gender perspective of practices from the drylands of the Global South

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Subtheme: Innovations in Sustainable Agriculture for Food Security and Rural Development

Abstract

Drylands are characterised by adversities that cross-pollinate to negatively affect food production leading to household level hunger. This is worse in the global south drylands where structures for food production and storage are ineffective. Here, erratic and unreliable precipitation reinforced by thermal stress make farming a risky venture. However, in times of favourable weather conditions, the drylands may have bumper harvest that is expected to augment household food security. Nevertheless, the storage of the plenteous harvest may still be a challenge, leading to preventable food wastage. This is because, post-harvest food storage practices remain wanting especially among poor households, who largely handle farm produce casually. In addition, food produce may be disposed of at low prices immediately after harvest, leaving a family food insecure. Thus, a qualitative field study of post-harvest practices and their implications on household food security in the drylands of Kenya was undertaken. Results indicated that farmers used both traditional and modern methods of storing and preserving their harvest which are ineffective given that they are largely done from a point of ignorance. In addition, marketing extra produce was often not done from a point of market understanding, but glut and hence fetching lower than expected returns. Consequently, it is recommended that a revitalization of storage practices is important in order to revitalize household food security in the drylands of Kenya.

Keywords: *Dryland, Food Security, Marketing, Post-Harvest, Storage*

10. The inter-relationships between community-based conservation governance arrangements and lion conservation in Amboseli ecosystem, Kenya

Margaret Wangui Muriuki[1], Thuita Thenya[2] and Jane Mutheu Mutune[2]

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Subtheme: Innovations in Sustainable Agriculture for Food Security and Rural Development

Abstract

Livestock predation by lions poses huge costs to the poor, leading to retributive killing. Protective conservation is considered an underlying cause. There is, however, scarcity of literature on the effects of governance arrangements on lion conservation. Using mixed methodology including key informant interviews, focused group discussions, and household surveys, governance capacity of community-based lion conservation in the Amboseli ecosystem was evaluated. The results indicate that the effects of policy arrangement approach variables including discourse, financial capital, natural capital, rules monitoring, on lion conservation are serially mediated by linking capital and congruence. The community lacks financial capital, which they acquire by collaborating with well-linked NGOs. Congruence was a strong positive predictor of lion conservation, indicating the importance of stability in community based conservation (CBC) policy arrangements. Residents of Selengei group ranch had positive perceptions of lion conservation compared to other areas due to the diversity of actors involved. The discourse of coexistence between lions and people is largely shared by NGOs, the state agency, Kenya wildlife service, community leaders and people who benefit most from conservation but not by majority of the community who feel left out in decision making and benefit sharing. Compliance to the rules and natural capital had significant negative relationship with lion conservation. Moreover, natural capital had a significant and negative indirect effect on lion conservation through linking capital and congruence. Communities perceive local-level organizations, which are major links to the larger institutional context to be imposing downward natural resource access restrictions, and rules directly related to lion conservation resulting in negative attitudes toward conservation. Communities should therefore be meaningfully involved in formulation and implementation of rules to increase legitimacy, and control of conservation and its benefits to avoid opportunistic behaviors particularly lion killing. Involvement of diverse actors to inject more resources in CBC is also recommended.

Keywords: *Wildlife Conservation, Lion Conservation, Community Based Conservation*

11. Cash crop production: a blessing or a curse to household food security in Bungoma county, Kenya

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Subtheme: Innovations in Sustainable Agriculture for Food Security and Rural Development

Abstract

Cash crop production is one of the strategies that have been put in place to improve income both at the government and household levels and subsequently household food security. However, this may not always be the outcome. This paper explores the relationship between tobacco growing, food crop cultivation and household food security in Malakisi, Bumula Sub County of Bungoma County. This study hypothesized that tobacco production had a negative effect on food crop production in the region. The main objective of the study was to investigate the effect of tobacco growing on household food production in the Sub County and its effect on household nutrition. The ecological conditions experienced in the study area are conducive for both cash crop and food crop growing. However, the region has experienced persistent food shortages, raising the question of tobacco's role in improving household income and therefore food security and nutrition. Data was collected using oral interviews, questionnaires, focus group discussion and direct observation from a sample of 200 farmers who grew both tobacco and food crops (62.3%) and those who cultivated tobacco only (37.7%) The study results indicate that farmers who grew tobacco only experienced persistent food shortages in the household compared to those who grew the cash crop together with some food crops. Most of the farmers were attracted to the crop by the farm inputs which were given on credit by the tobacco companies and later deducted from their final pay, which was determined by the grade of the produce. The study recommends the formation of cooperatives that would give farmers inputs on credit, which would allow them to decide whether they would grow food crops or tobacco. This will result in increased food production and therefore improved household food security and nutrition..

Keywords: *Tobacco growing, Food Crops, Food Security, Household Nutrition*

12. Food security assessment in agro-ecological zones of Meru county, Kenya

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Subtheme: Innovations in Sustainable Agriculture for Food Security and Rural Development

Abstract

Food security is a key pillar of the United Nations Sustainable Development Goals (SDG 2) that aims to eradicate hunger globally; thus, localized assessments provide guidance for effective policy and interventions. This study assessed the food security status across three agro-ecological zones (AEZs) of Meru County, Kenya, focusing on the Lower Highland 1 (LH1), Upper Midland 2 (UM2), and Lower Midland 6 (LM6) zones. A total of 366 households were proportionately sampled from the three AEZs to capture spatial and socio-economic variations in food security. The Household Dietary Diversity Score (HDDS) was employed as a key indicator, revealing that LH1 (HDDS = 7.0) and UM2 (HDDS = 7.1) exhibit adequate food security, while LM6 (HDDS = 5.2) reflects a state of moderate food insecurity. Statistical analysis identified a positive correlation between AEZs and the types of crops cultivated, with UM2 displaying the most diverse crop portfolio and highest HDDS. The highest food insecurity was observed in LM6 with10.9% followed by LH1 at 1.9% and UM2 at 1.6%. The findings underscore the need for targeted interventions in LM6 to enhance food access and prevent a decline into food insecurity. The study recommends agro-ecologically sensitive policies and support systems to strengthen food security resilience for vulnerable households.

Keywords: *Food Security, Agro-ecological zones, Household Dietary Diversity Score, Food Access, Food Availability*

13. Fly larvae on growth performance of Nile tilapia (*Oreochromis niloticus*)

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Subtheme: Innovations in Sustainable Agriculture for Food Security and Rural Development

Abstract

The search for sustainable aquaculture feeds has prompted an investigation into insect-based proteins to replace fish meal (FM). This study evaluated the effects of Black Soldier Fly Larvae Meal (BSFLM) as a substitute for FM on the growth performance of Nile tilapia (Oreochromis niloticus). A 90-day feeding trial was conducted using a randomized complete block design at Meru University of Science and Technology, Sanitation Research Institute (SRI). A total of 270 fingerlings were distributed into nine hapa nets (30 fish each), assigned to three isonitrogenous diets: Diet 1 (0% BSFLM), Diet 2 (50% BSFLM), and Diet 3 (100% BSFLM), each in triplicate. From findings, fish fed Diet 2 exhibited the highest survival rate (95.56%), compared to both D1 and D3. Growth performance parameters including Daily Weight Gain (DWG), body weight gain Feed Conversion Ratio (FCR), Relative Growth Rate (RGR%) and Specific Growth Rate (SGR) were significantly different ($p < 0.05$) across the diet treatments. Fish fed on D1 exhibited the highest mean length gain (5.38 ± 1.47 cm), followed by D2 (5.04 ± 1.34 cm), while D3 recorded the lowest gain (4.08 ± 1.08 cm). Body weight gain, showed that D1 had the highest gain (38.26 ± 15.94 g), followed by D2 (33.58 ± 13.37 g) and D3 (24.86 ± 8.10 g), with significant variation among groups ($p < .001$).Tukey HSD indicated that D3 performed significantly worse than D1 and D2 ($p < .001$), while the difference between D1 and D2 was marginal ($p = .057$).These results suggest that BSFLM can effectively replace fishmeal up to 50%, with no detrimental effects on growth and therefore, it could help reduce the environmental and economic burden of relying on fishmeal. However, full substitution (100%) impairs growth, likely due to nutritional imbalances, including deficiencies in essential amino acids and high chitin content. The study recommended to include up to 50% BSFLM in tilapia diets for optimal growth performance and sustainability in aquaculture practices.

Keywords: *Aquafeed, Black soldier fly, Fish meal, Growth performance, Nile tilapia,*

SUBTHEME 2: PURE AND APPLIED SCIENCES - Scientific Research and Technological Innovations for Sustainable Environmental and Societal Solutions

PURE AND APPLIED SCIENCES PRE-CONFERENCE PAPERS

14. Evaluating Effectiveness of Sugarcane Waste Biochar in the Purification of Greywater

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Subtheme: Scientific Research and Technological Innovations for Sustainable Environmental and Societal Solutions

Abstract

The study investigated the use of sugarcane waste biochar as a sustainable material for purifying greywater from kitchen, bathroom, and carwash sources, highlighting its potential to address environmental pollution and enhance water recycling. Biochar was produced by heating sugarcane waste at 500°C, with half of it activated using potassium hydroxide to enhance its adsorption capabilities. Characterization of the biochar was conducted using X-ray diffraction (XRD), X-ray fluorescence (XRF), and Fourier Transform Infrared Spectroscopy (FTIR). XRF analysis showed that the activated biochar was free of lead and chromium, while the inactivated biochar contained a small amount of chromium (0.067%). The XRD showed the presence of 32.7% of Kalicinite, 24.4%, of Petrovite and 43% of Bustanite in the biochar. The FTIR showed presence of C-H, C-O and COOH functional groups in the biochar. Greywater samples were spiked with lead and chromium to assess removal efficiency. Passing samples through 10g of biochar for 5 minutes, the activated biochar achieved a lead removal efficiency of up to 94% and chromium removal of up to 91%, depending on the greywater source. Additionally, it removed 33-38% of detergents and 75-80 % of oil and grease, proving more effective than inactivated biochar. Filtration with both types of biochar influenced physicochemical properties. Both increased the pH levels, with activated biochar causing a more substantial rise. Electrical conductivity, total dissolved solids (TDS), and total suspended solids (TSS) also decreased, with activated biochar showing a reduction of up to 61% in electrical conductivity in bathroom greywater. There was significant difference shown by t-test ($P < 0.05$) between the purification efficiency of inactivated and activated biochar. Based on the study findings activated sugarcane waste biochar was reliable for greywater treatment especially the removal of metal pollutants, oil and grease.

Keywords: *Greywater, Biochar, Water purification*

15. Development of a colony rearing procedure for anopheles arabiensis infected with Microsporidia MB

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Subtheme: Scientific Research and Technological Innovations for Sustainable Environmental and Societal Solutions

Abstract

Anopheles arabiensis, a key malaria vector, poses a significant challenge to global malaria control efforts due to its adaptability and resistance to conventional control measures. The endo-symbiont Microsporidia MB has been identified as a potential bio-control agent, capable of impairing mosquito fitness and transmission of malaria parasites. However, a sustainable laboratory colony-rearing protocol for Microsporidia MB-infected An. arabiensis is lacking. This study addresses the critical gap by evaluating the effects of Microsporidia MB on successive generations (F6) of An. arabiensis in a laboratory setting. Field-collected An. arabiensis were reared in the laboratory across six generations (F6), with Microsporidia MB prevalence and density quantified using molecular diagnostic tools, PCR. Survivorship and fecundity metrics were assessed through longitudinal monitoring, including life table analysis and egg-laying studies. Data was analyzed using statistical tools, including generalized linear models (GLMs) and survival analysis, to evaluate the trends across generations. The preliminary results of the prevalence of Microsporidia MB in laboratory-reared Anopheles arabiensis mosquitoes demonstrated stable maintenance across six generations, with density averaging 0.35±0.06 a level within acceptable limits for colony sustainability. Infected mosquitoes showed reduced survivorship compared to uninfected controls, with initial survival in F1 recorded at 37 days and rising to 50 days in F6, indicating adaptive improvement across generations. Fecundity analysis revealed a moderate decline in egg production, decreasing from 96 eggs in F1 to 65 in F3, then increasing again to 91 eggs by F6, highlighting adaptation through successive rearing cycles. Notably, development time shortened from 27 days in F1 to 15 days by F6. These findings underscore the potential of infected mosquitoes to adapt without significant compromise to viability. The F2 generation emerged as the most suitable candidate for release, supporting the feasibility of field deployment for malaria control. This study indicates a successfully established a viable laboratory rearing protocol for Microsporidia MB infected An. arabiensis, providing critical insights into the dynamics of infection prevalence, mosquito survivorship, and fecundity. The findings highlight the potential for utilizing Microsporidia MB for implementation in malaria vector control strategies.

Keywords: *Microsporidia MB, successive generations, Transmission, Vector control measures*

16. The impact of conservation farming on the biodiversity of plants species in small holder farms in Kenya

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Subtheme: Scientific Research and Technological Innovations for Sustainable Environmental and Societal Solutions

Abstract

Accounting Information System is one of the important technologies in any financial or non-financial institution operations. AIS are used in capturing, processing, storing and distributing accounting information. In implementing financial internal control system, the role of AIS is critical. The study aimed at providing an understanding of influence of AIS on microfinance institutions financial performance in Meru County, Kenya. The objective identified for the study was; to determine the influence of information quality on financial performance of micro finance institution in Meru County, Kenya. The study was guided by adverse selection theory; employed descriptive research design had target population of 316 with a sample size of 177 respondents. Structured closed and open ended questionnaire was the main data collection tool. Data was analyzed by the use of SPSS version 28. Data was analyzed by use of descriptive statistics, Pearson's correlation, ANOVA and multiple linear regressions. A pilot test was carried to ensure validity and reliability. The variable was tested for reliability by use of Cronbach alpha coefficient attaining 0.862. The regression was tested at 5% level of significant. The results had a mean of 1.63 with SD of 0.621 on a 5-point Likert scale starting with 1- strongly agree to 5- strongly disagree. Pearson's correlation coefficient was 0.218 at α =.001 which is less than .05 level of significance. Regression analysis beta coefficient for the independent variable is β = .501 at $p <$ .05 level of significant. The results indicate that the variable is statistically significant. Null hypothesis was tested using F – test (2.388) at 95% confidence level and the results lead to the rejection of the null hypothesis. The study concluded that financial performance of MFIs in Meru County has increased moderately. Thus, there is need to adopt AIS in order to improve in financial performance.

Keywords: *Accounting Information System, Financial Performance, Financial Institutions*

17. Completion of weakly sign symmetric po-matrix problem specifying digraphs of order 5 with 4, 5 arcs with positionally symmetric cycle

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Subtheme: Scientific Research and Technological Innovations for Sustainable Environmental and Societal Solutions

Abstract

A square matrix is a *Wss* Po-matrix if the off-diagonal elements have the property that if the element at position (i, j) is not zero ($i \neq j$), then the element at position (j, i) must either have the same sign or be zero. A *Wss* Po -matrix is considered to have positionally symmetric cycle if its entries are symmetric with respect to their positions in the matrix. A digraph D has a *Wss* Po -matrix completion if every partial weakly sign symmetric Po -matrix that describes D can be extended to a complete weakly sign symmetric Po -matrix. This study focused on completion of *Wss* Po-matrix specifying digraphs of order 5 with 4 and 5 arcs with positionally symmetric cycle. Digraphs with this cycle were utilized to create partial *Wss* Po- matrix, and zero completion applied to ascertain its completion. Our goal was to further identify and characterize the structural properties of such digraphs that leads to completion or non-completion. Our study established that digraphs of order 5 with 4 or 5 arcs that contain a positionally symmetric cycle do not have completion into a *Wss* Po-matrix. Moreover, we observed that digraphs with 5 arcs and positionally symmetric cycles inherit the non-completion property from the corresponding 4-arc digraphs with the same cycle structure. These findings could be applied in practical problems such as studying relationships in networks, filling missing data, and solving optimization tasks. Future research could be done on other digraphs characteristics which lead to non-completion.

Keywords: *Digraphs; zero completion; positionally symmetric cycle; Matrix completion; weakly sign symmetric Po-matrix.*

18. On investigation of structure and properties of cyclic codes over finite field 〖GF〗_2 and application of these codes to cryptography

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Subtheme: Scientific Research and Technological Innovations for Sustainable Environmental and Societal Solutions

Abstract

The study presents an extensive study of cyclic codes over finite fields, emphasizing their structure, properties, and applications in digital communication systems for error detection and correction. The primary focus is on the algebraic properties of cyclic codes, which are defined by the generator polynomial g(x). This polynomial, a divisor of x^n-1, where n is the code length, enables systematic codeword construction. The generator matrix G of an (n, k) cyclic code is derived from g(x) and features rows that are right cyclic shifts of the preceding rows. This structure simplifies encoding and decoding processes, ensuring the cyclical nature of the code. The parity-check matrix H is associated with the parity-check polynomial h(x), which satisfies g(x)h(x) = x^n-1. This relationship is crucial for efficient error detection via polynomial division. The minimum distance d of a cyclic code, a critical parameter for error-detection and correction capabilities, is influenced by the generator polynomial g(x). Cyclic codes are particularly effective in detecting burst errors, common in practical communication systems, due to their ability to handle sequences of consecutive erroneous bits. A significant property of cyclic codes is shift-invariance, allowing any codeword c(x) to remain a valid codeword under cyclic shifts. This property aids in simplifying both encoding and decoding processes and enhances the suitability of cyclic codes for hardware implementation. The thesis also explores the application of cyclic codes in data encryption and decryption. Using an example involving smart grid communications, it demonstrates how plaintext messages can be converted to binary, chunked, padded, and transformed into polynomial representations for encryption. The encryption process involves multiplying the polynomial codes by a generator polynomial and adding a One-Time Pad (OTP), resulting in secure ciphertexts. Decryption is achieved by reversing these steps, underscoring the robustness of cyclic codes in maintaining data fidelity through the encryption-decryption cycle.The conclusion highlights the effectiveness of cyclic codes in creating secure data streams, maintaining data integrity, and ensuring data security in critical infrastructure operations like smart grids. The recommendations suggest further research into combining cyclic codes with other cryptographic methods, integrating them with new technologies such as IoT devices in smart grids, and exploring their application over different Galois fields beyond 〖GF〗_2.

Keywords: *Cyclic codes, Cryptography*

19. Low-Cost digital telepathology workflow for cancer diagnosis using OpenFlexure Microscopy and AI Integration in Kenya

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Subtheme: Scientific Research and Technological Innovations for Sustainable Environmental and Societal Solutions

Abstract

This paper presents a low-cost, AI-enhanced telepathology solution implemented in Meru County, Kenya, aimed at addressing the critical shortage of diagnostic pathology services in resource-constrained settings. The system integrates the open-source OpenFlexure Microscope (OFM) for histological image acquisition, the MyPathomation™ cloud platform for remote image sharing and review, and a ResNet50V2-based deep learning model for automated classification of tissue samples as benign or malignant. Histological images were captured from archived patient samples using the OFM and uploaded to the cloud platform, where three independent pathologists remotely reviewed and annotated the slides. Concurrently, an AI model trained on the publicly accessible BreakHis dataset was evaluated against this clinical image set. The model achieved a sensitivity of 90% and specificity of 97%. Evaluation revealed strong concordance between the model and expert pathologists in identifying malignant tissue. However, there was a notable divergence in the classification of benign samples, which may be attributed either to model overfitting or inconsistencies in human annotations. These findings highlight both the promise and challenges of integrating low-cost, AI-enabled digital pathology into rural health systems. The project demonstrates the feasibility of remote cancer diagnostics and emphasizes the need for further refinement of AI models to enhance specificity and reduce false positives.

Keywords: *Digital pathology, Telepathology, OpenFlexure Microscope, Whole Slide Imaging, Artificial Intelligence, ResNet50V2, Histopathology, Cancer diagnosis, Resource-limited settings, MyPathomation, Deep learning, Kenya healthcare*

20. Comparison of integer-order, constant and variable fractional-order models of student competition using *Caputo-fabrizio* derivative with policy interventions.

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Subtheme: Scientific Research and Technological Innovations for Sustainable Environmental and Societal Solutions

Abstract

Savings and Credit Cooperative Organizations (SACCOs) are essential for economic growth, providing financial services such as deposits, loans, savings accounts, money transfers, insurance, and payment services. Despite the availability of digital media to enhance business processes and organizational agility, its adoption among SACCOs is relatively new. This study aimed to investigate the impact of digital marketing on the organizational agility of SACCOs in Meru Town, Kenya, focusing on social media, mobile, and website marketing. A descriptive research design was employed to examine the relationship between digital marketing and organizational agility. The study targeted five SASRA-licensed SACCOs in Meru Town, collecting data from 52 respondents through a semi-structured questionnaire and using a stratified sampling method. A pilot study with five respondents ensured the reliability and validity of the questionnaire. Data analysis involved descriptive and inferential statistics, including tabular, graphical, and numerical representations, and multiple linear regression to explore the relationship between digital marketing and organizational agility. Results indicated that social media, mobile, and website marketing positively influence SACCOs' organizational agility, with an R-squared value of 0.180. This means that 18% of the variance in organizational agility is explained by these digital marketing strategies. However, the moderate explanatory power suggests other factors also impact organizational agility. The study encourages decision-makers to integrate digital strategies into a broader framework of organizational transformation and adaptation. The findings contribute to the understanding of how digital marketing strategies intersect with organizational agility, emphasizing the importance of a holistic approach to digital integration in enhancing SACCOs' resilience and responsiveness to change. In conclusion, the study highlights the significant role of digital marketing in enhancing the organizational agility of SACCOs, indicating that by adopting comprehensive digital strategies, SACCOs can improve their resilience, responsiveness to change, and overall engagement with their ecosystem.

Keywords: *digital marketing, organizational agility, SACCOs, social media marketing, mobile marketing, website marketing*

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21. Formulation and physicochemical characterization of antibacterial camel milk cream-based toilet soap.

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Subtheme: Scientific Research and Technological Innovations for Sustainable Environmental and Societal Solutions

Abstract

Toilet soap is mainly used for both skincare and body cleansing, playing a role in maintaining personal hygiene and reducing the infection caused by disease causing microorganisms. The growing demand for natural skincare products has led to the utilisation of milk cream, known for its moisturizing and nourishing properties in soap formulation. This study aimed to formulate and evaluate physicochemical parameters, antibacterial activity and sensory acceptability of the camel milk cream-based toilet soaps. The camel milk cream toilet soap was produced using the cold saponification process with palm oil, coconut oil and camel milk cream as the main ingredients. Fresh raw camel milk was analyzed for its density, alcohol test as well as fat content and protein for extraction of milk cream used in the soap formulation. The physicochemical parameters evaluated included hardness, foam stability, pH, total fatty matter, alkali content, moisture content and Shelf-life. Antibacterial activity was tested against Staphylococcus aureus and Escherichia coli, and statistical significance in zones of inhibition (mm) was analysed using the Duncan's multiple range test ($p < 0.05$). The sensory acceptability of the soaps was evaluated by 20 panellists (12 females and 8 males) aged between 18 and 37 years. Some of these parameters are desirable in high value while others in small quantities. The findings showed that camel milk had density of 1.031 gcm3 while camel milk cream had a fat content of 43.33 ±0.58 % and protein content of 1.94 ±0.07 %. The observed results for the physicochemical parameter of the formulated camel milk cream soap showed that pH values ranged between 10.17 to 11.51. Total Fatty Matter was between 45.19 to 66.43%, Moisture content ranged between 21.06 to 33.4 %, foam stability and hardness were within the range of 0.33 cm to 1.37 cm and 0.281 to 0.639 kPa respectively. Additionally, inclusion of camel milk cream in the soap formulation showed a significant increase ($p<0.05$) in antibacterial activity. The sensory evaluation indicated high consumer acceptability, with positive feedback on the soap's skin-smoothing and moisturizing effects. All the parameters analysed were compared with commercial soaps such as Imperial leather and Dettol. The soap formulated with 20% coconut oil and 20% camel milk cream had a balanced physicochemical parameters and high antibacterial activity against both bacterial strains.

Keywords: *Toilet Soap, Saponification, Camel milk cream, Physicochemical parameter, A Antibacterial activity.*

22. Time Series Analysis of Prostate Cancer Incidences in Meru County

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Subtheme: Scientific Research and Technological Innovations for Sustainable Environmental and Societal Solutions

Abstract

Cancer is a major health challenge. Globally, the estimated number of diagnosed cancer incidences is approximately 14.1 million people per year and a mortality rate of 8.2 million deaths per year. The primary objective was to develop robust predictive models to forecast prostate cancer incidences and identify significant trends and patterns that inform healthcare planning and interventions in Meru County Kenya using Auto-Regressive Integrated Moving Average with exogeneous variable (ARIMAX) Models. The dataset used comprised historical records of prostate cancer incidences in Meru County. The data spanned from [Jan 2018] to [Nov 2023], providing a comprehensive overview of the trends over time. Additionally, exogenous variable age was included in the ARIMAX model to enhance the accuracy of the prostate cancer predictions. Data on the prevalence of prostate cancer was obtained from Meru Cancer Registry for 71 months. The ARIMAX model was fitted using the Box-Jenkins methodology which include four iterative steps that is model identification, parameter estimation, diagnostics and forecasting. The prostate cancer time series data was made stationary by differencing and log transformation. R programming (Version 4.3.3) software was used in the analysis. Further, given the highly sensitive nature of the forecast values, interpolated data from daily values to monthly values were used. The best models for the Prostate cancer incidences were ARIMAX (0,0,1). Majority of the Prostate cancer incidences were within the age group 70-79 years at 50.7%, ages 60-69 was 42.3% while 80-90 years was 7%. After log transformation and differencing of the prostate cancer time series data the Augmented Dickey Fuller test was performed and the P-value was (.01) which was less than the significance level of (0.05), the null hypothesis was rejected that the prostate cancer time series had a unit root. Therefore, there was sufficient evidence to conclude that the time series was stationary. Ljung-Box test checked for the presence of autocorrelation at multiple lags and a high P-value = .719 greater than 0.05 indicated that there is no significant autocorrelation remaining in the residuals, thus the ARIMAX model was adequate. The MA(1) coefficient was -0.9, which indicated strong short-term negative autocorrelation. A positive value of 0.587 suggested that as the external variable increases by one unit, the log-transformed and differenced prostate cancer monthly cases (lnPCa Monthlycases d1) were expected to increase by 0.5871 units, holding all else constant. Results show that the ARIMAX (0,0,1) model slightly outperformed the ARIMA (0,0,1) model. This study successfully modelled the trends of prostate cancer incidences in Meru County using ARIMAX models. The findings indicated a rising trend in incidences, with the ARIMAX model providing the most accurate forecasts by incorporating the external variable age.

Keywords: *ARIMA, ARIMAX, Stationarity, Autocorrelation, Forecasting, Prostate Cancer*

23. Mathematical modelling for assessing the impact of Human Papilloma Virus Vaccination on cervical cancer incidence in Meru County

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Abstract

The Human Papilloma Virus (HPV) is one of the most common sexually transmitted viruses worldwide and is associated with cervical cancer. Cancer is the third leading cause of mortality in Kenya 15% of cases needing cancer treatment sent to Kenyatta National Hospital came from Meru County and there was no deterministic model that assessed the impact of HPV vaccination on cervical cancer. The goal of this research is to develop a mathematical model for determining the impact of human papilloma virus vaccination, in Meru County. The SIR model (Susceptible-Infected-Recovered) is a commonly used mathematical model in epidemiology to study the spread of infectious diseases. Six compartment are considered in the model that is; Susceptible population, Exposed population, Infected population, Vaccinated population, Treated population and Recovered population. The Next generation matrix method was used to determine the basic reproduction number denoted Ro of the proposed model. The results obtained indicates that the Disease Free Equilibrium is locally asymptotically stable whenever $Ro * < 1$ and globally asymptotically stable if $R0 * \leq 1$. Endemic Equilibrium it is globally asymptotically stable if $Ro * > 1$. The results obtained show that increasing the rate of vaccination and treatment on the infected population and susceptible population respectively it's a crucial way to curb the spread of the Virus. The Government of Kenya should advocate treatment and vaccination as control methods. Further research should consider indoor screening , outdoor screening and media campeigns as control strategies.

Keywords: *HPV, cervical cancer, morbidity, mortality, cardiovascular, SIR.*

PURE AND APPLIED SCIENCES CONFERENCE PAPERS

24. Optimization of Black Soldier Fly (*Hermetia Illucens*) production for organic waste management in a small-scale institutional facility

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Subtheme: Scientific Research and Technological Innovations for Sustainable Environmental and Societal Solutions

Abstract

For the first time in history, there are five generations in the workplace.; Traditionalists—born 1925 to 1945, Baby Boomers—born 1946 to 1964, Generation X—born 1965 to 1980, Millennia's—born 1981 to 2000, Generation Z—born 2001 to 2020, (preparing for (GenAlpha 2021-). The commonalities are more than the difference, but often we focus on differences that are obviously due to each generations experience and circumstance, to the detriment of health life-work relationship and workplace organizational performance. The study method utilized is systematic review of studies on differences and commonalities of the generations. Unveiling and unmasking the myths that comes with Multigenerational presence in organizations. This knowledge's goal is form basis for intervention that create multigenerational teams for wellbeing at work place as well as performance and success of the organization. Results indicate that there are generally four generations in modern workplace. Each of the generation carry with the characteristics that peculiar to them, as well as history with experiences different epoch events in their time and shaped their perspective, as well as their value systems both at work place and personal life. The study also unveiled multiple myths that contribute to making it difficult for multigenerational team to work together. The study recommends models of team building interventions in work place and organizations as well as in community setting for wellbeing of the organizations and staff.

Keywords: *Multigenerational, generations, traditionalist, baby boomers, generation Z, Millennia's Gen Alpha*

25. Seeds of Pollution: Tracing microplastics in compost-amended agricultural soils in Embu, Kenya

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Subtheme: Scientific Research and Technological Innovations for Sustainable Environmental and Societal Solutions

Abstract

Microplastic pollution in terrestrial ecosystems has emerged as a growing environmental concern, particularly in agricultural soils that receive organic amendments such as compost. This is due to the fact that once in the soils, microplastic can be up taken by the crops, causing multiple adverse effects on plants including oxidative stress and decrease of crop biomass. Upon consumption of the agricultural products by human beings leads to health effects. This study investigated the occurrence, types, and potential sources of microplastics in agricultural soils amended with goat, chicken and cow dung composted manure. Soil samples were collected from twelve farmland sites with a history of compost application within Embu County. Microplastics were extracted from the soil samples using H_2O_2 catalyzed with Fe^{2+} to digest the organic matter. Microplastics recovered were visualized via microscopy with polymer types confirmed through Attenuated Total Reflection-Fourier transform infrared spectroscopy. Microplastics were detected in all the sites with abundances of 4.94 ± 1.29 items/Kg, 13.21 ± 0.89 items/Kg and 2.85 ± 0.33 items/Kg in goat, chicken and cow dung compost amended soils respectively. Polypropylene, polyethylene and polyacrylamide were the most dominant polymers types with fibers (88.11%) being the most common shape, followed by fragments (7.07%), microbeads (2.96%), and finally films (1.87%). The findings suggest that while composting is promoted for its role in improving soil health and sustainability, it may also serve as an unintended pathway for plastic pollution in agroecosystems. It further highlights need for stricter quality control in organic waste management and provides a foundation for future research on the environmental and agricultural implications of microplastic contamination in soils.

Key Words: *Environmental pollution; Microplastics; Agricultural soils; Compost manure.*

26. , Alternative environmentally benign extraction solvent: supercritical carbon dioxide

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Subtheme: Scientific Research and Technological Innovations for Sustainable Environmental and Societal Solutions

Abstract

Extraction is crucial for chemical processing and plays an important role for both qualitative and quantitative analysis. Conventional extraction techniques employ the use of organic solvents that have petroleum origin and known to be toxic, flammable, expensive, and have negative environmental impact. An ideal alternative solvent should have high flash point with low toxicity and low environmental impact. Supercritical carbon dioxide (SCO2) is generally regarded as safe and it has mild critical point values (73 atm, 31°C), which are easily achievable. It is relatively inert, making it ideal for chemically and thermally labile compounds. It possesses dual characteristics i.e. dissolve like a liquid and diffuse like a gas, which are easily fine tuned by changing temperature and pressure values. Besides, carbon dioxide is ubiquitous, cheap, recyclable, and it leaves no residue on the extract. Supercritical fluid extraction (SFE) using carbon dioxide as an alternate solvent was explored in processing of selected agricultural products (Beeswax, Distillers dried grains with solubles, waste sheep wool and essential oils extraction to produce value-added products. SCO2 was used in extraction and refining of beeswax and isolating pure lanolin from waste wool. SCO2 extraction of beeswax from honeycomb, cappings, slumgum, and filter cakes was performed and the effects of temperature, pressure and time on extract yield were studied. The results showed that at least 90% yield was obtained when the operating temperature and pressure were 70 °C and 10,000 psi respectively. This corresponded to a dynamic extraction time of 30 minutes. The results from lanolin isolation showed that carbon dioxide offers high selectivity for lanolin and no prior cleaning of the wool is required. This makes the process less laborious, convenient, and economical.

Keywords: *Supercritical Carbon Dioxide, extraction solvent*

27. Effect of Cu2+ ions on structural, optoelectronic, and morphological properties of black titanium dioxide prepared by modified sol-gel method

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Subtheme: Scientific Research and Technological Innovations for Sustainable Environmental and Societal Solutions

Abstract

Black copper-doped titanium dioxide (Cu-TiO2) nanoparticles (NPs) were synthesized using the modified sol-gel technique. Black TiO_2 is desirable primarily because of its enhanced visible light absorption and improved photocatalytic activity compared to conventional white TiO_2. The modified sol-gel method was employed due to its enhanced control over material Composition, lower processing temperatures and better homogeneity. The study explored structural, optoelectronic, and morphological properties of the prepared samples. The powder X-ray diffraction (XRD) results confirmed the presence of the anatase phase in all the samples. Ultraviolet-visible spectroscopy (UV-Vis) spectra showed bandgap narrowing from 3.21 eV (undoped TiO2) to 2.82 eV (Cu-doped) showing enhanced visible light absorption. Scanning Electron microscopy (SEM) results revealed that the particles were quasi-spherical while energy dispersive spectroscopy (EDS) analysis confirmed the presence of the anticipated elements. The functional groups of the samples were identified using the Fourier-transform infrared spectroscopy (FTIR). Photoluminescence (PL) results showed a decrease in peak intensity with increasing dopant concentration, with a 25% reduction observed at 5.2 mol %. The study shows that an appropriate amount of copper dopant is an effective means to enhance the TiO2 properties for visible-light photocatalysis.

Key words: *Degradation; morphology; optical properties; photocatalyst; Titanium dioxide*

28. Phytometabolites profile, oviposition deterrence, and F1 progeny emergence inhibition potential of organic extracts of invasive plant species on *Sitophilus zeamais*

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Subtheme: Scientific Research and Technological Innovations for Sustainable Environmental and Societal Solutions

Abstract

Sitophilus zeamais is an important pest of the stored maize grains. It's mainly controlled using synthetic pesticides, usually associated with several human health risks and intoxication of the fauna and flora. Bio-insecticides forms an alternative intervention since they possess fewer side effects on human health, are ecofriendly and readily available. This study evaluated the phytochemical composition and developmental effects, oviposition deterrence and progeny (F1) emergence suppression of organic leaf extracts of *Tithonia diversifolia* (Hemsl.) A. Gray and *Baccharoides lasiopus* (O. Hoffm.) H. Rob. on *Sitophilus zeamais* Motschulsky. The plant leaves samples were obtained from Embu County, Kenya where they are traditionally used by Mbeere community against weevils though without a valid scientific documentation of the claimed effects. Extraction was performed using two solvents, dichloromethane (DCM) and ethyl acetate (EtOAc). Four concentrations of the extracts (0.25, 0.50, 0.75 and 1 g/ml %) were tested. Actellic super TM was used as the positive control, whereas the negative control group was treated with extraction solvent only, separately admixed with 20 g maize grains. The Gas Chromatography-Mass Spectrometry (GC-MS) analysis of the extracts was also conducted. This was conducted in four replications and in a Completely Randomized Design (CRD). It was observed that the extracts caused oviposition deterrence activity ranging from 12.18 to 100 % and inhibition of *S. zeamais* adult F1 progeny emergence (between 38.38 and 100 %) 56 days' post treatment. The effects were also significantly ($P>0.05$) comparable to that of the standard. A total of 33 and 55 compounds were identified including 15 compounds known for their insecticidal activity. The study indicates that the DCM and EtOAc leaf extract of *T. diversifolia* and *B. lasiopus* have active bio-compounds with considerable oviposition deterrence and F1 emergence inhibition on *S. zemails*. This potential can be exploited and may contribute to control of the invasive plant species

Key words: *Phytochemicals, Bio-pesticide, Tithonia diversifolia, Baccharoides lasiopus, Oviposition deterrence*

29. Characterization of insecticidal properties of organic extracts from two invasive plant species on *Sitophilus zeamais*

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Subtheme: Scientific Research and Technological Innovations for Sustainable Environmental and Societal Solutions

Abstract

Sitophilus zeamais is an important pest of the stored maize grains. It's mainly controlled using synthetic pesticides, usually associated with several human health risks and intoxication of the fauna and flora. Bio-insecticides form an alternative intervention since they possess fewer side effects on human health, are ecofriendly and readily available. This study evaluated the phytochemical composition and developmental effects, oviposition deterrence and progeny (F1) emergence suppression of organic leaf extracts of *Tithonia diversifolia* (Hemsl.) A. Gray and *Baccharoides lasiopus* (O. Hoffm.) H. Rob. on *Sitophilus zeamais* Motschulsky. The plant leaves samples were obtained from Embu County, Kenya where they are traditionally used by Mbeere community against weevils though without a valid scientific documentation of the claimed effects. Extraction was performed using two solvents, dichloromethane (DCM) and ethyl acetate (EtOAc). Four concentrations of the extracts (0.25, 0.50, 0.75 and 1 g/ml %) were tested. Actellic super TM was used as the positive control, whereas the negative control group was treated with extraction solvent only, separately admixed with 20g maize grains. The Gas Chromatography-Mass Spectrometry (GC-MS) analysis of the extracts was also conducted. This test was conducted in four replications and in a Completely Randomized Design (CRD). It was observed that the extracts caused oviposition deterrence activity ranging from 12.18 to 100 % and inhibition of *S. zeamais* adult F1 progeny emergence (between 38.38 and 100 %) 56 days' post treatment. The effects were also significantly ($P<0.05$) comparable to that of the standard. A total of 33 and 55 compounds were identified including 15 compounds known for their insecticidal activity. The study indicates that the DCM and EtOAc leaf extract of *T. diversifolia* and B. lasiopus have active bio-compounds with considerable oviposition deterrence and F1 emergence inhibition on *S. zemais.* This potential can be exploited and may contribute to control of the invasive plant species.

Keywords: *Baccharoides lasiopus, Bio-pesticide, Oviposition deterrence, Phytochemicals, Tithonia diversifolia*

30. Risk predictive model for coronary artery disease using machine learning: a systematic review

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Subtheme: Scientific Research and Technological Innovations for Sustainable Environmental and Societal Solutions

Abstract

Heart disease is a regular occurrence and one of the leading causes of death all over the world. Among these diseases, coronary artery disease (CAD) is one of the common diseases around the world. Early identification and accurate risk prediction of Coronary Artery Disease (CAD) can enable timely interventions, potentially reducing morbidity and mortality rates associated with the disease. Predicting cardiac illness is a difficult undertaking, it is necessary to automate the process in order to avoid the risks connected with it and to inform the patient well in advance. This paper presents a systematic literature review of existing Risk Predictive Model for Coronary Artery Disease using Machine Learning. The paper provides a detailed analysis of Machine Learning Techniques such as Random Forest Tree Classification, Decision Tree Algorithm and K -Nearest Neighbor Algorithm (KNN) and Logistic Regression in relation to their effectiveness and accuracy in predicting CAD. The existing Machine Learning techniques' performance are evaluated on the basis of their strength, weakness and the level of accuracy in predicting CAD. The study reveals the need to improve the accuracy of Machine Learning techniques by leveraging on the power of various Machine Learning techniques for early identification of individuals at high risk of developing coronary artery disease (CAD). The study also proposes integration of a wide range of patients' data to enhance the accuracy and effectiveness of machine learning techniques in risk prediction.

Keywords: *Coronary artery disease, Risk prediction, Machine learning, Predictive model.*

31. Mathematical modeling of the effects of screening and treatment of gastric ulcers as a control strategy for gastric cancer

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Subtheme: Scientific Research and Technological Innovations for Sustainable Environmental and Societal Solutions

Abstract

Gastric cancer is among the most common cancers in the world, and it has a significant negative impact on the health and the economies of different countries, led by those that are developing. This study formulates a deterministic model for transmission dynamics of gastric cancer incorporating screening and treatment strategies for gastric ulcers. The model was thoroughly analyzed both quantitatively, qualitatively, and numerically. The key properties that were considered in the model analysis are not limited to positivity, invariant region, equilibria, stabilities, and bifurcation analysis. We compute the control reproduction number (R_C), proof the model has a unique disease-free equilibrium and endemic equilibrium point. Both DFE and EEP are locally and globally asymptotically stable whenever R_C<1.and R_C>1 respectively. Further, we validate the model by fitting it to real data of gastric ulcers and gastric cancer cases as recorded from Meru Teaching and Referral Hospital, Kenya. Sensitivity analysis indicates that increasing the rate of screening decreases the control reproduction number, consequently reducing the rate of transmission of infections. Simulation results demonstrate that the combination of screening and treatment is the most effective intervention in reducing infection transmission. Furthermore, a combination of early screening and treatment proves more effective than a combination of late screening and treatment of gastric ulcers. Screening the infected population alone is identified as the least effective strategy for curtailing transmission of infection in the susceptible population. The findings of this study will guide health officials in making decision regarding the screening and treatment of exposed individuals with H. pylori and gastric ulcer patients, therefore aiding in fighting gastric ulcers and its progression to gastric cancer.

Keywords: *Gastric cancer, gastric ulcers, control reproduction number, deterministic model, and numerical simulation.*

32. Fracture toughness and durability of fly ash-based cementitious composites: a comprehensive review

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Subtheme: Scientific Research and Technological Innovations for Sustainable Environmental and Societal Solutions

Abstract

Fly ash, a by-product of coal combustion in thermal power plants, has emerged as a key supplementary material in sustainable cementitious composites. With its more than 750 million tonnes annual production in 2022, only 60% was used in construction, the effective utilization of the material remains a top environmental and engineering concern. The fracture toughness and durability of fly ash-based cementitious composites, two performance criteria that govern structural integrity and service life are investigated in this study. Fracture resistance is enhanced through the pozzolanic reaction pozzolanic reaction of fly ash, which refines pore structure and promotes the formation of secondary calcium silicate hydrate (C–S–H). Studies report a 15–35% improvement in fracture energy and a 20% increase in critical stress intensity factor (K_IC) in fly ash-modified mortars compared to control specimens at 28 days. These improvements are especially notable in high-volume fly ash (HVFA) systems, where fly ash replaces 40–60% of Portland cement by mass. On durability, fly ash significantly reduces chloride ion permeability, with ASTM C1202 charge values dropping from 3500 coulombs in ordinary Portland cement (OPC) concretes to under 1000 coulombs in 30% fly ash blends. Sulfate resistance is enhanced due to reduced calcium hydroxide content and refined pore connectivity; expansion under ASTM C1012 can be limited to below 0.1% after 6 months in aggressive environments. Freeze–thaw durability is also improved, with mass loss in optimized fly ash concretes reduced by up to 40%. However, carbonation resistance may decrease due to lower calcium hydroxide availability, necessitating careful mix design and curing control. This review consolidates recent experimental evidence to highlight the dual performance benefits of fly ash, identifies variables influencing mechanical-durability synergy, and suggests critical research gaps, particularly in fracture modeling and long-term exposure tests, to guide future engineering and material optimization.

Keywords: *Fly Ash; Fracture Toughness; Durability; Cementitious Composites; High-Volume Fly Ash (HVFA)*

33. The fate of antibiotic-resistance genes and microbial community dynamics during Black soldier fly larvae bioconversion of human faecal waste

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Subtheme: Scientific Research and Technological Innovations for Sustainable Environmental and Societal Solutions

Abstract

Approximately 30–90% of administered antibiotics can persist in human faecal waste as either parent compounds or metabolites, making it a significant reservoir for a wide spectrum of antibiotic resistance genes (ARGs). Black soldier fly larvae (BSFL, Hermetia illucens) bioconversion has emerged as a promising novel strategy for mitigating ARGs and antibiotic-resistant bacteria (ARB) in human faecal waste. Five grams of five-day-old larvae were fed one kilogram of fresh faecal waste, while equal quantities of fresh faecal waste without larvae served as the control. A diverse range of total ARGs was quantified using real-time quantitative polymerase chain reaction (qPCR), while 16S rRNA amplicon sequencing was employed to monitor changes in the microbial community structure. BSFL bioconversion significantly reduced total ARGs by 0.2–2 log units and ARB by 0.3–1.5 log units in fresh human faecal waste. These results highlight the potential of BSFL bioconversion to mitigate antimicrobial resistance (AMR) risks during faecal waste management. These findings underscore the need to integrate BSFL bioconversion into sanitation policies and develop regulatory frameworks that promote sustainable, low-cost strategies for mitigating AMR in faecal waste management.

Keywords: Antibiotic Resistance Genes, Antibiotic-Resistant Bacteria, Antibiotics, Antimicrobial Resistance, Black Soldier Larvae Bioconversion, Faecal Waste

SUBTHEME 3: BUSINESS AND ECONOMICS - Entrepreneurship and Innovation for Economic Empowerment and Sustainable Development

BUSINESS AND ECONOMICS PRE-CONFERENCE PAPERS

34. Computerized accounting systems and financial performance of insurance companies in Kenya.

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Subtheme: Entrepreneurship and Innovation for Economic Empowerment and Sustainable Development

Abstract

Computerized accounting systems represent a technological evolution in financial management, replacing traditional manual accounting methods with automated processes. The purpose of the study is to evaluate the effects of computerized accounting systems on the financial performance of insurance companies in Kenya. Specific objectives include: To find out the effect of automated internal control systems on the financial performance of insurance companies in Kenya, To establish the effect of automated data processing on the financial performance of insurance companies in Kenya, and To examine the effect of automated reporting on the financial performance of insurance companies in Kenya. This study's significance lies in its contribution to the understanding of factors that may improve the financial performance of insurance companies in Kenya. The study adopted descriptive statistical analysis, correlation analysis, and regression analysis to analyze data. The target population is composed of 186 respondents from 62 insurance companies. Primary data was used. The data collection tool was questionnaires that were designed in a structured way to capture all the study objectives. The data was collected through the administration of questionnaires using a Google Form link created by the researcher. The study employed both qualitative and quantitative methods of data analysis to give the study results from the field. The study findings revealed strong positive correlations between all independent variables and financial performance. Government regulation had a significant direct effect on financial performance, but did not significantly moderate the relationship between computerized accounting systems and financial performance. The study concluded that computerized accounting systems play a crucial role in enhancing the financial performance of insurance companies in Kenya, with automated internal control systems having the strongest impact. The study recommends that insurance companies in Kenya should prioritize the implementation of computerized accounting systems as a critical component of their financial management strategies.

Keywords: *Computerized accounting, Financial Performance, Insurance Companies*

35. Impact of camel milk value chain development on human resource empowerment among pastoralist communities in Kenya

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Subtheme: Entrepreneurship and Innovation for Economic Empowerment and Sustainable Development

Abstract

Camel milk production and value chain development have emerged as vital economic activities among pastoralist communities in arid and semi-arid regions of Kenya. Despite its increasing contribution to household incomes and nutrition, there remains a critical gap in understanding how camel milk value chain development directly impacts human resource empowerment within these communities. This systematic review aims to critically synthesize existing literature focusing on the relationship between camel milk value chain interventions and empowerment of pastoralist human resources in Kenya. Using a rigorous methodological approach, relevant peer-reviewed articles, theses, and reports from 2000 to 2025 were systematically identified through databases such as Google Scholar, ResearchGate, and institutional repositories, applying strict inclusion and exclusion criteria. Data extraction and thematic synthesis were conducted, with quality assessment of studies done using the CASP tool. The findings reveal that camel milk value chain development significantly contributes to skills enhancement, employment creation, income diversification, and socio-economic empowerment of pastoralists, especially women and youth. However, challenges such as poor market infrastructure, limited access to credit, and traditional socio-cultural barriers persist. This review concludes that targeted interventions in the camel milk value chain can effectively empower human resources and recommends policy focus on capacity building, infrastructure improvement, and gender-inclusive programs. The novelty of this study lies in its holistic and systematic synthesis of empirical evidence on camel milk value chain impacts on human resource empowerment, offering crucial insights for stakeholders in Kenya's pastoral development agenda..

Keywords: *Camel Milk Value Chain, Human Resource Empowerment, Pastoralist Communities, Socio-Economic Development, Gender Inclusion*

36. Assistance programs and employee performance of public universities in Mount Kenya East

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Subtheme: Entrepreneurship and Innovation for Economic Empowerment and Sustainable Development

Abstract

Employees are the key drivers of every organization thus provision of staff welfare programs is considered essential in productivity. The performance of public universities in terms of providing quality education, training and research is pegged on the performance of its workforce. The main objective of this study was to determine the effect of employee assistance programs on employee performance of Public universities in Mount Kenya East. The study targeted Public Universities in Mount Kenya with a population of 1633 employees comprising of both teaching and non-teaching staff. The study applied stratified random sampling resulting to a sample size of 90 non-teaching staff and 59 teaching staff. Primary data was collected using structured questionnaires. In the analysis of data, this study employed SPSS (Version 28) and utilized descriptive and inferential statistics. Multiple linear regression models were used to analyze the connections between the dependent and independent variables. It was established that counseling programs highly enhanced employees' morale, the study established a statistically significant association between employee assistance programs and the employee performance of public universities. Subsequently, the study concluded that employee assistance programs had a significant association with employee performance of Public universities in Mount Kenya East. The study recommends that university management should introduce employee assistance programs where they are lacking in order to take care of the welfare of their workers. Similarly, university management should encourage employees to utilize the counseling programs availed by the management.

Keywords: *Welfare Programs, Employee Assistance Programs, Employee Counselling, Public Universities, Employee Performance.*

37. Data quality of accounting information systems and the financial performance of microfinance institutions in Meru County

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Subtheme: Entrepreneurship and Innovation for Economic Empowerment and Sustainable Development

Abstract

Accounting Information System (AIS) is one of the important systems in organizational operations. AIS is used in capturing, processing, storing and distributing information. Recently, more and more digital and online information has been utilized in Accounting Information Systems for decision-making. Organizations need to take action, put such systems at the forefront, and consider both the system and the human-related factors while managing their Accounting Information Systems. The main objective of the study was to find out the influence of Accounting Information Systems on the financial performance of MFIs in Meru County. A target population of 316 employees was identified for the study, with a sample size of 177 respondents applying Yamane's formula. A questionnaire was used to collect data and secondary panel data contained in the annual reports and financial statements of selected MFIs utilized from 2018-2022. Regression and correlation analysis were carried out and data quality can influence financial performance at 95.3 percent, other factors held constant. The regression coefficient significance value was .000, showing that data quality was statistically significant and positively influenced the financial performance of Microfinance Institutions in Meru County. The study recommends that the relevance and completeness of data within the Accounting Information System (AIS) contribute directly to more effective financial reporting, decision-making, and strategic planning. Thus, there is a need to adopt an Accounting Information System to improve performance..

Keywords: *Accounting Information System, Data Quality, Financial Performance, Financial Institutions, Micro Finance.*

38. Influence of equity financing on the financial performance of manufacturing firms quoted at the Nairobi Securities Exchange

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Subtheme: Entrepreneurship and Innovation for Economic Empowerment and Sustainable Development

Abstract

Firms require capital to finance their business operations and investments. Most firms are faced with a predicament on whether to utilize debt or equity to finance their investments. Consequently, these firms need to find the best option and effectively manage their risks. The main aim of this study was to establish the influence of financial structure on the financial performance of firms quoted at the Nairobi Securities Exchange. The specific objective identified for the study was to establish the influence of equity financing on the financial performance of manufacturing firms quoted at the Nairobi Securities Exchange. The research method employed was descriptive research design. The census method was adopted and a target population of 8 manufacturing firms quoted at the Nairobi Securities Exchange was considered. A questionnaire and secondary data collection form were data collection instrument. Secondary data was obtained from audited financial statements of the eight firms identified for the study as per institution websites and Central Bank of Kenya annual supervisory reports from 2018-2022. Descriptive statistics and inferential statistics were used and data was analyzed using Statistical Package of Social Science (SPSS) version 26. The study findings established that equity financing had a significant positive influence on the financial performance of manufacturing firms quoted at the Nairobi Securities Exchange. Therefore, the study recommends that manufacturing firms should consider equity financing as one of the ways of financing the firm. The study provides useful information to managers and policymakers on the best financing option to initiate before choosing other financing options. Finally, the study recommends that other studies be conducted to establish the influence of equity financing on the financial performance of manufacturing firms that are not quoted at the Nairobi Securities Exchange.

Keywords: *Equity Financing, Financial Performance, Financial Structure, Manufacturing Firms, Nairobi Securities Exchange, Shares.*

39. Influence of audit committee on the financial performance of deposit taking SACCOS, in Meru County Kenya

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Subtheme: Entrepreneurship and Innovation for Economic Empowerment and Sustainable Development

Abstract

In Corporate governance is a critical tool for enhancing the performance of Deposit-taking Savings and Credit Cooperative Societies (SACCOs) and ensuring they meet their members' economic and social needs. Properly structured cooperatives can contribute to equitable development and justice. However, a significant challenge facing these SACCOs is the issue of corporate governance. Some have faced mismanagement problems, resulting in the cessation of their operations. The general objective of the study aimed to investigate the effect of audit committee on corporate governance and the financial performance of deposit taking SACCOs in Meru County. The study population was 92 directors. A sample of 75 directors was selected using stratified random sampling on the basis of proportional allocation. Closed ended questionnaires were used to collect primary data. Secondary data collection template was used to collect data from period of 2017 to 2022 from the SACCO supervision annual reports. The findings disclosed a significant association between the audit committee and the performance of Deposit-taking SACCOs The study concluded that there is exists of correlation between the audit committee and Deposit taking SACCO's financial performance. The study results showed a positive and significant relationship between the two variables. In addition, the study found that these SACCOs select audit committee members transparently, majority members are well-versed in accounting matters and possess financial reporting experience in auditing and also held frequent meetings. The performance of deposit-taking SACCOs is improved and also liquidity problem. The implications of these findings are substantial, particularly for the directors of Deposit-taking SACCOs and other cooperative organizations. Directors of SACCOs can employ strategies to enhance governance practices within their societies, ultimately improving their overall performance. The study recommends that audit committee members maintain regular meetings to assess the SACCOs' performance, ensuring smooth operations from the findings. The study concluded that the selection of members transparently improved SACCO's financial performance.

Keywords: *Audit committee, Corporate governance, Deposit-taking SACCOs, equitable and financial performance.*

BUSINESS AND ECONOMICS CONFERENCE PAPERS

40. Moderating effect of legislation on relationship between social inclusion in cooperative governance and financial performance of agricultural cooperatives in Kenya

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Subtheme: Entrepreneurship and Innovation for Economic Empowerment and Sustainable Development

Abstract

This study examined the relationship between social inclusion in cooperative governance and the financial performance of agricultural cooperatives in Kenya, emphasizing the moderating role of legal frameworks. Social inclusion in this context refers to the active participation of diverse members in the governance and decision-making processes of agricultural cooperatives. The study's objective was to determine whether enhanced social participation in cooperative governance correlates with improved financial performance and how legal frameworks influence this relationship. A quantitative methodology was employed in the study, analyzing data from 31 agricultural cooperatives in Kiambu and Kajiado counties, covering a sample of 57,640 members over five years (2019–2023). Regression analysis was used to assess the direct impact of social inclusion on financial performance and to explore the moderating effect of legal frameworks. Findings revealed a significant positive correlation between social inclusion in cooperative governance and financial performance, with social inclusion in cooperative governance accounting for 71.7% of the variance in financial performance (R-value = 0.846, R^2 = 0.717). ANOVA results supported these findings (F-value = 1013.681, p-value = 0.000). Additionally, the moderating model indicated a strong explanatory power (R-value = 0.862, R^2 = 0.743), with legislation significantly enhancing the positive influence of social inclusion in cooperative governance (F-value = 1161.891, p-value = 0.000). The study concluded that socially inclusive cooperative governance practices and supportive legislation are critical for enhancing the financial sustainability of agricultural cooperatives, providing valuable insights for cooperative leaders and policymakers.

Key words: *Agriculture, Cooperative, Governance, Inclusion, Performance*

41. The moderating role of top management characteristics on the relationship between management development practices and service delivery in higher learning institutions: evidence from Kenyan Public Universities

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Subtheme: Entrepreneurship and Innovation for Economic Empowerment and Sustainable Development

Abstract

Purpose – Literature on Top management characteristics and management development is limited and still evolving; The purpose of this paper is to establish the moderating Role of Top Management Characteristics on the Relationship between Management Development Practices and Service Delivery in Higher Learning Institutions in Kenya by addressing the primary gaps in the literature: the research findings and results on the relationship between management development practices and service delivery have been contradicting and no attempt to clear the contradictions; biased and unbalanced analysis of the different measures of service delivery, as well as the failure to use the moderating role of top management characteristics. The universities were used as a unit of analysis, using the upper echelon theoretical underpinning. **Design/methodology/approach** – The sampling frame was the fourteen universities targeted by the study, a sample of four hundred (400) respondents was used in the study drawn using proportionate sampling from a total population of one thousand one hundred and thirty-four (1134) top management employees. The response rate was 52.25 %, descriptive likert scale analysis was used to present the descriptive results while regression analysis was used to test the hypotheses. The preliminary tests employed the use of Kaiser Mayer-Olkim (KMO) and Bartlett's test. The study's KMO measure is 0.732, a value indicating sampling adequacy as the Bartlett's test of sphericity is significant with its associated probability is less than 0.00. **Findings** –the results indicate the relationship between management development practices and service delivery is affected by top management characteristics (Adjusted R Square = .993, F = 960.040, $p > 0.05$). The β depicting the coefficient for the interaction (X.T) was also significant ($\beta = 0.637$, $t = 23.673$, $p > 0.05$), therefore supporting the condition for moderation in the relationship between management development practices and service delivery by top management characteristics (X.T) is statistically significant **Research limitations/implications** – While 10 literature reviews are taken into account in this paper as the basis of the empirical analysis, this allows for assessing the range of procedures applied in previous literature reviews and for pointing to their strengths and shortcomings **Originality/value** – The study contributed to empirical literature and policy in organization's also concluded on future research considerations for additional variables, external validity, qualitative research design aimed at extending the research.

Keywords: *Management, Upper echelon, service delivery*

42. The Influence of job characteristics on knowledge sharing in public and private chartered universities in Kenya

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Subtheme: Entrepreneurship and Innovation for Economic Empowerment and Sustainable Development

Abstract

Mobile phone users in Participatory Sensing Systems (PSS) are invited to collect information from their immediate locations. Authors believe that sensor-equipped mobile phones will transform many sectors of Kenya economy, including environmental monitoring. Significantly, today's smartphones are programmable while others come with a growing set of cheap powerful embedded sensors, such as Global Positioning Systems etc. which are enabling the emergence of crowd sensing applications. Gas detectors and sensors play a critical role in ensuring safety, environmental protection, and industrial efficiency. With advancements in technology and ongoing research efforts, gas sensing technologies continue to evolve, offering enhanced performance, versatility, and applicability across diverse domains. Despite the stable growth of participatory sensing application worldwide, there is still little understanding of participatory sensing adoption and user's experiences in other countries, especially in Africa. These few research efforts have provided valuable findings and lessons for improving users' experiences and adoption; however, the participants in all these studies were drawn in the U.S., Europe, and Asia. The extent to which these findings about adoption and experiences generalize to other regions, such as Kenya, is still largely neither unaccounted nor unknown. To achieve this objective, the researchers conducted a questionnaire-based study involving 400 participants to investigate the possible key preconditions necessary for successful implementation of Participatory sensing in Kenya. To this end, we present a generic multi sensor tool that collects real time data simultaneously to monitor air quality. The selected multiple gases are carbon monoxide, carbon (IV) oxide, Ozone, particulate matter, methane, smoke, acetone, pressure, temperature, and humidity.

Keywords: *Participatory sensing, Air quality, Assessment, Embedded sensors, Portable sensing device*

NB: This work was supported in part by the National Research Fund (NRF), Kenya, Multidisciplinary Research, under Grant 2016/2017.

43. The socio-economic potential impact of Apiculture Entrepreneurship in Meru County

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Subtheme: Entrepreneurship and Innovation for Economic Empowerment and Sustainable Development

Abstract

This study investigates the socio-economic potential of beekeeping entrepreneurship in Meru County, focusing on its impact on small-scale farmers' economic welfare and environmental conservation. Traditionally regarded as a marginal activity confined to cultural practices such as dowry payments, medicinal uses, or traditional brew production beekeeping is now recognized for its broader applications in medical therapy and industrial processes. This study adopted descriptive survey research methodology for a cross-sectional data aimed at establishing the status of beekeeping entrepreneurship in Meru county. A total of two hundred and two responses was received of which one hundred eighty-fours was considered for final data analysis. The study mainly collected qualitative data through structured questionnaire, face to face interview method was used to administer the questionnaires. The study explores key concepts around beekeeping enterprise development and assesses its potential to improve economic outcomes while contributing to the conservation. The study is premised on two theoretical postulations i.e. Porters diamond model and Delmar model of entrepreneurship. The findings indicate beekeeping in Meru county is underdeveloped, no significant adoption of modern beekeeping practices. Beekeepers are generally sensitive to environment protection because beekeeping is practiced in forests and watershed areas, when practiced in open lands there is an attempt to plant permanent trees. Ants and honey badgers are the most widely recognized threats to beekeeping activities. In addition, the research identifies the lack of capital, skilled personnel, lack of production and marketing infrastructure as the main challenges faced by beekeepers in Meru County, setting the stage for recommendations aimed at fostering an enabling environment for beekeeping commercialization. The study recommends development of structured academic training programs and beekeeping focused county government policies. This report makes a compelling case for integrating educational initiatives and policy reforms to promote sustainable beekeeping entrepreneurship, thereby enhancing both economic resilience and environmental conservation.

Keywords: *Apiculture Entrepreneurship, Environment Conservation, Beekeeping*

44. Sustainability of affordable housing programs in Kenya

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Subtheme: Entrepreneurship and Innovation for Economic Empowerment and Sustainable Development

Abstract

Amid growing demand for accessible and adequate housing, Kenya's AHP has emerged as a key initiative to address housing challenges, particularly for low- and middle-income earners. However, questions remain regarding the long-term viability and sustainability of these projects. This study assesses the sustainability of the Affordable Housing Program (AHP) in Kenya, focusing on Meru and Embu Counties. The study adopted descriptive research design, to evaluate the economic, social, and environmental dimensions of sustainability. Data was collected from 215 respondents, comprising of public respondents (46.3%), academia (36.4%) and contractors (17.3%) across the sample. The highest ranked social criteria among respondents was safety and security (mean=4.89). The mean score was significantly higher in Meru compared to Embu. The least ranked was lift (2.95 across sample). Among the economic criteria, the highest ranked score was housing affordability (5.03). Air quality and management of waste were considered most important while use of local materials, least important for the environmental criteria. Generalized Linear Model (GLM) regressions revealed significant influences of socio-economic characteristics on these factors. Higher education levels, particularly Post-Graduate, positively influenced factors related to accessibility, family amenities, and sustainable environmental factors. Older age groups generally had varied impacts, showing positive associations with housing structure and security, but negative associations with sustainable construction. Contractor and Public designations significantly impacted housing unit features and affordability. Years worked also showed diverse effects, with longer tenure negatively impacting certain economic and environmental factors. These findings highlight the complex interplay between demographic profiles and perceptions of housing quality across different dimensions, providing valuable insights for targeted policy interventions and urban planning in the respective counties. Findings reveal that while the AHP has made notable strides in increasing access to affordable housing, several challenges hinder its sustainability, including limited stakeholder engagement, inadequate infrastructure, poor policy implementation, and environmental concerns. The study recommends enhanced policy integration, community participation, and long-term financing models to ensure the sustainability of the housing program. These insights are intended to inform both national policy and local implementation strategies for improved housing outcomes in Kenya.

***Keywords**: Affordable Housing Program, Sustainability, economic, social, environmental*

45. Influence of financial accessibility on the financial performance of Small and Medium-Sized Enterprises (SMEs) in Kenya: a systematic review

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Subtheme: Entrepreneurship and Innovation for Economic Empowerment and Sustainable Development

Small and Medium-Sized Enterprises (SMEs) form the backbone of Kenya's economy, yet many continue to struggle with financial sustainability. Financial accessibility—defined as the ease with which SMEs can obtain financial services—plays a pivotal role in determining their performance. Despite growing interest in SME financing, empirical findings remain scattered and inconclusive. This systematic review consolidates existing literature to evaluate how financial accessibility influences the financial performance of SMEs in Kenya. The objective of this review was to critically assess and synthesise empirical evidence on the relationship between financial accessibility and the financial performance of SMEs in Kenya, with the aim of identifying key factors, trends, gaps, and policy implications. A systematic literature search was conducted across databases including Google Scholar, ResearchGate, JSTOR, and university repositories, focusing on peer-reviewed articles, theses, and grey literature published between 2013 and 2025. The review followed PRISMA guidelines to ensure transparency and replicability. Inclusion criteria required studies to focus on financial accessibility (e.g., access to credit, banking services, mobile money) and measurable financial performance indicators (e.g., revenue growth, profitability, return on investment). A total of 32 relevant studies were selected and thematically analysed. The review revealed a consistent positive correlation between financial accessibility and SME financial performance. Access to formal credit and digital financial services emerged as the most influential factors. However, challenges such as high interest rates, collateral requirements, and limited financial literacy were found to hinder the full utilisation of accessible financial services. Notably, SMEs in urban areas reported better financial outcomes than their rural counterparts, indicating geographic disparities. Financial accessibility significantly influences the financial performance of Kenyan SMEs, particularly when supported by enabling regulatory environments and financial literacy. However, structural and contextual barriers continue to limit the potential benefits for many enterprises. Policymakers should prioritise reforms aimed at lowering borrowing costs, expanding credit guarantee schemes, and promoting financial education for SME owners. Future research should focus on sector-specific and gender-based analyses to better understand subgroup dynamics. This review provides a comprehensive synthesis of over a decade's worth of evidence on financial accessibility and SME performance in Kenya, offering an updated perspective and identifying underexplored areas such as digital finance adoption and regional inequities.

Keywords: *Financial Accessibility, SME Performance, Credit Access, Financial Inclusion, Financial Services*

46. Influence of Endowment funds mobilization on financial sustainability of Universities in Kenya

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Subtheme: Entrepreneurship and Innovation for Economic Empowerment and Sustainable Development

Abstract

Public and private higher education institutions in Kenya have increasingly faced challenges of financial unsustainability in recent years. Achieving financial sustainability requires institutions to secure regular and reliable internally generated funds to support their operations. In the context of dwindling government funding, escalating operational costs, rising debts, and deteriorating infrastructure, universities are under mounting pressure to identify and implement alternative income-generating strategies while preserving academic quality and institutional viability.This study evaluated the influence of financial resource mobilization strategies on the financial sustainability of universities in Kenya. Specifically, the research examined the impact of Endowment funds mobilization on financial sustainability. The study was supported and anchored on Resource Mobilization Theory. A sample of 64 universities comprising 34 public and 30 private institutions was drawn from a population of 76 chartered universities in Kenya as of December 31, 2022, using Yamane's formula. Stratified sampling ensured proportional representation. Primary data were collected from 290 senior university officers through structured, self-administered questionnaires. Instrument reliability was confirmed with a Cronbach's alpha coefficient exceeding 0.9, surpassing the 0.7 threshold. Secondary data were obtained from university reports and audited financial statements covering the period 2018–2022.Data analysis involved descriptive and inferential statistics, with hypothesis testing conducted using binary logistic regression at a 95% confidence level ($\alpha = 0.05$).Chi-square analysis was used to determine the association between endowment funds mobilization and financial sustainability in the Kenyan Universities The study found a significant association between endowment funds mobilization and financial sustainability in the Kenyan Universities at the 5% level ($P < 0.05$).As shown by the Nagelkerke R Square percentages, Endowment funds mobilization account for 68.5% of the variation, confirming its importance as a long-term funding mechanism.From the findings of multivariate regression analysis, it was clear that endowment funds mobilization is significantly associated with financial sustainability ($P = 0.004$). If endowment funds are mobilized, universities in Kenya are 2.900 times more likely to achieve financial sustainability (OR = 2.900) compared to those that do not implement such strategies.

Keywords: *Endowment funds Mobilization, Financial Resource Mobilization strtaegies ,Financial sustainability*

47. Investment in Technology-enhanced Learning and financial sustainability of Universities in Kenya

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Subtheme: Entrepreneurship and Innovation for Economic Empowerment and Sustainable Development

Abstract

Public and private higher education institutions in Kenya have increasingly faced challenges of financial unsustainability in recent years. Achieving financial sustainability requires institutions to secure regular and reliable internally generated funds to support their operations. In the context of dwindling government funding, escalating operational costs, rising debts, and deteriorating infrastructure, universities are under mounting pressure to identify and implement alternative income-generating strategies while preserving academic quality and institutional viability.This study evaluated the influence of financial resource mobilization strategies on the financial sustainability of universities in Kenya. Specifically, the research examined the impact of investment in technology-enhanced learning on financial sustainability. The study was supported and anchored on Resource Dependency Theory. Using Yamane formula, a sample of 64 universities comprising of 34 public and 30 private Universities was drawn from a population of 76 chartered universities in Kenya as of December 31, 2022. Stratified sampling ensured proportional representation. Primary data was collected from 290 senior university officers through structured, self-administered questionnaires. Instrument reliability was confirmed with a Cronbach's alpha coefficient exceeding 0.9, surpassing the 0.7 threshold. Secondary data were obtained from university reports and audited financial statements covering the period 2018–2022.Data analysis involved descriptive and inferential statistics, with hypothesis testing conducted using binary logistic regression at a 95% confidence level ($\alpha = 0.05$). Chi-square analysis was used to determine the association between technology enhanced learning and financial sustainability in the Kenyan Universities The study found a significant association between technology enhanced learning and financial sustainability in the Kenyan Universities at the 5% level ($P < 0.05$).As shown by the Nagelkerke R Square percentages, Investment in Technology enhanced learning account for 71.2% of the variation, confirming its importance as a key driver of financial sustainability.From the findings of multivariate regression analysis, it was clear that Investment in Technology enhanced learning is significantly associated with financial sustainability ($P = 0.002$). If significant investment in technology enhanced learning is in place universities in Kenya are 6.343 times more likely to achieve financial sustainability (OR = 6.343) compared to those that do not invest in technology enhanced learning.

Keywords: *Investment in Technology Enhanced Learning, Financial Resource mobilization strategies, Financial Sustainability*

SUBTHEME 4: EDUCATION - Innovative Educational Practices for Sustainable Development and Community Transformation

EDUCATION PRE-CONFERENCE PAPERS

48. Proactive strategies for effective implementation of the Competency-Based Curriculum in senior secondary schools in Kenya

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Subtheme: Innovative Educational Practices for Sustainable Development and Community Transformation

Abstract

The transition from a knowledge-based to a competency-based curriculum (CBC) in Kenya has introduced significant challenges in senior secondary schools, such as inadequate infrastructure, limited teacher preparedness, and stakeholder resistance. This study sought to examine the systemic and institutional barriers affecting CBC implementation and to identify effective preventive strategies to ensure its successful adoption and sustainability. The specific objectives were to: examine systemic and institutional barriers; and explore effective preventive strategies to enhance the success and sustainability of CBC implementation in senior secondary schools. The study employed a qualitative research design guided by Fullan's Educational Change Theory, using purposive sampling to select 15 senior secondary school principals, 10 curriculum support officers, and 5 policy makers. Data were collected through semi-structured interviews and focus group discussions, and analyzed thematically. The study established that early and continuous professional development for teachers, infrastructure preparedness, inclusive policy frameworks, and phased roll-out strategies are essential preventive strategies for CBC implementation. The study concluded that anticipatory planning, multi-stakeholder collaboration, and consistent monitoring and evaluation are crucial for the success of CBC implementation at the senior secondary level. It recommends the establishment of structured mentorship and coaching programs for teachers transitioning to CBC to provide ongoing support and improve implementation effectiveness

Keywords: *Competency-Based Curriculum, proactive strategies, senior secondary education, teacher professional development, curriculum implementation.*

49. Teachers' characteristics that cause differentiation in academic performance between public and private primary schools in Igembe North Subcounty, Meru County, Kenya

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Subtheme: Innovative Educational Practices for Sustainable Development and Community Transformation.

Abstract

Learners' academic performance has lured the interest of scholars, parents, policy makers, planners and curriculum implementers. Private primary schools in Igembe North have been performing far much better than public primary schools. Studies reveal that teachers are among the main determinants of the learners' academic performance. This study aimed to investigate teachers' characteristics that caused differentiation in academic performance between public and private primary schools in Igembe North sub-county of Meru County, Kenya. The study employed expost-facto research design. The target population included 83 head teachers, 83 senior teachers and 3550 pupils, making a total of 3716 subjects. A sample of 250 respondents - 25 head teachers, 25 senior teachers, 200 pupils was randomly and proportionately drawn from the target population. The researcher used questionnaires to collect data from the respondents. Descriptive, t–test, chi-square statistics, and Pearson correlation analyses were used to analyze teachers' characteristics that cause differentiation in Academic performance between public and private primary schools. The findings indicated that six of the ten teachers' characteristics items differed significantly between private and public primary schools. The study established that the 2017 KCPE mean score of private primary schools was significantly higher than the mean score of the public primary schools. A positive correlation was established between the teachers' characteristics and 2017 KCPE mean score. It was further established that the scores for teachers were significantly higher in private primary schools than for public primary schools. The study concluded that the variations in teachers' characteristics were significantly associated with disparity in academic performance between pupils in public and private primary schools in Igembe North Sub County. The study recommended that the Ministry of Education should ensure that the recommended class size of 40 pupils per class is attained in public primary schools for the teachers to spearhead the learning process effectively.

Keywords: *Teachers' Characteristics, Academic Performance, Public and Private Primary Schools*

50. Influence of parental participation in school management on academic performance in Catholic-Owned Schools

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Subtheme: Innovative Educational Practices for Sustainable Development and Community Transformation.

Abstract

Parental involvement is a recognised factor in students' academic success, yet its influence through school governance structures in faith-based institutions remains under-investigated in Kenya. This study explores the relationship between parental participation in school management and academic performance in Catholic-owned primary and secondary schools in Isiolo County. The primary objective was to determine how parents' involvement in school governance, through roles in Boards of Governors (BOG), Parent-Teacher Associations (PTA), and school management committees, influences students' performance in national examinations. A descriptive survey design was adopted, targeting a population of 1,745 stakeholders. A sample of 224 participants was selected, comprising BOG and PTA members, school managers, students, head teachers, and an education secretary. Although purposive sampling was employed due to the study's focus on Catholic-owned schools, the concentration of such institutions in the area supported representativeness. Data collection involved structured questionnaires, interviews, observations, and document analysis of KCPE and KCSE results from 2008–2012. Academic performance was analyzed in relation to school-level governance practices, while efforts were made to account for confounding variables such as school size, location, and resource availability. Findings revealed that while all schools had active PTAs, only 25% of parents participated in funding or strategic initiatives. Most PTA meetings focused on discipline, motivation, and academic issues, yet participation in decision-making on school projects and resource allocation was minimal. Schools with structured parental engagement reported improved monitoring of academic progress and communication practices. However, challenges such as student indiscipline (53.33%) and parental apathy (26.67%) hindered broader involvement. The study found a modest correlation between parental participation in school governance and improved academic oversight, though causality could not be definitively established due to the multifactorial nature of academic achievement. The study concludes that while parental involvement exists, its impact is constrained by limited roles in strategic planning and resource mobilisation. It recommends the development of inclusive frameworks and policies that empower parents as active contributors to governance in faith-based schools. These findings offer context-specific insights into participatory governance and its potential in enhancing educational outcomes in marginalised settings.

Keywords: *Parental involvement, school management, academic performance, Catholic schools, Isiolo County, PTA, educational governance, Kenya.*

51. Influence of school physical resources on implementation of Competency-Based Curriculum in Junior schools in North Imenti

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Subtheme: Innovative Educational Practices for Sustainable Development and Community Transformation.

The government of Kenya introduced Competency-Based Curriculum after conducting a summative evaluation of the 8-4-4 system. However, transitioning to Competency-Based Curriculum (CBC) has faced many challenges, particularly at the school level, from limited school physical resources to resistance by education stakeholders. The study examined how the availability of school physical resources influenced the implementation of CBC in public junior schools in North Imenti Sub-County, Meru County. The CBC, introduced in 2017, emphasizes on practical skills and learner-centered pedagogy, which requires adequate facilities such as classrooms, laboratories, libraries, and play fields. The study used a descriptive survey design. The population comprised of 26 junior schools (70 teachers, 26 head teachers, 2 education officers). Stratified random sampling yielded 21 teachers, 8 head teachers, and purposive sampling resulted to 2 education officers. Data were collected via questionnaires, interviews, and observations checklist. The study established that availability of classrooms was the most influential factor in implementation of CBC since this was rated very impactful by the respondents. Science laboratories were also rated high because the CBC emphasizes on hands-on learning especially in science subjects. Playgrounds were also important perceived very useful since teaching of sports is anchored as one of the key pillars of CBC. The study concluded that inadequacy of school infrastructure in junior schools in North Imenti likely hinders effective implementation of Competency-Based Curriculum. Therefore, Ministry of Education should prioritize provision of adequate school infrastructure such as classrooms, computer labs, science labs, play grounds and workshop to support practical learning activities.

Keywords: *School Physical Resources, Competency-Based Curriculum, hands-on learning*

52. The impact of teachers' attitudes towards Technology on teaching public secondary schools in Tigania West, Meru County, Kenya

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Subtheme: Innovative Educational Practices for Sustainable Development and Community Transformation.

Abstract

The integration of technology in education is vital for achieving its goals, as it enhances learning experiences, improves accessibility, fosters students' engagement, and equips learners with the digital skills necessary for success in the modern world. Government and schools have invested in infrastructure, but the success of this technology depends largely on the teachers' implementation and attitude. This study aimed to explore the impact of teachers' attitudes on technology on their instructional practices and student engagement in public secondary schools in Tigania West. The study utilized a descriptive survey approach. The target population consisted of 50 public secondary schools, 50 principals, 100 heads of departments, and 200 teachers. The study utilized a stratified random sampling technique to choose schools. The purposive sampling technique was employed to assess school principals, heads of departments, and teachers. The sample size included a total of 105 participants, consisting of 15 administrators, 30 heads of department, and 60 teachers. Data gathering involved the utilization of questionnaires, interview schedules, and observation checklists. The quantitative data was analyzed using statistical methods such as calculating means, frequencies, and percentages. The interviews yielded qualitative data, which was evaluated using content analysis. The study established that the teachers' attitudes significantly impacted the incorporation of technology in instruction delivery. It was determined that while teachers were optimistic about using technology, the skills and knowledge needed to incorporate it into their teaching effectively were deficient. Furthermore, the study emphasized the need for schools to direct the deployment of ICT and self-help initiatives. Lastly, it suggested that further research is required to assess the economic efficiency of incorporating technology in teaching and learning.

Keywords: *Teachers' attitudes, integration of technology, Teaching*

53. Evaluation of Information and Communication Technologies in optimizing administrative and pedagogical management within day secondary school systems

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Sub Theme: Innovative Educational Practices for Sustainable Development and Community Transformation

Abstract

In the wake of the Fourth Industrial Revolution, education systems worldwide are increasingly integrating Information and Communication Technologies (ICT) to enhance both administrative efficiency and pedagogical effectiveness. This study explores the efficacy of ICT in optimizing administrative and teaching-learning processes in day secondary schools. Specifically, it investigates the availability of ICT resources for daily instruction, the extent of principals' awareness and utilization of ICT in school operations, and the use of technology in managing school records. Employing a descriptive survey design, data were collected from 110 participants using systematic random sampling, interviews, and structured questionnaires. Results revealed that 49% of the teaching staff held a bachelor's degree, and 87% of academic and examination-related activities were conducted through ICT platforms. The findings underscore ICT as a critical enabler in day-to-day school administration and instructional delivery. Therefore, the study recommends that schools invest in retooling teachers with advanced ICT skills to align with 21st-century educational demands and improve learning outcomes in technology-driven environments.

Keywords: *technology, administration, management, Pedagogy, education.*

54. Demystifying gender imbalance in STEM enrollment among Kenyan university students

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Subtheme: Innovative Educational Practices for Sustainable Development and Community Transformation.

Abstract

This study assessed the gender disparities in STEM (Science, Technology, Engineering, and Mathematics) courses enrolment at Meru University of Science and Technology, Meru County, Kenya. This was meant to addressing the persistent underrepresentation of women despite broader gender equality efforts. The primary objective was to identify the cultural and societal factors contributing to this gap, and understand the institutional challenges women faced in STEM programs. The target population comprised Meru University's student body (5000) and faculty members (150). A stratified random sampling technique was employed to select a sample of 200 students and 50 faculty members. Data were collected using observation and questionnaire surveys, and analysed using descriptive statistics for quantitative data and thematic analysis for qualitative data. Major findings revealed that deeply ingrained cultural and societal norms, such as traditional gender roles and stereotypes, significantly discouraged women from pursuing STEM. The study concluded that, institutional challenges, including a lack of female role models, teacher biases, and inadequate career guidance should be addressed moving forwards so as to minimize the ever widen gender disparities in STEM. The study recommends implementing targeted mentorship programs, promoting gender-sensitive curricula, and fostering an inclusive university environment to encourage and support greater female enrolment and success in STEM fields

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Key words: *Gender Disparities, STEM Enrolment, Cultural Factors Institutional Barriers, Female Underrepresentation*

55. Motivation and instruction in English composition among public primary pupils in Igembe Central, Kenya

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Subtheme: Innovative Educational Practices for Sustainable Development and Community Transformation.

Abstract

In primary education, English composition writing is essential for language development. It strengthens both written and spoken communication, encourages critical thinking, and demands structured teaching methods. Effective instruction in composition writing depends on various factors, with teachers playing a central role by guiding learners through appropriate writing processes. Learner motivation is believed to be closely linked to performance in composition writing and overall academic achievement. This study aimed to examine how specific variables impact the teaching of English composition in public primary schools in Igembe Central Sub-County, Kenya. It focused on exploring the relationship between pupils' motivation and the instruction of composition writing, guided by Lev Vygotsky's sociocultural theory. A descriptive survey research design was employed to capture relevant data from a target population of 7,011, which included 171 English teachers and 6,840 Class Seven pupils across 75 public primary schools. Using the finite population formula, a sample size of 361 pupils and 9 English teachers was selected through simple random sampling, with proportionate sampling applied to maintain balance between the two groups. Data was collected using questionnaires for pupils and interview schedules for teachers, both aligned with the study objectives to ensure validity. A pilot study conducted in a comparable school established the reliability of the instruments using Cronbach's Alpha, which yielded a coefficient of 0.70. Data was analysed using SPSS Version 26, employing descriptive statistics (frequencies and percentages) and hypothesis testing through Chi-square at a 95% confidence level. Findings indicated that pupil motivation positively influences the instruction of English composition writing. The study concluded that motivated learners are more likely to benefit from composition instruction. It recommended that teachers use innovative strategies to enhance motivation, and school administrators ensure the availability of instructional resources to support effective teaching.

Keywords: *Motivation, Instruction, Composition Writing, Primary Education, Sociocultural Theory*

56. A critical review on how socio-economic status drive Competency Based Curriculum success

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Subtheme: Innovative Educational Practices for Sustainable Development and Community Transformation.

Abstract

The Competency-Based Curriculum (CBC) has been embraced in Kenya as a transformative educational approach aimed at equipping learners with practical skills and the ability to apply knowledge to real-world challenges. This shift from rote learning to a skills-oriented system is envisioned to foster sustainable livelihoods and empower communities across the country. However, the successful implementation of CBC is significantly influenced by the socioeconomic status (SES) of families, which varies widely across Kenyan households. Socioeconomic status is commonly defined by three key indicators: income, education, and occupation. These factors determine a family's access to educational resources, and disparities in SES have resulted in unequal implementation of CBC, particularly in low-income households. This study investigated how the socioeconomic status of parents influences the implementation of the Competency-Based Curriculum in Kenya, guided by Human Capital Theory, which emphasizes the role of education in enhancing individual and societal productivity. The study reviewed a total of 17,100 scholarly papers published between 2020 and 2025 related to SES and CBC. A representative sample of 391 papers was selected using simple random sampling to ensure a 95% confidence level and a 5% margin of error. Purposive sampling was employed to identify papers most relevant to the research question, and thematic analysis was conducted to categorize findings. Results revealed that while most parents value and are concerned about their children's education, those from low socioeconomic backgrounds face significant barriers. These include the high cost of implementing CBC requirements, such as purchasing learning materials, limited educational attainment that hinders their ability to support learning at home, and unstable occupations that reduce access to quality schooling. The study recommends increased government support for low-income families through provision of subsidized learning materials, the organization of structured CBC workshops to enhance parental understanding, and the establishment of community-based learning centers to bridge the resource gap..

Keywords: *Competency, Curriculum, Socioeconomic, Income, Education*

57. Influence of principals' supervision of instruction on academic performance of students in public secondary schools in Buuri East, Meru county, Kenya

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Subtheme: Innovative Educational Practices for Sustainable Development and Community Transformation.

Abstract

The importance of instructional leadership in students' academic performance has assumed great interest in education as stakeholder's demand accountability. This study focused on how supervision of instruction, influenced students' academic performance. This study was based on system theory. A total of 23 public secondary schools in Buuri East Sub-County provided a target population which included 23 principals, 162 heads of departments, 188 teachers, and one Quality Assurance and Standards Officer. Twelve schools were selected at random to participate in the study using simple random sampling. A sample size of 190 respondents were included in the sample. One QASO Buuri East Sub-County, twelve principals, eighty-two Heads of Departments, and ninety-five teachers were selected from the target population using a proportionate sample technique. Descriptive survey research design was employed and data was corrected using questionnaires and interviews. The Statistical Package for Social Sciences (SPSS) version 29 was used to analyze the quantitative data, which was analyzed using frequency, percentages, and chi-square. The qualitative data was coded, and thematic analysis was conducted. The results of the study indicated statistically significant and positive association between principals' supervision of instruction, and academic performance of students. The study's results are to be very helpful to principals, ministry of education and other stakeholders in designing mechanisms to improve the academic performance of students. The study recommends that secondary schools management should enhance use of class visitations/observation, assessment of professional document (lesson plan, schemes of work, record of work), conflict resolution, visible presence and monitoring quality to enhance the school academic performance.

Keywords: *Principal's instructional leadership, Academic performance, population, instructional supervision, public secondary school, Education.*

58. A review article on the influence of public secondary schools' education subsidy on students' retention

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Subtheme: Innovative Educational Practices for Sustainable Development and Community Transformation.

Abstract

The government of Kenya introduced Public Secondary Schools Education subsidy in 2008 to help alleviate the financial burden of secondary school fees and related expenses for students. However, despite this initiative, the dropout rates among secondary school students have continued to be a concern. The amount and timing of subsidies or reimbursement can significantly impact a student's decision to continue their education. This financial support can be a crucial factor in helping students overcome financial difficulties and stay in school. This study investigated how Public Secondary Schools' Education subsidy influences retention of students in public secondary schools in Kenya, guided by the Theory of Planned Behaviour (TPB) and Tinto's Model of Institutional Departure. The study reviewed a total of 1,200 scholarly papers published between 2018 and 2025 related to public secondary school subsidies and student retention. A representative sample of 120 papers was selected using simple random sampling to ensure a 95% confidence level and a 5% margin of error. Purposive sampling was employed to identify papers most relevant to the research question, and thematic analysis was conducted to categorize the findings. Results revealed that government subsidies are not adequate to cater for the retention of students in public secondary schools. Other costs, such as the acquisition of textbooks, infrastructural development monies, remuneration of extra teachers employed by the Board of Management (BOM), feeding program expenses, uniform and transportation costs, play a role. Additionally, the dropouts of students were accelerated by the inconsistency and delayed disbursement of subsidies. This study recommended that the government increases the allocation of subsidies above the current annual allocation of Ksh. 12,870 per student and employ more teachers to alleviate the parental burden of remunerating BOM teachers. Additionally, these subsidies should be disbursed on time at the beginning of the academic year.

Keywords: *Secondary schools, Public Secondary schools, Education subsidies, Student, Student retention.*

EDUCATION CONFERENCE PAPERS

59. The Impact of Academic and Administrative Leadership style on the of the University staff and students' holistic mental well-being

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Subtheme: Innovative Educational Practices for Sustainable Development and Community Transformation.

Abstract

The mental health of university staff and students is intricately linked with the quality of leadership adopted by both academic and administrative figures within the institution. This connection highlights the critical need to examine leadership styles and their subsequent influence on the holistic well-being of the High education university community. The study investigated the relationship between leadership style adopted by High education Managers and Academic Mentors and mental health wellbeing of the staff and students'. The study adopted a systematic review of literature (2000–present) analyzed studies on Leadership style among the University academic and administrative leaders and its impact on Mental health outcomes of Staff and Students. Main sources were peer reviewed articles and reports. Understanding the complexities of mental health within the university setting is of paramount importance, as it directly affects academic performance, workplace satisfaction, and the general atmosphere of the institution Leadership within higher education institutions has been progressively recognized as a substantial area of research, mirroring the trends observed in the corporate sector. The rationale based on myriad of empirical studies often focus on the relationship between a specific leadership style and well-being, leadership styles and organizational outcomes, or the relationship between well-being and organizational outcomes, but rarely examine all three concurrently. Leadership styles Considered for study include, transformational leadership, laissez-faire leadership, and Authoritarian leadership. Transactional Results show that Health-promoting leadership focuses on developing their followers through methods such as supervision, coaching and training. The impact of a leader's style on staff and students' well-being in the workplace is significant and should be considered when developing interventions and training programs. Effective leadership is not confined to a single style but involves adapting one's approach to suit the specific needs of the team and the University organizational context, promoting an environment where individuals feel valued, supported, and empowered to have a holistically wellbeing.

Key words: *Leadership style, mental health, transformational leadership, laissez-faire, Authoritarian, Transactional leadership and well being*

60. Parental involvement in the implementation of environmental education in early years of learning in Kenya

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Subtheme: Innovative Educational Practices for Sustainable Development and Community Transformation.

Abstract

Environmental education is an integral part of the Competency-based curriculum at the early years of learning Kenya. In response to the UN call for Climate action, the Kenya Institute of Curriculum Development (KICD) designed a curriculum with content and learning activities aimed at cultivating a learner endowment with knowledge, skills, and attitudes that respond to the need to care for the environment. The curriculum deliberately includes learning content, activities and experiences that raise environmental consciousness in school and out of school. To achieve the expected outcomes, parents are assigned a pertinent role to work closely with teachers and their children. Although, the intentions of curriculum developers are well articulated, there is a potential gap between policy and practice that needs attention. The objective of the study was to establish the parental involvement in the implementation of environmental education in the early years of learning in Kenya. The study adopted a descriptive survey design. The target population was parents and teachers of grade 1 to 3 of all primary schools in Imenti South constituency. Purposive sampling technique was used to select 12 primary schools, that is, a public and a private school from each of the 6 wards. Stratified random sampling technique was used to select a sample of 36 teachers and 24 parents. Data was collected using questionnaires. Descriptive statistics were used to analyze quantitative data, while qualitative data was analyzed in themes. The results of the study were that majority of the parents had no time to discuss environmental education with their children, though they involved them in some activities, especially gardening. 90% of the parents only communicated with their childs teacher on academic progress and not environmental education. All teachers agreed parents generally support their children in classroom projects, but they often don't take the initiative to teach their kids about environmental issues beyond what's covered in school. The study recommends more sensitization of parents on how to be involved in their children's environmental education. The study suggests that more research needs to be carried out on how other stakeholders can collaborate to ensure the effectiveness of environmental education. In conclusion, there is a need for increased parental involvement in environmental education activities, as parents are already participating in these activities within the school setting.

Keywords: *Environmental Education, Parents, Parental Involvement, Stakeholders.*

61. Policy innovations for integrating social community voices in educational planning for sustainability in Kenya

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Subtheme: Innovative Educational Practices for Sustainable Development and Community Transformation.

Abstract

Inclusive educational planning is vital for achieving sustainable development, particularly in contexts where community knowledge and participation are essential for addressing local environmental and social challenges. This study explores policy innovations aimed at integrating community voices into the educational planning process for sustainability in Kenya. Grounded in participatory governance and education for sustainable development (ESD) frameworks, the research employs a mixed-methods approach, combining policy analysis with interviews and focus group discussions involving policymakers, educators, community leaders, and civil society actors across diverse Kenyan regions. The study investigates the extent to which current education policies reflect and facilitate community engagement, identifies barriers to effective participation, and highlights best practices and emerging innovations. Findings are expected to reveal policy gaps and opportunities for fostering more inclusive, context-responsive, and sustainable educational systems. Ultimately, the research seeks to contribute to the development of a policy model that promotes equitable collaboration between communities and educational institutions in shaping sustainable futures..

Key words: *Policy innovations, frameworks, policy analysis, policymakers, educators, community leaders, civil society actors, education policies, policy gaps and opportunities, context-responsive, policy model*

62. Mobile Learning innovations for sustainability education in underserved communities in Kenya

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Subtheme: Innovative Educational Practices for Sustainable Development and Community Transformation.

Abstract

In underserved communities across Kenya, access to sustainability education is often limited by poor infrastructure and a shortage of trained educators. This study examines how mobile learning innovations such as SMS platforms, mobile apps, and WhatsApp learning groups—are being used to deliver sustainability content in low-resource settings. Using a mixed-methods approach, the research explores their effectiveness, accessibility, and impact on learners' awareness and behavior. Data from rural and peri-urban regions highlights both the potential and the challenges of mobile-based education, including issues of digital access, local content relevance, and learner engagement. The findings offer practical insights for educators, NGOs, and policymakers seeking to harness mobile technologies for inclusive and scalable sustainability education in Kenya.

Keywords: *underserved communities, sustainability education, mobile learning, innovations, SMS Platforms, mobile apps, WhatsApp, peri-urban regions, digital, local content relevance, policymakers*

63. The place of technology in addressing corruption in Africa: a reading of John Lara's play, *The Samaritan* .

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Abstract

Corruption has been a prevalent social condition for most African nations since independence. This paper draws from John Lara's The Samaritan to address the significant role played by technology in the fight against corruption. The study will involve a close textual reading of the primary text The Samaritan, as well as relevant literature on technology and corruption. This work is grounded on the understanding that literature is a mirror of the society, thus fictional depictions can open a window to societal realities and offer suggestions on ways of addressing such challenges. The primary objective of this study is to examine how the playwright. Interweaves the twin themes of technology and corruption to provoke the social consciousness of the masses and empower them to demand for accountability from the leaders. The play utilizes a school setup to satirize poor governance to suggest the necessity of integrating technology and education in the face of contemporary challenges. The findings indicate that exposure to technology equips the society, especially the youth to resist social injustices such as corruption.

Keywords: *Education, Technology, Literature, Corruption, Satire.*

64. Transitivity in courtroom interpreting: insights from Dholuo-English contexts in Kenya

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Subtheme: Innovative Educational Practices for Sustainable Development and Community Transformation.

Abstract

In this paper, we examine the interpreting between Dholuo and English in Kenyan courtrooms. The main objective was to identify the processes in the representation of actions/states in Dholuo-English courtroom interpretation and determine the ideational, stylistic and pragmatic modifications in the TT.The data on which the present study is based was collected from three magistrate's courts in Kenya namely: Nyando, Siaya and Kisumu. Adopting a critical stylistics approach (Jeffries 2010), the paper examines choices made during courtroom discourses representing actions and states. We examine the use of verbs in the Source Text and Target Text and focus specifically on the notion of transitivity (following Halliday 1985, Simpson 1993). The study finds that in the TT interpreters often use verbs with different transitivity to those of the ST which in some instances result in a change of meaning. There are also instances in which the illocutionary force of verbs in the ST were missing in the TT or were replaced by different illocutions. In some cases, the TT became vaguer than the ST due to the verb choices. Interpreters also made verb choices that resulted in changes in meaning between the ST and the TT in semantic terms. An additional finding relates to the practice of interpreters explaining their verb choices, particularly in instance in which they felt the interpretation would be unclear to the litigants. As a result, they ended up using explanations that were absent in the ST. Lastly, we also find that extrinsic factors affected the quality of interpretation. Overall the paper shows that a lot of changes were made in the original text during interpretation.

Keywords: *Courtroom interpretation, Kenya, Dholuo, illocutionary force and transitivity.*

65. Alignment of a Diploma in Pharmacy Curriculum at a Medical Training College in Kenya with the Harden's Ten Question's Framework: an online population survey among faculty members and students

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Subtheme: Innovative Educational Practices for Sustainable Development and Community Transformation.

Abstract

Background: A comprehensive analysis of the Kenya Medical Training College (KMTC)'s diploma in pharmacy curriculum (DIPC) is lacking, yet the curriculum's review is due. The Harden's Ten Questions Framework (HTQF), a structured and all-encompassing tool, is widely used in curriculum analysis. This study determined the extent to which faculty members and learners perceived that the DIPC used at the KMTC Nairobi campus aligns with the HTQF. **Methods & Results:** An online population survey was conducted among students and lecturers who use the DIPC. A questionnaire based on eight questions in HTQF (answers to the first two questions are evident in the curriculum) was validated through expert review and distributed to 255 potential respondents targeting to collect ratings of the curriculum from at least 153 participants between March and April 2024. The ratings' medians were compared to determine alignment between the curriculum and Harden's Ten Questions Framework.Two-hundred participants (78% response rate) responded to the survey. There were no significant differences in the students' and faculty members' ratings. The following aspects of the DIPC were rated 4 out of 5 (interquartile range, IQR = 0): clarity of learning objectives, application of science in practice, promoting student autonomy, effective assessments, conducive environments, and continuous monitoring. The following aspects were rated low: coverage of information computer technology skills, availability of instructional resources in the portal, sufficiency of lecturers, adequacy of instructional media and teaching materials, and availability of scholarships and grants (median ≤ 3, IQR ≥ 1). **Conclusion:** The diploma in pharmacy curriculum has more strengths than weaknesses regarding alignment with the HTQF. KMTC can improve its technological and resource-availability aspects for optimal preparation of competent pharmaceutical technologists. Future studies could explore the meaning of the highlighted weaknesses by conducting key informant interviews with learners and faculty members.

Keywords: *curriculum, pharmacy, diploma, students, Harden's ten questions framework, Kenyan medical education.*

66. Community service learning as an enabler of teacher mentorship programmes

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Subtheme: Innovative Educational Practices for Sustainable Development and Community Transformation.

Abstract

In The Competency Basic Education (CBE) identifies community service learning as one of the key pillars supporting the learners 'mentorship programme. While community service learning is perceived as a new learning area under the CBC programme, universities are navigating best ways of training competent teachers to teach this learning area at the basic education. The programme has attracted criticism and support from teacher training institutions, teachers and the community in almost equal measure. This study sought experiences on ways of enhancing community service learning as an enabler of the mentorship programme of teacher trainees by teacher training institutions. Using survey research design, the study randomly sampled 80 teacher trainees from 240 science teacher trainees of the 2020 cohort at the School of Education, Meru University of Science and Technology. The inclusion criteria applied only to teacher trainees who undertook a community service learning and mentorship programme during the third year of study. An online Google survey gathered data from the respondents. The study found that most secondary schools that hosted teacher trainees undertaking a community service learning and mentorship were cooperative and assigned a mentor teacher to a trainee; most mentors were in the subject areas of their mentees. It was established that the mentorship programme played a pivotal role in enlightening the teacher trainee on the right procedures of conducting basic activities undertaken by the school. The trainee interacted with the whole system of the school, making learning experiential. The study concluded that Community Service Learning enhances a teacher trainee's confidence in building competencies necessary to work on school activities. From the findings, it is recommended that teacher trainees undertake their community service learning in institutions that have teachers in their areas of specialization. This will create rapport and build more confidence between the mentor and the mentee.

Keywords: *Competency-Based Education, mentor, mentee, community service learning*

67. Learning delivery models and student perception in higher education: a case study of TVET students at Meru University of Science and Technology .

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Abstract

This study investigated the perception of trainees on various learning models utilized in higher education, with a specific focus on TVET trainees at Meru University of Science and Technology (MUST). For years, higher educational institutions adopted diverse instructional approaches to accommodate technological advancements and dynamic learner needs. The primary models examined were traditional classroom learning, hybrid (blended) learning, and competency-based learning.Pure online model was not provided in the TVET courses. While these instruction delivery models are increasingly utilized in learning institutions, their effectiveness in promoting academic achievement and acceptability among trainees has remained unclear.The study assessed three learning delivery models. A descriptive research design was employed, and using purposive sampling technique structured questionnaires were administered to 80 TVET students at Meru University of Science and Technology. Both qualitative and quantitative methods were used to analyse the data, with findings presented through descriptive statistics.The results reveal that each learning delivery model has some distinct effect on learner perception. Online learning is hailed for its flexibility. Blended learning emerged as the most balanced model, offering both engagement and flexibility. Competency-based learning promoted skill mastery and personalized learning. Traditional classroom learning was perceived as effective in fostering direct student-instructor interaction but lacks the flexibility offered by other models.The study concluded that effectiveness of each model depended on its implementation, infrastructure, and the learner's adaptability. Based on these findings, the study recommends that universities need to adopt a strategic blend of learning models, supported by investment in digital infrastructure, training for faculty, and continuous evaluation of student outcomes. These insights should guide institutional policies and pedagogical strategies to improve quality of higher education and promotion of learner achievements.

Keywords: *Learning models, Hybrid model, Competency-based learning, Traditional learning model.*

68. Ageing well in the rural place: the Aging in Place environmental challenge

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Subtheme: Innovative Educational Practices for Sustainable Development and Community Transformation.

Abstract

Most people in Sub-Saharan Africa prefer and are expected to age in the rural place. Ageing well is the expectation of every human being. The study sought to explore how older rural persons perceive the challenges as they age in the rural place. Specifically, the study highlighted the climatic challenges older persons' experience as they age in the rural space. The qualitative study design was used. Purposeful sampling used identified 15 participants drawn from three created sub-divisions of the study location based on the differential environmental conditions. In-depth semi-structured interviews were used to gather the required data to answer the study objectives. Qualitative data analysis using NVIVO version 12 was used to analyze the data. Results showed that the climatic challenges encountered included those aligned to the infrastructure, and the worsening weather conditions. Majority of the participants cherish living in their rural environment although a few registered dissatisfactions in their residential places. Since the perceptions were subjective in nature, the study recommends specific research on the mitigation measures of climatic changes.

Keywords: *Aging well, rural place, older persons, challenges, Envoronment, climatic conditions.*

69. Potential historical origins of tribalism in multiparty democracy in Africa (1963-2003): a comparative analysis of Kenya and Tanzania

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This paper explores the historical underpinnings of tribalism in the context of multiparty democracy in Africa, with a comparative focus on Kenya and Tanzania from 1963 to 2003. The research investigates how colonial legacies, post-independence political strategies, and socio-economic dynamics contributed to the entrenchment or mitigation of ethnic-based politics. By analyzing key political developments and governance frameworks, the paper demonstrates how Kenya's multiparty evolution exacerbated tribalism, while Tanzania's nation building efforts fostered relative ethnic cohesion. The paper concludes by highlighting innovative strategies for empowering inclusive governance and addressing global challenges through equitable democratic systems.

Keywords: *Tribalism, Multiparty Democracy, Comparative Analysis, colonial legacies, post-independence*

70. Junior Secondary School curriculum implementation and teacher training challenges

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Abstract

The Junior Secondary School (JSS) level, bridging primary and senior secondary education, is pivotal in realizing this vision. However, the success of JSS curriculum implementation hinges on teachers' readiness, which remains a significant challenge. This study employs a mixed methods approach, adopting a descriptive survey design to capture both quantitative and qualitative data for a comprehensive analysis. The target population encompasses JSS teachers, who are the primary curriculum implementers, school administrators responsible for institutional oversight, curriculum developers from the Kenya Institute of Curriculum Development (KICD) who design the curriculum framework, and education officers from the Ministry of Education and TSC tasked with policy execution and quality assurance. Data collection techniques include structured questionnaires distributed to teachers and administrators to quantify training experiences and resource availability, semi-structured interviews with curriculum developers and education officers to gain policy-level insights, focus group discussions with teachers to explore shared challenges and recommendations, and document analysis of training manuals, policy documents, and implementation reports to contextualize findings. The study's objectives are to assess the current state of teacher training, identify critical implementation barriers, evaluate the effectiveness of support mechanisms, and propose actionable strategies to bolster teacher preparedness. Expected outcomes include a detailed mapping of the teacher training landscape, a clear articulation of systemic and practical challenges, and evidence-based recommendations for enhancing training programs, resource allocation, and stakeholder coordination. These findings aim to enrich the discourse on educational reforms in Kenya by providing policy relevant insights to strengthen teacher capacity, align training with CBC goals, and ensure the sustainable rollout of the JSS curriculum. By addressing these challenges, the study seeks to contribute to the development of a robust, equitable, and effective education system that supports Kenya's vision for competency-based learning, fosters learner-centered pedagogy, and prepares students for 21st-century demands. Ultimately, the research underscores the critical role of well-prepared teachers in achieving educational transformation and advocates for systemic interventions to empower educators in delivering the CBC effectively at the JSS level. This study examines the Competency-Based Curriculum (CBC) implementation at the Junior Secondary School (JSS) level in Kenya, focusing on teacher training and pedagogical challenges.

Keywords: *Competency Based Curriculum (CBC), Junior Secondary School, Teacher Training Challenges, pedagogical challenges.*

71. Leveraging vernacular media for cancer prevention-promotion in culturally diverse communities

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Subtheme: Innovative Educational Practices for Sustainable Development and Community Transformation.

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Abstract

The Sustainable Development Goals agenda 6.2 aims to improve access to safely managed sanitation by 2030. However, the sewer system serves only 17 % of the Sub-Saharan African population in informal settlements. Possible interventions and options to address sanitation issues in informal settlements have been advanced through research. However, upscaling and improving sanitation in informal settlements has been a challenge. The study investigated the technologies used in sanitation delivery in Mukuru Kwa Reuben. The study employed a convergent research design and a mixed method approach. Cluster and simple random sampling technique enrolled 100 household heads from 10 clustered administrative units. The quantitative data from questionnaires and structured observations were analyzed descriptively and inferentially at 5% level of significance in SPSS version 25. The sanitation technologies for containment and storage of excreta/sludge included pit latrine, fresh life toilet, pour flush, cistern flush and composting toilet. In emptying and transportation, eco bags, washing machines, transfer station, buckets, urine container, hand cart, trucks and sewers were used. The excreta/sludge treatment/disposal options available encompassed treatment plants, septic tanks, open grounds, rivers, and landfills. There was a moderate positive correlation between accessibility and construction/installation process of the toilet with ($r = .546$, $p < .05$). There was a significant difference in the accessibility ($p=0.013$), availability ($p=0.047$), and accountability ($p=0.000$) in the provision of sanitation technologies for emptying and transportation of sludge/excreta. Type of sanitation technology ($F(3, 96) = 8.497$, $p < .05$), and the construction and installation process ($F(3, 96) = 20.379$, $p < .05$) significantly influenced accessibility, availability, affordability and accessibility. This study concludes the type of sanitation technology and the construction/installation process are important factors in predicting affordability, accessibility and availability. The study recommends an innovative and context-appropriate sanitation technologies.

Keywords: *Sanitation, Technology, Mukuru Kwa Reuben*

72. A Socio-Political assessment of 'Okolea' (Rescue) Programme as a sustainable development model for community development in Meru County

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Abstract

The media play multiple roles in the society, including informing the public, democratization, by working as a watchdog by questioning government decisions, exposing injustice, and managing public opinion. Media is a mouthpiece for the public, it educates, entertains and informs. This paper examines how vernacular television, using indigenous language can be used to mobilize the community for sustainable social development. This study examined the strategies used by vernacular television to effect social development. Most researches on development journalism have concentrated on community radio and television. Thus, there is a knowledge gap on the role, contribution and effectiveness of vernacular television in fostering sustainable community development. This is the gap the study sought to close. Using Baite TV as a case study, this audience television study employed the descriptive survey research design which seeks to find the relationship between the independent variables and the dependent variables after an action or event has already occurred without the interference of the researcher. The results show that "Okolea kaana ka Meru" (Rescue the Meru child) is the second most watched programme after "Muthiuruko jwa nteto" (News roundup). These two programmes have been used by the station to mobilize the community to attend "Okolea" meetings. Based on the agenda setting theory, the media sets the agenda for public discussion and focuses on topics they wish to enhance and sustain. Due to the widespread access, vernacular TV stations can be used to mobilize responsible citizens and resources. Baite TV has devised unique strategies that integrate the station's programmes with the community. This close interaction has fostered social development in Meru County. The station sets the agenda by focusing on needy persons and rallying the community around a project to assist the needy. This way the station plays a role in social development. This paper questions whether communication enables the community to plan for their own development by providing the information necessary for social change. When people are involved in making decisions on issues that affect their lives, communication impacts positively on the community.

Keywords: *Audience, sustainable development, vernacular television, media roles, development journalism, CIDP*

73. Relationship between good record management practices and the dispensation of justice at Meru Law Courts, Kenya

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Abstract

Effective record management is fundamental to the efficiency, transparency, and fairness of judicial processes. In Kenya, many court systems still rely on manual, paper-based procedures, which can hinder justice delivery. This study investigates how the quality of record management practices influences the dispensation of justice at Meru Law Courts. The study aimed to examine the relationship between record management practices and justice dispensation, specifically focusing on how accessibility, reliability, and technological integration of records affect judicial efficiency, fairness, and public trust. A descriptive research design was adopted. Data were collected using structured questionnaires administered to key stakeholders, including magistrates, members of the Meru Bar Association, and court registry staff. These participants were selected based on their direct interaction with judicial records. Responses were analyzed to identify patterns and perceptions regarding current practices. The findings revealed a strong perception among stakeholders that effective record management contributes significantly to timely and fair case resolution. Magistrates reported fewer delays when records were complete and accessible. Advocates indicated that disorganized or missing files negatively impacted case progression and outcomes. Registry staff cited challenges such as outdated manual filing systems, lack of digitization, and inadequate resources. Most respondents agreed that the absence of electronic case management systems undermines accountability and hampers case tracking.The study concludes that while the judiciary recognizes the value of good record management, current practices at Meru Law Courts remain inadequate. These limitations affect the speed and integrity of justice delivery. The study recommends urgent investment in electronic records systems, real-time case tracking tools, and capacity building for court personnel. Adoption of digital solutions aligned with international judicial standards can improve case flow management, reduce delays, and restore public trust in the judiciary. This study provides empirical evidence from a Kenyan judicial context, highlighting the operational link between record-keeping practices and justice outcomes. It contributes original insight into an under-researched area in legal information management, particularly in developing-country settings.

Keywords: *Record Management, Justice Dispensation, Court Efficiency, Meru Law Courts, Technology Integration, Judicial Transparency*

74. Tahakiki ya usimilisho wa tenzi za kale kuwa fasihi ya watoto

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Manthari: Mbinu Bunifu za Kielimu kwa Maendeleo Endelevu na Mabadiliko ya Jamii

Ikisiri

Utafiti huu ulihakiki usimilisho wa tenzi za kale kuwa fasihi ya watoto kwa kutumia nadharia ya usimilisho ya Linda Hutcheon. Kazi kuu zilizotathminiwa ni Kisa cha Fumo Liyongo (Wamitila, 2007), Wasifu wa Mwana Kupona (King'ei, 2008) na Mkasa wa Shujaa Liyongo (Matundura, 2018). Nia kuu ya utafiti huu ilikuwa kuchunguza jinsi tenzi za kale zilivyobadilishwa ili kuwezesha uwasilishaji wa historia, utamaduni na maadili kwa watoto wa shule ya msingi. Utafiti huu uliongozwa na malengo matatu mathalani: kuchunguza jinsi usimilisho wa tenzi za kale kuwa fasihi ya watoto unavyowezesha uwasilishaji wa historia na utamaduni kwa watoto; pili, kuchunguza mabadiliko ya vipengele vya tenzi ili kulenga hadhira ya watoto na tatu, kujadili jinsi masimilisho teule yamezingatia saikolojia ya watoto. Data ya utafiti ilikusanywa kupitia mbinu ya usomaji wa kazi za fasihi teule. Mtafiti alisoma matini chasili mathalan; Utenzi wa Mwana Kupona na Utenzi wa Fumo Liyongo kwa kina. Aidha, mtafiti alisoma kwa kina matini lengwa mathalan: Kisa cha Fumo Liyongo, Wasifu wa Mwana Kupona na Mkasa wa Shujaa Liyongo. Data ilichanganuliwa kupitia uchambuzi wa matini ya vitabu teule kwa kutumia misingi ya nadharia ya usimilisho. Matokeo ya utafiti yamewasilishwa kupitia maandishi ya kinathari kwa kuzingatia malengo ya utafiti. Matokeo ya utafiti huu yamebaini kuwa, usimilisho wa tenzi za kale kuwa fasihi ya watoto umefanikiwa kwa kiasi kikubwa katika kufikisha historia na utamaduni wa Kiswahili kwa njia rahisi na ya kuvutia kwa watoto. Aidha, kazi hizo zimebadilishwa kimtindo, kimaudhui na kimuundo ili kuendana na uwezo na mazingira ya mtoto wa sasa. Zaidi ya hayo, kazi hizo zimezingatia saikolojia ya watoto kwa kutumia lugha nyepesi, picha na mifumo ya usimulizi. Matokeo ya utafiti huu yataweza kuchangia katika kuendeleza masomo kuhusu fasihi ya watoto kwa kutoa umaizi wa jinsi tenzi za kale zinavyoweza kubadilishwa kwa ufanisi kwa ajili ya watoto. Hili litaweza kusaidia wasomi kupanua uelewa wao wa kile kinachojumuisha fasihi ya watoto na jinsi inavyoweza kujumuisha maandishi mbalimbali ya kitamaduni na kihistoria..

Maneno Makuu: *usimilisho, tenzi, watoto, fasihi ya watoto, matini chasili, matini lengwa*

75. Understanding dialogic communication in community development: perceptions and practices among Community-Based Organizations in Kenya

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Subtheme: Innovative Educational Practices for Sustainable Development and Community Transformation.

Abstract

Dialogic communication is considered as one of the most ethical form of communication because it serves to mitigate power relationships, values individuals' dignity and self-worth and involves all participants in conversations and decision making. Several studies document that dialogic communication is needed in community development in order to build trust, empathy, mutual understanding and collaborative exploration of different perspectives in identifying the best course of action to successfully address a situation that needs to be changed hence jointly building a learning environment that will facilitate social change and development. However, existing studies on development communication conceptualize dialogue differently. The study explored the perceptions and practices of dialogic communication among Community Based Organizations in Kenya and how dialogic communication can be applied for effective communication. The specific research questions were; how dialogic communication is perceived by CBOs, how dialogic communication is practiced by CBOs and the implications of these perceptions on dialogic communication practices and performance of CBO's in executing their mandate. I used purposive sampling procedure to identify 11 participants and conducted the study in five Community-Based Organizations. I analysed the data thematically and presented the data in narrative form in accordance with the themes. The findings show that; CBOs have varied perspectives of dialogic communication; mixed approaches of practicing dialogic communication are used by CBOs and perceptions of dialogic communication influence the practice and performance of CBOs. The overall perspective is that; CBOs lack a clear understanding of dialogic communication though evidence of it being practiced is visible in their initiatives. The main contribution of this study is that it highlights the perceptions of dialogic communications and how dialogic communication perceptions influence how it is practiced among CBOs. The study contributes to the body of knowledge on development communication by responding to varied authors' perspectives on the relevance of dialogic communication in community development especially in the African context and more so in the Kenyan context. Based on this study, I recommend face-to-face group sensitizations on dialogic communication to further enhance its applicability in community-based initiatives. This will further advise on the individual roles played in a dialogic communication context.

Keywords: *Dialogic Communication, Dialogue, Communication for Development, Community development, Development*

76. Principals' role in enhancing student academic achievement through Teachers involvement.

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Subtheme: Innovative Educational Practices for Sustainable Development and Community Transformation.

Abstract

Effective school leadership strongly relates to principals' involving teachers in decision-making. This is a key determinant of student academic achievement. This study was conducted in public secondary schools in Tigania West Sub-county, Meru County, Kenya. This study employed descriptive survey design to determine the extent to which principals involve teachers in various decision-making within public secondary schools; and established the relationship between the level of teacher involvement in school decision-making and the academic achievement of students. The study sample was obtained using the Krejcie and Cochran model resulting to, sample sizes of 240 students and 50 teachers from populations of 637 and 55 respectively. This sampling was stratified across schools categorized as high, average, and low-performing academically to ensure representation of different achievement levels. Principals were purposively selected to provide in-depth insights into leadership practices. Data was collected using questionnaires for teachers and students, interviews with principals, and observation schedules of school operations. The findings revealed a strong positive relationship between high levels of teacher involvement in decision-making and higher school academic achievement. The principals in high-performing schools demonstrated significantly greater teacher involvement across pivotal areas than their counterparts in average and low-performing schools. The study concludes that fostering a participatory decision-making environment, where teachers actively contribute to key school improvement decisions, is critical for enhancing student academic achievement. The paper recommends that the Ministry of Education prioritize training for principals to adopt inclusive leadership styles that effectively empower teachers in school management.hygiene.

Keywords: *School leadership, teacher involvement, decision-making, participatory leadership, student achievement.*

SUBTHEME 5: Health Sciences - Innovative Health Solutions for Global Health Challenges and Community Wellbeing

HEALTH SCIENCES PRECONFERENCE PAPERS

77. Examining the link between malnutrition and life quality in chemotherapy patients Meru Teaching and Referral Hospital, Meru County, Kenya

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Subtheme: Innovative Health Solutions for Global Health Challenges and Community Wellbeing

Abstract

Cancer continues to be a major global health burden, contributing significantly to morbidity and mortality. Malnutrition is highly prevalent among cancer patients, often worsened by chemotherapy-induced side effects, further impairing their quality of life (QoL). This study assessed the nutritional status and QoL of cancer patients undergoing chemotherapy at Meru Teaching and Referral Hospital (MeTRH), Kenya. The study aimed to evaluate the nutritional status of cancer patients receiving chemotherapy., Determine the prevalence of nutrition impact symptoms (NIS) and assess the association between nutritional status and QoL. The study design and methodology adopted was a descriptive cross-sectional study was conducted at the Haemato-Oncology Clinic of MeTRH from May to August 2023. A total of 246 chemotherapy patients were recruited via purposive sampling. Data were collected using: Structured questionnaires (demographics, clinical characteristics). WHOQOL-BREF (Quality of Life assessment) Nutritional Risk Screening (NRS-2002) (Malnutrition screening) Statistical analysis was performed using SPSS version 30, employing descriptive statistics and Pearson's correlation to examine the relationship between nutritional status and QoL. The key findings of the study were Nutrition Impact Symptoms (NIS), Loss of appetite (45.8%), Nausea/vomiting (35.2%), Quality of Life 4.2% reported "neither poor nor good" QoL 0% reported "good" QoL Statistical Association: Malnutrition was significantly correlated with lower QoL scores ($p < 0.05$). The Conclusion Cancer patients undergoing chemotherapy at MeTRH experience significant nutritional challenges, leading to diminished QoL. The findings underscore the need for early nutritional screening and targeted interventions to mitigate malnutrition and improve patient well-being.

Keywords: Cancer, Malnutrition, Chemotherapy, Quality of Life- QoL, WHOQOL-BREF, Kenya.

78. Climate Change and Agrochemical Use Trends Among Fresh Produce Farmers in Nakuru County, Kenya

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Subtheme: Innovative Health Solutions for Global Health Challenges and Community Wellbeing

Abstract

Climate change patterns and development of pest resistance have led to an increase in the frequency and volume of farmers' use of agrochemicals which negatively affects public health. This study aimed to determine the association between climate change and agrochemical use trends among Fresh Produce farmers in Nakuru County, Kenya. The study design was a community based cross-sectional analytic and descriptive study, and target population included fresh produce farmers living in rural areas who are routinely exposed to agrochemicals in their daily occupational activities. A sample of 388 participants was accessed. Data was collected using structured questionnaires, Interview schedules, Focused Group Discussion (FGD) guide and an Observation guide. Data were analyzed using SPSS v28 for descriptive and inferential statistics, and Nvivo for qualitative data thematic analysis. Chi Square was used to estimate the degree of association between categorical variables and binomial regression used to measure the significance of association. Regression analysis of the association between climate change variables and methods used to apply agrochemicals showed a statistically significant association between the two variables. Further regression analysis showed a statistically significant association between change in weather patterns over the past years and how decisions on agrochemical use volume and frequency were made, with a p-value <0.05. The study findings revealed that 98.7% of respondents were aware of climate change, and 96.4% observed increases in pest and disease pressure attributed to it. There was a significant association between observed climate change and agrochemical decision-making (OR = 1.2, $p < 0.05$) indicating that those who had observed climate change were 1.2 times more likely to increase their use of agrochemicals compared to those who had not, and a weak negative association with methods of application (OR = 0.87, $p = 0.01$). Most farmers relied on peers or agrochemical vendors for advice on volume and frequency of use, while few adhered to pre-harvest intervals due to economic pressure and lack of enforcement. Through training, fresh produce farmers can identify climate change effects early enough and make informed decisions on their farming practices.

Keywords: Climate Change, Weather Patterns, Agrochemical Use Trends, Fresh Produce Farmers, Nakuru County

79. The unseen burden of tinea capitis infection in primary school going children in Tigania west: Prevalence characterization and risk factors associated with tinea capitis

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Subtheme: Innovative Health Solutions for Global Health Challenges and Community Wellbeing

Abstract

Tinea capitis (scalp ringworm) remains one of the most common fungal infections in children worldwide, particularly in school-aged populations. Its prevalence varies significantly by region, influenced by factors such as climate, socioeconomic conditions, hygiene practices, and access to healthcare. There is high prevalence in Tropical and Low-Income Regions; Sub-Saharan Africa, Asia, and Latin America report high infection rates of up to 30–50% due to overcrowding, limited access to clean water, and poor hygiene. A cross-sectional study was conducted between February and March 2025 involving 153 pupils from four primary schools. Demographic and clinical data were collected via questionnaires, while skin scrapings and hair samples were analyzed using KOH microscopy and fungal culture. The sample size was determined based on a preliminary prevalence rate of 10%, at 95% confidence level, and a 10% adjustment for non-response, yielding a final target of 153 participants. Among the participants (67.32% boys, 32.68% girls), the overall prevalence of Tinea capitis was 80.39%, with higher rates in boys (87.38%) than girls (66%). Boys had a significantly higher prevalence rate than girls hence, using a chi-square distribution table, the (P-value < 0.002), hence highly significant rejecting the null hypothesis. Significant risk factors included age groups—for age group 5–7 the p-value = 0.0396, while the age group for 8–10 years the (P-value = 0.143); moreover, the age group 8–10 years the (P-value = 0.126). Also, gender, hygiene practices, and socio-economic status are risk factors. Tinea capitis was highly prevalent among primary school children in Tigania West, Meru County, particularly affecting boys. The infection adversely impacts children's quality of life, causing psychological distress due to social stigma, physical discomfort, and potential secondary infections, ultimately hindering academic performance. Tinea capitis remains a significant global public health concern, disproportionately affecting children in low-resource settings. Improved hygiene, antifungal therapies, and public health education are critical to reducing its burden.

Keywords: Tinea capitis, Dermatophytosis, KOH microscopy, Kerion, Agminate folliculitis, Erythema, Impetigo.

80. Innovative research for combating *visceral Leishmaniasis* in kenya: promoting interdisciplinary collaboration for sustainable solutions in surveillance, treatment, and vector control

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Subtheme: Innovative Health Solutions for Global Health Challenges and Community Wellbeing

Abstract

Visceral Leishmaniasis (VL) remains a major public health concern, especially in arid and semi-arid areas in Kenya. In these areas, the disease burden is exacerbated by factors such climate change, environmental alterations, population mobility, and weak health systems. Reducing disease-related mortality to less than 1% is the World Health Organization (WHO) 2021-2030 Neglected Tropical Diseases (NTDs) road map. Prevention and control efforts can be enhanced thorough adoption of innovative multidisciplinary and multisectoral approaches ensuring long-term control in view of increasing outbreaks. In order to address VL through sustainable approaches in surveillance, treatment, and vector control, this abstract examines the need for interdisciplinary collaboration. By utilizing geospatial technologies and mobile health platforms, innovative surveillance research has the potential to improve early detection and response. By facilitating real-time data collection and mapping to monitor and forecast outbreaks, these tools can enhance community health care delivery. Access to affordable, safe, and optimal diagnostics and treatment is still a major obstacle in VL management. However, there are encouraging opportunities to enhance healthcare delivery in remote endemic regions through research-driven solutions like telemedicine, and mobile clinics. Developing sustainable, localized vector control strategies requires combining expertise of environmental scientists, entomologists, and community leaders. Important elements of this integrated strategy comprise innovative community-based prevention initiatives, active engagement of affected communities including relevant stakeholders. Kenya can significantly lower the incidence of VL and improve impacted populations wellbeing by encouraging interdisciplinary collaboration among researchers, policymakers, health professionals, and local communities. Based on this review, we propose and underline the need for a well-funded strategic framework focusing on health system strengthening, building partnerships, implementation and operational research, advocacy, community mobilization and engagement. These approaches are imperative to strengthen and intensify Kenya's overall efforts in combating Visceral Leishmaniasis as a public health problem setting the stage for global elimination efforts.

Keywords: Innovative, Interdisciplinary Collaboration, Sustainable Solutions, Surveillance, Vector Control, Visceral Leishmaniasis

81. Hand to harm; Prevalence of Escherichia coli and Pseudomonas spp. Contamination on toilet door handles in learning institutions in Nchiru, Meru County.

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Subtheme: Innovative Health Solutions for Global Health Challenges and Community Wellbeing

Abstract

Public learning institutions are frequented by large numbers of students and staff, making hygiene in shared facilities, particularly restrooms, crucial for preventing the spread of infectious diseases. Toilet door handles, as high-touch surfaces, are often contaminated with pathogenic microorganisms, including Escherichia coli (E.coli) and Pseudomonas species (Pseudomonas spp), posing significant health risks. Pathogenic strains of E.coli can cause gastrointestinal illnesses, and urinary tract infections, while Pseudomonas spp, particularly Pseudomonas aeruginosa, a common environmental bacterium, is an opportunistic pathogen that is known for its resistance to antibiotics. This study investigated the prevalence of E. coli and Pseudomonas species on toilet door handles in learning institutions in Nchiru area, Tigania West Meru County. By conducting a cross-sectional study was in selected learning institutions from February to March in four institutions: St. Rita Primary School and Junior Secondary, Kunene Secondary School and Meru University of Science & Technology. A total of 110 samples were collected using sterile swabs, followed by incubation on selective media. Identification was confirmed through biochemical tests. Data on hand hygiene practices and resource availability were collected via questionnaires. Results showed a significant prevalence of E.coli (22.7%), particularly higher in girls' toilet door handles compared to boys' Pseudomonas spp was not isolated in any samples. Contamination levels were inversely related to the age group of the institution ($p=0.0038$) with younger learners' environments showing higher contamination. Although most respondents demonstrated good knowledge of hand hygiene, reported practices did not match this knowledge. Limited access to soap was observed in several institution, potentially undermining effective hygiene behavior. These findings underscore the importance of targeted hygiene interventions, including regular disinfection of high-touch surfaces and ensuring consistent availability of soap and water. Bridging the gap between knowledge and practices is essential to improving sanitation and creating healthier learning environments.

Keywords: Escherichia coli (E.coli), Toilet door Handles, Contamination, Hand Hygiene, and Learning Institutions

82. Association of hyperglycemia and breast cancer in Meru County, Kenya: A case-control study

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Subtheme: Innovative Health Solutions for Global Health Challenges and Community Wellbeing

Abstract

In Kenya, breast cancer and type 2 diabetes mellitus (T2DM) are rising public health challenges, yet their association remains underexplored in low-resource settings. This main objective of this case-control study was to investigate the relationship between hyperglycemia, and breast cancer among women at Meru Teaching and Referral Hospital. A total of 285 participants were recruited in the study with 143 cases and 142 controls. Data on glycemic status, BMI, T2DM, and risk factors were collected using questionnaires, laboratory assays, and blood glucose testing. Results revealed a 50% prevalence of hyperglycemia (HbA1c ≥6.5%) among cases compared to 15% in controls ($p<0.001$). Breast cancer cases had higher mean HbA1c (6.7%), $p<0.001$) and BMI (27.5 vs. 24.2 kg/m², $p<0.001$). Type 2 Diabetes Mellitus increased breast cancer odds 4.5-fold (95% CI: 2.6–7.9, $p<0.001$), with HbA1c ≥6.5% conferring a 5.2-fold risk (95% CI: 3.0–9.1, $p<0.001$). Family history (OR=3.0, $p<0.001$), alcohol use (OR=2.3, $p=0.013$), and hormonal contraceptive use (OR=2.0, $p=0.003$) were significant risk factors. Among cases, 45% presented at stages III/IV, correlating with higher HbA1c ($p=0.001$). Logistic regression confirmed HbA1c (OR=2.8, $p<0.001$) and T2DM as independent predictors. These findings suggest hyperglycemia and T2DM are significant breast cancer risk factors, likely mediated by insulin resistance and inflammation. Integrating HbA1c screening into breast cancer protocols could improve early detection in resource-limited settings like Meru County, where late-stage diagnoses predominate. Future prospective studies should clarify causality and molecular mechanisms. This study underscores the need for metabolic-focused interventions to address the dual burden of non-communicable diseases in Low and Middle Income Countries (LMICs).

Keywords: Breast cancer, Hyperglycemia, HbA1c, Type 2 diabetes, Risk factors

83. Barriers to effective prosthetic and orthotic service delivery: challenges in quality rehabilitation care in Meru County, Kenya

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Subtheme: Innovative Health Solutions for Global Health Challenges and Community Wellbeing

Abstract

Worldwide, over 1 billion people are living with disabilities and 125 million in low-income countries requiring prosthetic and orthotic (P&O) devices by 2035, access to these services remains critically limited in Kenya's underserved regions. This study evaluated P&O service provision in Meru County, where no previous assessments existed regarding availability, standards compliance, or implementation challenges. A hospital-based cross-sectional study was conducted at Meru Teaching and Referral Hospital, enrolling 226 healthcare workers through purposive proportional sampling. Using CIPP evaluation model-guided Likert questionnaires was used to collect data on device types, availability, standards adherence, and service barriers. Data analysis done using IBM SPSS® v25, incorporating descriptive statistics, chi-square tests ($\alpha=0.05$), and thematic analysis for qualitative data sets. The study findings revealed trans humeral (34.2%) and through-knee (27.6%) prostheses as most common, with ankle-foot orthoses (57.8%) predominating orthotic devices. Critical service gaps included Device unavailability (68.1% reported minimal availability), Substandard clinical (41.6%), physical (37.2%), and fabrication (40.7%) services, Poor adherence to care standards (71.7%), particularly in nursing (38.1%) and psychosocial support (41.6%), Notably, 77% of respondents underestimated system challenges, suggesting normalization of deficiencies. Significant correlations emerged between Service availability and education level ($\chi^2=35.117$, $p=0.004$) Age and standards compliance ($\chi^2=22.038$, $p=0.037$), Employment terms and quality perception ($\chi^2=16.307$, $p=0.038$). This study documented severe systemic deficiencies in P&O service delivery within Meru County's rehabilitation framework, characterized by inadequate device supply, suboptimal care standards, and unrecognized operational barriers. We recommend immediate multisectoral interventions including: enhanced device procurement, strict standards implementation, comprehensive staff training, and integrated referral networks to improve trauma rehabilitation outcomes.

Keywords: Barriers, Assistive Technology, Prosthetic, Prosthesis, Orthotic, Service Delivery, Disability, Challenges in Quality Rehabilitation Care

84. Assessment of selected laboratory quality management essentials in the haematology department at Meru Teaching and Referral Hospital

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Subtheme: Innovative Health Solutions for Global Health Challenges and Community Wellbeing

Abstract

This research proposal investigates selected laboratory quality management essentials in the Haematology Department at Meru Teaching and Referral Hospital (MeTRH), a key referral facility in Meru County, Kenya. Despite the critical role of accurate haematological testing in patient diagnosis and care, national audits reveal significant deficiencies in process control, facilities and safety, and equipment management, with Meru County scoring below national averages (1.10–1.51 *vs.* 1.76). This study aims to address these gaps by examining process control practices, assessing the adequacy of facilities and safety measures, and examining equipment management practices using the WHO's Stepwise Laboratory Quality Improvement Process Towards Accreditation (SLIPTA) checklist. Employing a descriptive cross-sectional design, the study will involve laboratory technologists and technicians, utilizing census sampling, data collection through standard operating procedures, quality manuals, interviews, and observations, and analysis via SPSS with descriptive and inferential statistical tests. The findings will enhance diagnostic accuracy, inform hospital management and policy decisions, and contribute to academic research, ultimately improving patient outcomes at MeTRH.

Keywords: Laboratory Quality Management; Haematology; SLIPTA Checklist; Process Control; Meru Teaching and Referral Hospital.

85. Assessment of the role of community health promoters in hypertension care in Imenti North Sub County

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Subtheme: Innovative Health Solutions for Global Health Challenges and Community Wellbeing

Abstract

This study seeks to assess the role of Community Health Promoters (CHPs) in hypertension care within Imenti North Sub-County, Kenya, with a focus on addressing critical gaps related to hypertension prevalence, resource utilization, treatment adherence, and operational challenges. The sub-county faces a significant burden, with an estimated 3,616 individuals affected by hypertension and treatment adherence rates as low as 32.5%. CHPs are strategically positioned to mitigate these challenges through community-based interventions such as health education, blood pressure screening, and patient follow-up. The study will adopt a descriptive survey design and employ simple random sampling to select CHPs for participation. Data will be collected using structured questionnaires and analyzed using the Statistical Package for the Social Sciences (SPSS). Descriptive statistics will be used to summarize the data, while inferential statistics will be applied to examine associations between key variables. The findings are expected to provide insights into barriers faced by CHPs, evaluate their effectiveness in hypertension management, and generate evidence to inform health policy and strengthen community-based strategies aimed at reducing hypertension risks in low-resource settings.

Keywords: Community Health Promoters; Hypertension Care; Treatment Adherence; Primary Healthcare; Imenti North Sub-County.

86. Evaluating the effectiveness of the Linda Mama Healthcare Program in enhancing maternal health outcomes in Igembe South, Meru County

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Subtheme: Innovative Health Solutions for Global Health Challenges and Community Wellbeing

Abstract

Launched in 2013 and incorporated into Kenya's National Hospital Insurance Fund (NHIF) in 2016, the Linda Mama program seeks to enhance maternal and neonatal health by offering free maternity services in public health facilities. Despite its aim to improve access and ensure accountability, issues such as limited service availability, out-of-pocket expenses, and delayed NHIF payments continue to hinder its success. This research evaluates the effectiveness of Linda Mama at Nyambene Sub-County Hospital in Igembe South, Meru County, examining its influence on maternal health outcomes, awareness levels among multiparous mothers, barriers to accessing services, and satisfaction with care quality among beneficiaries. A cross-sectional study will involve randomly selected multiparous mothers and healthcare providers, with data gathered through pretested, structured questionnaires and analyzed using SPSS for descriptive and inferential statistics. Ethical clearance will be secured from the Meru University Institutional Research Ethics Committee (MIREC) and Nyambene Hospital management, alongside informed consent from participants. The study's results will offer evidence-based insights to refine maternal and child health initiatives, guide policy development, and improve service provision in Igembe South Sub-County and comparable areas, supporting Kenya's pursuit of universal health coverage and reduced maternal mortality.

Keywords: Maternal Healthcare, Linda Mama, Universal Health Coverage, Service Accessibility

87. Assessment of tuberculosis preventive therapy uptake among healthcare workers at Meru Teaching and Referral Hospital

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Subtheme: Innovative Health Solutions for Global Health Challenges and Community Wellbeing

Abstract

Meru County, Kenya, faces a rising tuberculosis (TB) burden, with cases increasing from 3,606 in 2020 to 4,257 in 2023. Despite elevated occupational risk of latent TB infection (LTBI) among healthcare workers (HCWs) at Meru Teaching and Referral Hospital, only 2.1% of Tuberculosis Preventive Therapy (TPT) cases involve HCWs (NTLD-P, 2023). This study investigates LTBI and active TB prevalence among HCWs, evaluates TPT adherence, assesses knowledge levels, and identifies uptake determinants. Utilizing a mixed-methods quantitative approach, the research combines a retrospective review of TPT health records with a cross-sectional survey. Data will be collected through standardized checklists and structured questionnaires, employing simple random sampling for HCWs and census sampling for TPT records. Descriptive statistics will characterize demographics, adherence, and knowledge, while inferential statistics will uncover associations with TPT uptake. Analysis, performed using SPSS, will be presented via tables, charts, and graphs. These findings are poised to drive targeted interventions, fortify occupational health policies, and enhance TB prevention strategies for HCWs in high-prevalence settings.

Keywords: Healthcare Workers, Latent Tuberculosis, Occupational Health, Tuberculosis Preventive Therapy, Uptake

88. Assessment of mental health inequities and access to mental health services in Samburu East Sub-County, Kenya

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Subtheme: Innovative Health Solutions for Global Health Challenges and Community Wellbeing

Abstract

Mental health disorders are one of the main public health concerns in the world in that low and middle-income countries such as Kenya are prone to bear a misappropriate burden on the same. Particularly, communities in rural settings yet underserved, such as the Samburu East sub-county, face a variety of systematic, cultural and socio-economic challenges which often tend to limit their abilities to access timely and most appropriate care when it comes to mental health. Despite the increases in the global recognition of mental health as one of the most integral in some of the sustainability development, mental health care in some of the Kenyan sub-counties has remained a stigmatized, underfunded and inaccessible criterion. Moreover, in Samburu East, some of the challenges that mental health patients face include the traditional beliefs of the residents in association with mental health. Most of the beliefs are such that mental health problems are caused by the possession of spirits, curses or displeasure by the ancestors, which has limitations on the uptake of the formalities of mental health. The study has thereby been designed to investigate the nature and extent of mental health inequities as well as access to mental health services in Samburu East Sub County. The main objective of this study is to assess mental health disparities and barriers to accessing professional care within Samburu East Sub County, standing as a marginalized pastoralist community. To achieve the given aim, the study is prone to adopt a cross-sectional descriptive research design, which will incorporate a sequential mixed method approach. Data will be obtained both quantitatively and qualitatively. Quantitative data will be collected using structured questionnaires, which will be administered to the residents of Samburu East Sub County, thus enabling the study to capture the demographics and prevalence patterns of the mental health disorders that exist. Qualitative data will be gathered through the use of focus group discussions and interviews with key informants, which include traditional healers, healthcare workers, and community leaders, to help gain insights into some of the challenges influencing mental health illnesses. The populations that will be incorporated in the study include the adult community members from the Samburu East sub-county, who will cover a variety of age groups and socio-economic statuses, thus ensuring that all the groups are represented effectively. Data analysis of the above study will involve inferential statistical techniques and descriptive data analysis for the quantitative data collected, while thematic analysis will be used for the interpretation of the responses given for the qualitative data collected. Various assumptions will be made to guide the study. Some of the assumptions will suggest that mental health disorders in the Samburu East sub-county are undermanaged, underreported and influenced majorly by cultural beliefs. Expected findings are such that there should be a significant gap and high reliance on traditional medications.

Keywords: Mental Health Inequities; Access to Care; Cultural Beliefs; Rural Communities; Samburu East Sub-County.

89. Utilization of mobile health applications for infectious disease monitoring among healthcare workers in Meru County, Kenya

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Subtheme: Innovative Health Solutions for Global Health Challenges and Community Wellbeing

Abstract

Infectious diseases remain a major public health burden, particularly in resource-limited settings, where they contribute significantly to morbidity and mortality. While traditional interventions have mitigated disease spread, mobile health (mHealth) technologies present new opportunities for improving health monitoring and response. This study investigates the influence of selected mobile phone applications on healthcare workers' efforts to monitor and combat infectious diseases in Meru County, Kenya. A convergent mixed methods design will be employed, integrating quantitative and qualitative data for comprehensive analysis. Structured questionnaires will be administered to 321 healthcare workers, selected via proportionate simple random sampling from a purposively chosen pool of healthcare facilities. Additionally, focus group discussions involving 7–11 purposively selected participants per group will capture in-depth perspectives. Quantitative data will be analyzed using SPSS version 27.0 with descriptive statistics and logistic regression at a 95% confidence level ($p < 0.05$), while qualitative data will be thematically analyzed using NVivo. Results will be presented through tables, charts, and thematic summaries. This study aims to identify usage patterns, perceived benefits, and barriers to mHealth adoption among healthcare professionals. The findings are expected to inform evidence-based strategies and policies for enhancing healthcare delivery and infectious disease control through mobile technology. Ultimately, the study will contribute to strengthening public health systems in Meru County and similar contexts by offering practical insights into the role of mHealth in achieving sustainable development goals related to health.

Keywords: Healthcare workers, Infectious Diseases, mHealth, SDGs, Kenya.

90. Genetic predisposition to non-communicable diseases: a Public Health perspective

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Subtheme: Innovative Health Solutions for Global Health Challenges and Community Wellbeing

Abstract

Non-communicable diseases (NCDs) such as cardiovascular diseases, diabetes, and certain cancers are a major cause of public health concern as they are increasing at an alarming rate and are the lead to global mortality and morbidity. The risk of acquiring or being protected from NCDs arises from the complex relationship between the environment that an individual life in and an individual's health behaviors and genetic makeup. There is growing evidence that genetics along with environmental, physiological, and behavioral factors play an important role in the individual's susceptibility to the development of NCDS.This study aims to examine and analyses the roles of genetics in development of NCDS and with a main focus on the gene-environment relationship that lead to disease development within a specific population. This study will use cross-sectional design and with the use of already published literature and sorted genomic datasets the research will aim to evaluate the key genetic markers associated with the common NCDS.this study will apply ethical consideration on integrating the genetic screening as preventative measuer.it will also focus on the challenges of the integration of screening. This will help in early interventions, coming up with early detection mechanisms and create personalized preventive structures.it will help in development of targeted interventions to help reduce the burden of NCDS.

Keywords: **Genetic predisposition, non-communicable diseases, public health, gene-environment interaction, genomic dataset**

91. Hypolipidemic effects of non-bitter Cucumis metuliferus (Thorn melon) fruit extract in a high-fat/fructose diet and streptozotocin-induced type II diabetes mellitus in Wistar Albino rats

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Subtheme: Innovative Health Solutions for Global Health Challenges and Community Wellbeing

Abstract

Globally, dyslipidemia remains a lifestyle-associated disease, with ageing and metabolic disorders like diabetes mellitus increasing its risk. The World Health Organization estimates that dyslipidemia is associated with approximately 50% of the global cases of ischemic heart disease, which accounts for over 40% of deaths related to cardiovascular diseases. Today, cardiovascular disease is one of the leading causes of death, accounting for about 31% of worldwide mortality, and is predicted to remain like that in 2030. Although, the non-bitter Cucumis metuliferus fruit is used for managing type 2 diabetes mellitus by some communities like Kikuyu in Kenya, its therapeutic benefits have not been adequately studied. The study aimed to determine the effects of non-bitter Cucumis metuliferus fruit extract on the lipid profile of a high-fat/fructose diet and streptozotocin-induced type II diabetic Wistar albino rats. This study adopted an experimental laboratory-based design. A sample size of 64 male Wistar albino rats, aged 5 weeks and weighing 90 to 130 grams, was randomly assigned to two major study groups: the control and the experimental. The experimental group received a high-fat/fructose diet plus streptozotocin (STZ) injection to induce diabetes mellitus, whereas the control group received a standard rodent pellet diet plus 0.9% normal saline. The experimental group was further divided into a positive control group that was treated with pioglitazone (the standard drug) at a dose of 20 mg/kg body weight, a low-dose CMFE group at 200 mg/kg body weight, and a high-dose CMFE group at 400 mg/kg body weight. Serum total cholesterol, triglycerides, low-density lipoprotein and high-density lipoprotein tests were used as indicators, and the results were compared between groups. The study findings revealed a significant statistical rise in serum total cholesterol ($P < 0.001$), triglycerides ($P = 0.019$), low-density lipoprotein ($P = 0.016$) and mean total body weight ($P = 0.033$) after treatment with high-fat/fructose diet, which was followed by a decline to levels comparable to the control group after treatment with CMFE and pioglitazone. Similarly, there was a significant decrease ($P = 0.004$) in the beneficial high-density lipoproteins after treatment with a high-fat/fructose diet, followed by a significant increase ($P = 0.001$) after treatment with CMFE and pioglitazone. This study concludes that the non-bitter Cucumis metuliferus fruit extract possesses hypolipidemic properties in type II diabetes mellitus.

Keywords: *Cucumis metuliferus; High fat/Fructose diet; Lipid profile; Streptozotocin; Type II Diabetes*

92. Ethnobotanical and Epidemiological Assessment of Herbal Remedies for Zoonotic Disease Management in Laisamis Sub-County, Marsabit County, Kenya.

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Subtheme: Innovative Health Solutions for Global Health Challenges and Community Wellbeing

Abstract

Objective: This study aims to assess the ethnobotanical practices and epidemiological patterns of herbal remedy use in managing zoonotic diseases in Laisamis Sub-County, Marsabit County, Kenya. Problem: Zoonotic diseases remain a significant health challenge in pastoral regions, compounded by limited access to formal healthcare and reliance on traditional medicine whose efficacy remains poorly documented. Methodology: A mixed-methods cross-sectional design was employed. Qualitative data were collected through key informant interviews, focus group discussions, and guided plant walks with traditional healers and community elders to document medicinal plants used. Quantitative data involved structured questionnaires and review of health facility records to determine disease prevalence, health-seeking behaviours, and clinical outcomes. Key Findings: Preliminary results indicate widespread use of indigenous herbal remedies for zoonotic conditions such as brucellosis, anthrax, and rabies, attributed to cultural acceptability and accessibility. The study identified commonly used plant species, preparation methods, and indications. Epidemiological analysis revealed correlations between herbal remedy use and disease outcomes. Discussion: The findings highlight the critical role of ethnobotanical knowledge in zoonotic disease management and underscore the need for integrating traditional medicine within public health frameworks. Application: This research informs policy development towards culturally sensitive, community-based zoonotic disease control strategies and conservation of indigenous medicinal knowledge. Conclusions: Traditional herbal remedies are vital in managing zoonotic diseases in Laisamis Sub-County, yet scientific validation and integration with formal health systems are necessary to improve health outcomes. Recommendations: Further pharmacological and clinical studies on identified plants are recommended, alongside public health initiatives to enhance community awareness and formal recognition of ethnobotanical practices.

Keywords: Zoonotic diseases, Ethnobotany, Herbal remedies, Epidemiology, Pastoral communities

93. Assessment of factors influencing outcome of drug-resistant Tuberculosis treatment among patients enrolled in Meru County, Kenya

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Subtheme: Innovative Health Solutions for Global Health Challenges and Community Wellbeing

Abstract

Background: Worldwide, the World Health Organization (WHO) reported that a total of 175, 923 cases of drug-resistant Tuberculosis were notified in 2023. Kenya is among the 30 high burden countries with a huge burden of both drug-susceptible and drug-resistant Tuberculosis. Drug-resistant tuberculosis is a major cause of morbidity and mortality across population demographics. Although there has been availability of treatment which has saved millions of lives globally, drug-resistant tuberculosis treatment outcomes remain sub-optimal globally. The World health organization reported that only 63 percent of drug-resistant tuberculosis cases enrolled in 2020 were successfully treated with 13 percent mortality and a loss to follow-up of 11 percent. In Kenya, only 67 percent of all cases enrolled in 2020 were cured against a national target of 90 percent. Meru County is among the counties in Kenya harboring a high burden of both drug-susceptible and drug-resistant Tuberculosis reported 348 cases of drug-resistant Tuberculosis between 2020 and 2023. Problem Statement: The outcome of treatment for drug-resistant Tuberculosis remains sub-optimal with Meru County achieving 75 percent treatment success rate, a mortality rate of 4 percent and loss to follow-up of 6 percent among patients reported in the 2020 to 2023 cohort. Treatment for drug-resistant Tuberculosis is complex and often requires intensive patient monitoring so as to achieve optimum treatment success. This study aims to assess the factors influencing the outcome of drug-resistant tuberculosis treatment among patients enrolled in Meru County, Kenya. Specifically, the study will assess the patient characteristics, the clinical factors and health service delivery factors influencing the outcome of drug-resistant Tuberculosis treatment. Methods: A retrospective cohort study design will be used to assess the variables of patient characteristics, healthcare service delivery factors and clinical factors and their influence on treatment outcomes. Data from records of patients enrolled in health facilities within Meru County between January 2020 and December 2023 will be analyzed. Study data will be collected by use of a structured data collection tool and analyzed using the Statistical Package for Social Sciences (SPSS) version 28.0. Descriptive and inferential statistics will be utilized to describe relationships between the independent and the dependent variables. Bivariate and multivariate analysis will be done by use of regression models and associations will be interpreted using Chi square test. Study data will be presented using tables, graphs and charts. The study results will be significant in informing policy and practices aimed at enhancing the quality of care offered to patients with drug-resistant Tuberculosis

Keywords: Drug-resistant Tuberculosis, Treatment Outcome, Patient Characteristics, Health service delivery, Tuberculosis, Meru County

94. Determinant of Severe Acute Malnutrition among children Age 6-59 Months, Kenya, Marsabit County.

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Subtheme: Innovative Health Solutions for Global Health Challenges and Community Wellbeing

Abstract

Global deaths of children with SAM have been high about 17 million children. Africa is however found to contribute largely to 46% of the deaths. Kenya being a low and middle income economy has faced a major public health burden due to severe acute malnutrition especially in the ASAL counties with Marsabit recording highest rates of all of them. Severe acute malnutrition (SAM) is a life-threatening condition characterized by a severe deficiency of essential nutrients, particularly protein and calories, vitamins, and minerals. Acute malnutrition is mostly common among children in developing countries. WHO reports that 19 million children under five years are affected and globally and over 400,000 children die annually from SAM.This study will be conducted in the four sub-counties of Marsabit County in Kenya. The burden of severe acute malnutrition in children under five years remains alarmingly high, especially in low- and middle-income countries.The objective of this study is to assess the risk factors that affect severe acute malnutrition among children age 6-59 months in Marsabit County. This study will use the cross sectional research design and case-control design to establish comparison between SAM cases and control samples. The findings of this study will help raise awareness among the general public about the factors contributing to severe acute malnutrition, helping to promote understanding and empathy for affected individuals and communities. Knowledge of the risk factors will also create empowerment among the affected communities. A sample size of 385 respondents will be selected using simple random sampling and purposive sampling where affected SAM children/caregivers, well-nourished children for control cases and nutritionists or health care professionals will form the target population. Cochran formula for sample size determination will be used to determine the sample size. Primary data will be collected using structured questionnaires. However, a checklist will be ideal for collecting secondary data from the clinical records. KII guide will be used to collect qualitative data from the healthcare professionals. Collected data will be cleaned, coded and analyzed using SPSS version 28. Statistical tests such as ordinary least squares will be used to draw relationships between the independent variables and SAM at 0.05 level of significance.

Keywords: Severe Acute Malnutrition (SAM); Risk Factors; Children Under Five; Marsabit County; Public Health.

95. Risk Factors associated with malnutrition in children below five years in Kajiado County, Kenya

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Subtheme: Innovative Health Solutions for Global Health Challenges and Community Wellbeing

Abstract

Malnutrition, as defined by the World Health Organization (WHO), refers to deficiencies, excesses, or imbalances in a person's intake of energy and/or nutrients. In this context, malnutrition specifically refers to undernutrition, which leads to conditions such as wasting, stunting, underweight, and deficiencies in vitamins and minerals. Among children under the age of five, malnutrition is a result of a complex interaction between the availability, accessibility, and utilization of food and healthcare services. Global statistics highlight the severity of malnutrition, with an estimated 149 million children under five suffering from stunting in 2022, 45 million experiencing wasting (too thin for height), and 37 million living with overweight or obesity. Alarmingly, nearly half of all deaths among children under five are linked to undernutrition, predominantly occurring in low- and middle-income countries. In Kajiado County, the prevalence of Global Acute Malnutrition (GAM) based on Weight-for-Height Z-scores (WHZ) was 9.2%, with Severe Acute Malnutrition (SAM) at 0.9%. The Integrated Phase Classification for acute malnutrition classified the country as "Stressed" (IPC Phase 2). GAM and SAM based on Mid-Upper Arm Circumference (MUAC) were 4.6% and 1.3%, respectively. This study will be an institutional-based analytical cross-sectional survey, focusing on 125,288 children for wasting, 264 children for stunting, and underweight, out of an estimated 167,677 children under five in Kajiado. The study will employ both quantitative and qualitative data collection methods, utilizing purposive sampling for hospitals and simple random sampling for participants. Data will be analyzed using SPSS version 25, employing frequencies, proportions, and bivariate logistic regression to examine individual factors, feeding practices, and morbidities. Ethical approval will be sought from the university's ethical review board, with necessary permits from NACOSTI, the county government, and the county commissioner.

Keywords: Malnutrition, Wasting, Underweight, Stunting, Feeding practices, Morbidity, under five

96. Factors Influencing HPV vaccination uptake among caregivers of adolescent girls in the pastoralist community of Garbatulla Sub County, Isiolo County, Kenya

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Subtheme: Innovative Health Solutions for Global Health Challenges and Community Wellbeing

Abstract

The prevalence of infection with high-risk human papilloma virus among Kenyans is rising and posing a public health concern as it reflects on increasing cases of cervical cancer. As a key prevention strategy against cervical cancer, the World Health Organization has recommended the vaccination of all girls between the ages of 9-14 years before their coitarche. Kenya has already integrated the vaccination of school-age girls 9-14 years old into its routine immunization schedule. However, coverage remain low across the country particularly among the hard-to-reach populations such as the nomadic pastoralist communities. This study aims to investigate the factors influencing HPV vaccination uptake among age-eligible girls in the pastoralist community of Garbatulla, Isiolo County. A mixed-methods cross-sectional analytical design will be employed on a sample size of 347 caregivers with adolescent girls aged 15-18 years. Quantitative data will be collected using structured questionnaires administered by the research team, while qualitative data will be collected with aid of Focus Group Discussion and Key Informant Interview guides. Pretesting will be conducted on 10% of the sample size in Sericho Ward. SPSS version 27 will be utilized for data analysis. Descriptive statistics will be presented using frequencies and percentages for categorical data and means and medians for continuous data. Chi-square test will be used to test associations between categorical variables and binary logistic regression to determine the predictor variables for vaccinate uptake. Thematic content analysis will be used for qualitative data. Findings will be presented using tables and charts, the expected result will be to find factors that influence HPV vaccination uptake among adolescent girls i.e Perceptions, Attitudes, knowledge towards HPV vaccine, and understanding of children vaccination status. Ethical approval will be sought from Meru University Ethical Review Committee. Research approval will be sought from the Meru University Graduate School, while a research permit will be sought from the National Commission for Science Technology and Innovation (NACOSTI). Potential respondents will be enrolled to participate based on their informed consent.

Keywords: HPV Vaccine, coitarche, cervical cancer, pastoralist community.

97. Assessment of water quality and associated health Risks in Buuri East Sub-County, Meru County, Kenya

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Subtheme: Innovative Health Solutions for Global Health Challenges and Community Wellbeing

Abstract

Water quality includes Physical, chemical and biological characteristics based on the standards of its usage. Water quality impacts both the public health and aesthetic value of a consumable product. The study area is Buuri East Sub- County, which is situated in Meru County, Kenya. It has an area of approximately 251 square kilometers, 23834 households. The main source of drinking water from the study area includes; the boreholes, springs, aquifers, rain water among other sources. The research on the assessment of water quality and associated health risks in Buuri East Sub- County has not been done before. Therefore, this study will be useful for policy-making by the county government of Meru in Kenya. The main objective of study is to assess water quality and associated health risks in Buuri East Sub- County, Meru County, Kenya. The Specific objectives of this research are to establish biological pollutants, chemical pollutants and methods of water treatment used by the residents in domestic water sources. The study will also assess the water related diseases that are common in the area of study. This research study will address these gaps by discovering the health risks associated to domestic water in Buuri East Sub- County. Water samples collected from the field of study will be analyzed in Laboratory to identify and quantify different pollutants, both microbiological and chemical analysis will be done. Quantitative data will be collected using a structured open and closed ended questionnaire. The collected data from the laboratory will be entered into the computer and analyzed by Statistical Package for Social Sciences (SPSS) version 26. The results will be presented in percentages, tables and chats. The expected results will be detailed analysis of water content and retrospective data on water related diseases from the area of study. The study will help the county government and other stakeholders to intervene on matters of water hygiene on water sources and supply.

Keywords: Water Quality; Health Risks; Biological and Chemical Pollutants; Buuri East Sub-County; Waterborne Diseases.

98. Prevalence and factors associated with multi drug resistant *E. Coli* causing UTI among women in Nyambene Hospital and Meru Level Five Hospital, Kenya:

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Subtheme: Innovative Health Solutions for Global Health Challenges and Community Wellbeing

Abstract

Background: Urinary tract infections (UTIs) pose a significant health challenge globally, affecting over 400 million people annually, with approximately 60% of adult women experiencing a UTI in their lifetime. The increasing prevalence of multidrug-resistant (MDR) E. coli, the primary causative agent of UTIs, has rendered empirical treatments ineffective, necessitating a comprehensive understanding of antimicrobial susceptibility patterns and associated risk factors. Objectives: This study aims to determine the antibiotic susceptibility pattern, prevalence, and risk factors associated with drug-resistant E. coli among female patients with UTIs at Meru Level 5 Hospital and Nyambene Sub County Hospital. Methodology: A cross-sectional study will be conducted among 288 female patients with active UTIs, recruited using purposive sampling, between July and December 2025. Urine samples will be cultured on CLED and MacConkey Agars, followed by antimicrobial sensitivity testing to determine antibiotic susceptibility patterns in Muller Hinton agar. Data analysis will be performed using SPSS, and results will be presented using graphs and charts. Expected Outcomes: This study will provide valuable insights into the antimicrobial susceptibility patterns and risk factors associated with MDR E. coli among female patients with UTIs in Meru, Kenya. The findings will inform evidence-based treatment guidelines, contributing to the effective management of UTIs and mitigating the spread of antibiotic resistance in the region. Recommendations: The study's results will be used to make recommendations for public health policy, clinical practice, and antimicrobial stewardship, ultimately improving patient outcomes and reducing the burden of UTIs in Kenya and beyond.

Keywords: Urinary Tract Infections (UTIs); Multidrug-Resistant E. coli; Antibiotic Susceptibility; Risk Factors; Meru County.

99. Analysis of trends in ovarian, endometrial and cervical cancers in Nakuru County, Kenya

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Subtheme: Innovative Health Solutions for Global Health Challenges and Community Wellbeing

Abstract

Ovarian, endometrial and cervical cancers are the most common gynecological cancers among women that disrupts their quality of life and the function of the reproductive system. There is a growing population of the selected gynecological cancers in Kenya. In Nakuru county, there is inadequate data on the exact disease burden of the diseases. This research aims to analyze the trends in the selected gynecological cancers in Nakuru county through a retrospective cross-sectional study of hospital-based patient registries in the Nakuru County Regional Cancer Center from May 2018 to December 2024. A census approach will be used to include all ovarian, endometrial and cervical cancer patients that meet the inclusion criteria. Data abstraction will be done using a Kobo collect questionnaire that is guided by a standard checklist developed using the hospital registries for data quality and consistency. Purposive sampling technique will be used. Data analysis for both descriptive and analytic measures will be done using R Studio version 4.4.2. The prevalence of the selected gynecological cancers will be measured using frequencies of cases and standardizing using 2019 Census population for women in Nakuru county. Age-standardized rates will also be calculated to describe prevalence by age-group. The geographical epidemiology will be quantified using choropleth maps that show the standardized cases by region of residence and spatial analysis using Local Moran's I to identify shared patterns of spatial autocorrelation of factors in neighboring regions. Associated comorbidities will be measured using heatmaps and Kaplan-Meir estimates to show the impact of comorbidities on survival of the selected gynecological cancer patients. Cox-proportional hazards regression will be used for survival analysis to determine the factors that influence survivorship of the selected gynecological cancer patients in Nakuru county. Summary tables, graphs, and maps will be used to present findings. The study aims to provide a research database for others to use to help understand the gynecological cancer patterns, their associated comorbidities, outcomes, and factors influencing survivorship in Nakuru county. The study outcomes will give path for evidence-based decision-making in Nakuru county on interventions for prevention, management and rehabilitation of selected gynecological cancers.

Keywords: Ovarian, Endometrial, Cervical, Selected gynecological cancer, Trends, Prevalence, Age-standardized Rates

100. Assessment of knowledge, attitude and practices among healthcare workers professions in the adoption of molecular diagnostics in cancer care and treatment in Kenya

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Subtheme: Innovative Health Solutions for Global Health Challenges and Community Wellbeing

Abstract

Cancer continues to among the leading causes of mortality and morbidity worldwide. Based in recent studies, more than three quarter of the 20.4 million premature deaths reported in 2019 was as a result of the different types of Cancer. The most affected areas include sub–Saharan Africa and South East Asia which is aggravated by poverty, ignorance, environmental factors, inadequate diagnostics and treatment centers coupled with inadequate specialized personnel within the region. Molecular diagnostics offers significant potentials in enhancing cancer care and treatment through early detection, personalized treatment and improved outcomes. In Kenya, where cancer -related cases and deaths continue to increase, the adoption of Molecular Diagnostics remains a challenge. These challenges include existing gaps in knowledge, negative attitude and practices which limits the successful adoption of Molecular diagnostics. This study aims to assess the knowledge, attitude and practices of healthcare workers in the adoption of Molecular diagnostics for cancer care and treatment. A cross-sectional analytical study will be used to assess healthcare workers who will include Oncologists, pathologists and nurses across public and private facilities in Kenya. The facilities healthcare workers will be selected through stratified random sampling. Data will be collected using structured questionnaire, focused group discussion and Key informant interviews to evaluate KAP regarding Molecular diagnostics. The study is anchored on two theoretical frameworks: The Health Belief Models which examines perceived benefits such as early detection and perceived barriers which include costs which facilitates or hinders the adoption of Molecular diagnostics. Diffusion of Innovation theory explains the adoption through the lenses of relative advantages, complexity and observability of a particular method to be adapted. Qualitative data will be analyzed through descriptive statistics and logistics regression to identify predictors of the adoption while quantitative data will be analyzed thematically to explore barriers and facilitators of the same.

Keywords: Molecular Diagnostics; Cancer Care; Knowledge, Attitude and Practices (KAP); Healthcare Workers; Kenya.

101. Analysis of trends in ovarian, endometrial and cervical cancers in Nakuru County, Kenya

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Subtheme: Innovative Health Solutions for Global Health Challenges and Community Wellbeing

Abstract

Ovarian, endometrial and cervical cancers are the most common gynecological cancers among women that disrupts their quality of life and the function of the reproductive system. There is a growing population of the selected gynecological cancers in Kenya. In Nakuru county, there is inadequate data on the exact disease burden of the diseases. This research aims to analyze the trends in the selected gynecological cancers in Nakuru county through a retrospective cross-sectional study of hospital-based patient registries in the Nakuru County Regional Cancer Center from May 2018 to December 2024. A census approach will be used to include all ovarian, endometrial and cervical cancer patients that meet the inclusion criteria. Data abstraction will be done using a Kobo collect questionnaire that is guided by a standard checklist developed using the hospital registries for data quality and consistency. Purposive sampling technique will be used. Data analysis for both descriptive and analytic measures will be done using R Studio version 4.4.2. The prevalence of the selected gynecological cancers will be measured using frequencies of cases and standardizing using 2019 Census population for women in Nakuru county. Age-standardized rates will also be calculated to describe prevalence by age-group. The geographical epidemiology will be quantified using choropleth maps that show the standardized cases by region of residence and spatial analysis using Local Moran's I to identify shared patterns of spatial autocorrelation of factors in neighboring regions. Associated comorbidities will be measured using heatmaps and Kaplan-Meir estimates to show the impact of comorbidities on survival of the selected gynecological cancer patients. Cox-proportional hazards regression will be used for survival analysis to determine the factors that influence survivorship of the selected gynecological cancer patients in Nakuru county. Summary tables, graphs, and maps will be used to present findings. The study aims to provide a research database for others to use to help understand the gynecological cancer patterns, their associated comorbidities, outcomes, and factors influencing survivorship in Nakuru county. The study outcomes will give path for evidence-based decision-making in Nakuru county on interventions for prevention, management and rehabilitation of selected gynecological cancers.

Keywords: Ovarian, Endometrial, Cervical, Selected gynecological cancer, Trends, Prevalence, Age-standardized Rates

102. Genomic epidemiology of Dengue virus isolates associated with outbreaks in Kenya from 2011 to pre-COVID-19 period

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Subtheme: Innovative Health Solutions for Global Health Challenges and Community Wellbeing

Abstract

Dengue is one of the most common arboviral diseases prevalent worldwide caused by Dengue viruses. We had a total of five outbreaks between 2011 and 2019. These outbreaks were recorded mainly in northern and coastal Kenya. Despite the increased number of outbreaks, there is paucity of information on the genomic epidemiology of DENV in Kenya. We sort to perform whole genome sequencing (WGS) on Dengue serotypes isolated from patients in the different counties of Kenya, to understand the genetic diversity across time in the country and compare with other contemporaneous sequences across the globe. Seventy two samples tested positive for DENV by RT-PCR from 420 samples received at the Arbovirus/VHF laboratory in KEMRI between 2011 and 2019. Ribonucleic acid (RNA) was extracted using QIAmp RNA kit. Forty two samples that tested positive and had cycle-threshold values below 30 were selected for WGS. The RNA was reverse transcribed using Lunascript were then sequenced by next-generation sequencing using GridION Genome Sequencer (ONT, UK). We obtained 28 near complete genomes (78-97%). Genotyping showed that we had six Den-1 genotype I, four Den-2 genotype II and eighteen Den-3 genotype III from different parts of the country. In 2011, we got two isolates of Den-3; 2013, five isolates of Den-1 and one isolate of Den-2; 2014, three isolates of Den-2; 2018 one isolate of Den-1 and in 2019, sixteen isolates of Den-3. The phylogenetic analysis of Den-1 isolates from Mombasa indicates that they were obtained in two different years i.e. 2013 and 2018, without much difference in their genetic make-up. Den-2 had four isolates from three different counties, two of the counties reported dengue for the first time, with no significant difference among them. Den-3 indicates a variation in the clustering pattern of 2011 and 2019 outbreak isolates, suggesting 2019 had a new introduction.

Keywords : *Genomic epidemiology, Dengue virus*

103. Determine the prevalence of schistosomiasis in humans in Tharaka County, kenya

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Subtheme: Innovative Health Solutions for Global Health Challenges and Community Wellbeing

Abstract

Background: Schistosomiasis, a neglected tropical disease caused by Schistosoma species, remains a major public health burden in sub-Saharan Africa. Despite widespread interventions including mass drug administration and improved sanitation, many endemic regions continue to report high infection rates. Objective: This study aimed to determine the prevalence of Schistosoma mansoni and Schistosoma haematobium in selected rural communities of Mukothima, Tharaka County, Kenya, and to provide insights to guide targeted control strategies. Methods: A cross-sectional study was conducted in two primary schools—Kagurini and Thanantu—as well as within the surrounding community. A total of 280 samples (stool and urine) were collected: 110 from Kagurini, 170 from Thanantu, and 40 from the community. Samples were examined microscopically for Schistosoma ova using the formal ether concentration technique. Results: In Kagurini Primary School, 8 out of 110 samples tested positive for S. mansoni (7.27%). In Thanantu Primary School, 5 out of 180 samples tested positive (2.78%), with all cases occurring in male pupils. In Kagurini, 6 males and 2 females were positive. No positive cases were recorded among the 40 community samples, yielding a prevalence of 0%. The overall prevalence among school-aged children was 4.48%. Conclusion: The findings confirm ongoing S. mansoni transmission among school-aged children in Tharaka County, with notable differences in prevalence between the two schools. Contributing factors may include proximity to infested water sources and varying hygiene practices. The absence of infection in community samples suggests possible age-related exposure differences or acquired immunity. Continued school-based treatment, community health education, and improved sanitation infrastructure remain vital to achieving schistosomiasis elimination.

Keywords: *schistosomiasis, zoonoses, zoonotic diseases, neglected tropical diseases*

104. Effective use of electronic health records in tuberculosis surveillance: a survey of Tigania East Sub-county, Meru county, Kenya

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Subtheme: Innovative Health Solutions for Global Health Challenges and Community Wellbeing

Abstract

Tuberculosis (TB) remains a major public health threat in Meru County, Kenya. Effective surveillance is essential to reduce TB incidence, ensure timely treatment, and achieve national and global TB control targets. This study investigates the effective use of Electronic Health Records (EHRs) in TB surveillance in Tigania East Sub-County. The research specifically assesses the completeness and accuracy of pre-treatment EHRs, identifies update frequency during treatment, evaluates documentation of post-treatment records, and examines the utilization of EHR data in supporting TB surveillance efforts. A cross-sectional survey design will be employed, targeting a study population of 700 individuals comprising TB patients and healthcare providers across selected health facilities. Using a combination of simple random, stratified, and systematic sampling techniques, a sample size of 379 will be determined using Cochran's formula. Data collection will involve structured questionnaires administered to healthcare providers and secondary data extraction from EHR systems. Data will be cleaned in Excel and analyzed in SPSS using descriptive statistics. Preliminary findings will indicate gaps in data completeness, inconsistent record updates, and underutilization of EHR data for surveillance. Despite the presence of functional EHR systems, interoperability limitations, inadequate training, and delayed data reporting hinder optimal TB surveillance. This study underscores the urgent need to strengthen digital health infrastructure, streamline EHR workflows, and train healthcare workers in effective data use. The findings will contribute to national TB surveillance enhancement under Kenya's NTLD-P and support WHO's End TB Strategy, reinforcing the role of digital innovation in public health monitoring and response.

Keywords: *Electronic Health Records, Tuberculosis Surveillance, Digital Health Systems, Public Health, Kenya*

HEALTH SCIENCES CONFERENCE PAPERS

105. Knowledge, attitude, practices and beliefs among religious leaders on uptake and adoption of routine immunization in Turkana, Samburu, Kitui, Kwale and Garissa Counties in Kenya

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Subtheme: Innovative Health Solutions for Global Health Challenges and Community Wellbeing

Abstract

Vaccination remains the most effective method for controlling communicable diseases. Vaccine hesitancy due to inadequate knowledge, negative attitudes, perceptions, practices, and beliefs among religious leaders is a significant obstacle to this achievement. Engaging religious leaders in Low and Middle-Income Countries (LMICs) can enhance vaccination coverage. This study employed a cross-sectional mixed-methods approach to investigate the knowledge, attitudes, beliefs, and practices regarding vaccine uptake among religious leaders in the selected five counties. Data were collected through structured questionnaires, and information was triangulated through qualitative data collection from key informants, including sub-county medical officers of health, health promotion officers, Expanded Program of Immunization (EPI) coordinators, and community leaders. A total of 387 respondents were sampled through stratified and purposive random sampling, yielding a response rate of 95.1%. Data were analyzed using SPSS (version 29). The study found low knowledge, at 48%, regarding routine immunization among religious leaders. Eighty-four per cent (84%) believed that vaccines were beneficial to society at large, albeit with low coverage. Demonstrating this, 62% (240) of the interviewees had received the first dose of the COVID-19 vaccine. However, only 29% (70) had taken the second dose. Only 20% (31) of the eligible girls had received the first dose of the HPV vaccine. Of the 20% who received the first dose, 19.4% (5) returned for the second dose, demonstrating a negative attitude. The study indicates that religious leaders' beliefs and attitudes significantly influenced vaccine uptake. The study recommends increased knowledge transfer at religious congregational level by stakeholders. Secondly, stakeholders should enhance advocacy and social mobilization efforts to promote uptake of HPV and COVID-19 vaccine second dose. Thirdly, the Ministry of Health should strengthen collaborative and supportive linkages among stakeholders, religious leaders and community for sustained vaccine uptake. Lastly, religious leaders should utilize scripture to promote health through routine immunization.

Keywords: *Religious leaders, Routine Immunization, Vaccination*

106. Perspectives of healthcare workers on the risk factors for comorbidities among HIV/AIDS outpatients in Meru County, Kenya: a qualitative study

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Subtheme: Innovative Health Solutions for Global Health Challenges and Community Wellbeing

Abstract

Objective: To explore perspectives of healthcare workers on the reasons for the high prevalence of comorbidities among people living with HIV (PLWH) in Meru County as reported in the Comorbidities in HIV/AIDS Outpatients (CHAO) project in Kenya. Study design: Qualitative study design using a grounded theory approach and an interpretivist research paradigm. Methods: Fifteen Comprehensive Care Centers (CCC) across Meru County's healthcare facilities were selected based on their high prevalence rates of comorbidities in the preceding CHAO project. A total of 25 clinical providers and 16 community health promoters were interviewed and their responses subjected to manual deductive thematic analysis with the major themes as the predetermined codes. Subsequently, open coding was used in inductive analysis to identify minor themes on the healthcare workers' perspectives regarding the factors behind the high prevalence of the comorbidities. Results: The health workers' explanations of the factors contributing to the high prevalence of comorbidities were consistent. They attributed the high prevalence of: underweight to undernutrition due to low socioeconomic status compounded by a prolonged drought; hypertension to sedentary lifestyles, stress, stigma, and alcoholism; and dyslipidemia to unhealthy diets and sedentary lifestyles. Occasional shortages of condoms and unaffordability of syphilis screening tests explained the occurrence of syphilis. Behavior change after health education to promote healthy lifestyles is hindered by low socioeconomic status, fear of managing chronic conditions, and misleading beliefs. Conclusion: Health workers in CCCs in Meru County perceive low socioeconomic status, processed foods, sedentary occupations, alcoholism, and misleading beliefs as the reasons behind the increasing prevalence of comorbidities among HIV outpatients in Meru County. A contextualized health education intervention is recommended to empower them with practical knowledge on home gardening, choice of healthy foods, physical activities, mental health, health-seeking, and spirituality. Progressive integration of management of comorbidities into the HIV CCC is suggested.

Keywords: *SPHEDM-S, chronic wounds, sepsis, epithelialization*

107. Improved sanitation in slums: influence of social and economic gaps in meeting community needs in Kaptembwo, Nakuru County, Kenya

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Subtheme: Innovative Health Solutions for Global Health Challenges and Community Wellbeing

Abstract

The Sustainable Development Goals recognizes improved sanitation as a way of promoting community wellbeing and dignity. Access disparities between urban dwellers exist, with the residents in slums bearing more consequences. Although efforts to improve sanitation conditions have been made, faecal management is a challenge, increasing possibilities of diseases. The study examined social and economic gaps in meeting slum community sanitation needs. A convergent design was used with 100 household heads targeted for quantitative data. Simple random technique used to select households from Kaptembwo Slum in Nakuru. The data was collected using questionnaires and focus group discussions. Quantitative data was analysed using Statistical Package for Social Sciences (SPSS) version 26 in descriptive and inferential statistics while thematic analysis was used in analysis of qualitative data. Common sanitation options were basic pit latrines (62.5%) and flush toilets (18.8%). Residents (18.8%) indicated that open defecation happened in slums even with presence of latrines due poor maintenance, inadequate privacy and closure of toilets. Participants indicated that gender-related sanitation roles such as cleaning, latrine construction and repairs influenced promotion of improved sanitation (Mean=3.513, SD=1.136). Most residents (70%) reported their toilets had never been emptied; a condition likely to contaminate the environment during floods. Although water was present in 75% of the households, 55% of the toilets were unclean, with faecal and urine stagnation on the floors. Results for the odds of open defecation showed that latrines which were not maintained clean had 27% lower chances of being used compared to the clean latrines (Unadjusted OR=0.73, 95% CI: 0.357-0.889, p=0.003). Households' latrines (40%) were constructed under subsidized program, and were easy to maintain and comfortable to use. The odds of latrines emptying were 3.98 times higher in households whose latrines were constructed under subsidy program compared to the non-subsidized latrines (Unadjusted OR=3.98, 95% CI: 0.053-0.086, p=0.000) due to strategic location and standard designs to suit emptying. Inaccessibility of toilets lowered chances of emptying (OR=0.657, 95% CI:0.243-1.045, P=0.013) and high households population predicted increased frequency of pit emptying due to high user capacity and fill up rates (Unadjusted OR=2.303, 95% CI: 1.044-5.083, p=0.039). Emptying of toilets was more likely for households with disposal options for menstrual waste, children's diapers and solid waste (OR=2.03, 95% CI: 1.034-1.256, p-0.01) compared to households without who disposed of bulk materials in toilets, capable of blocking emptying machines. The study concluded that most slum residents lived in contaminated environment due to poor condition of sanitation facilities. Strengthening community engagement as well as addressing sanitation infrastructure gaps could be key in promoting improved sanitation status in slums.

Keywords: *Social, Economic, emptying, slums, improved sanitation*

108. Relationship between the severity of Aphasia and linguistic impairments among individuals with aphasia in selected tier four hospitals in Nakuru County, Kenya.

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Subtheme: Innovative Health Solutions for Global Health Challenges and Community Wellbeing

Abstract

This study investigated the relationship between the severity of aphasia and linguistic impairments among adults in select Tier Four hospitals in Nakuru County, Kenya. Aphasia, primarily caused by brain injuries affecting the left hemisphere - particularly Broca's and Wernicke's areas - leads to significant disruptions in language production, comprehension, and overall communication abilities. Grounded in Broca's and Wernicke's theories and Communication Accommodation Theory, the research employed a correlational case study design using mixed methods. A sample of 36 respondents were selected from a target population of 116 through purposive and convenience sampling, based on Kothari's formula. Data were collected through observation schedules, semi-structured interviews, document analysis, and questionnaires administered to key informants. Quantitative data were analyzed using descriptive statistics (mean, frequency, standard deviation), while chi-square tests were used to examine the relationships between categorical variables. Thematic analysis was applied to qualitative data to capture patterns and emerging themes related to language deficits. The study analyzed the connection between lesion location and comprehension deficits, evaluated variability in speech production impairments, and identified the most significantly affected linguistic features. Findings revealed strong correlations between aphasia severity and specific linguistic impairments, enhancing the understanding of neuro-linguistic dysfunctions in Linguistic settings. The study contributes to psycholinguistic research, improves diagnostic and rehabilitative practices, and supports the development of assistive communication technologies. It also aims to promote public awareness, reduce stigma, and inform supportive policies and interventions for individuals living with aphasia and their caregivers..

Keywords: *Aphasia, Language Production, Neuro-Linguistics, Speech Deficits, Cognitive Science.*

109. Medicinal potential of *Miraa and Muguka - Catha edulis* Extracts: harnessing positive effects for therapeutic interventions in Meru Kenya

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Subtheme: Innovative Health Solutions for Global Health Challenges and Community Wellbeing

Abstract

Most of the previous researchers have carried research on the premise that Miraa has negative impacts on health and the society forgetting the positive medicinal and nutraceutical benefits accrued from use of controlled amount of cathinone extracted using current modern technology.. Miraa compared with other stimulants such as tea and coffee are consumed as processed products presented in different forms, Miraa has double stimuli effects which if tapped could have double effects in addressing various medical challenges among the human population. However, because Khat is consumed raw by chewing of the young shoots, leaves and twigs due to limited processing and value addition. Research, extraction and repackage of the extracts for its confirmed and validated desired effects just like Sildenafil. The Various Khat parts such as twigs, roots, backs, stems were evaluated to confirm the amount of cathinone contained, enormous amount of 90% to 98% of Cathinone from every 300gram of raw Miraa and Muguka. Other related components were extracted from Miraa are capable of solving various human health problems. This study sought to change the presentation twigs and leaves from chewing only use to a more valuable hygienic product. Miraa research on integration of the Khat extracts into different forms such as chewable forms, suspensions, parenteral Intravenous infusions, miraa flavors, herbal extracts and nutraceuticals to enhance Khat Medical Value. This will reduce the stigma associated with Miraa use as an additive drug, to drug of medical importance is not yet documented. The study investigated and confirmed the positive untowards medical effects of various Miraa and Muguka (Khat) active ingredients. In addition to Miraa and Muguka (Khat) extracts medical other untowards effects will be studied to ascertain their medicinal value. Through ongoing precise prepared khat extracts are undergoing animal clinical trials at Meru University, this is to ascertain the extracts desired health effects of Miraa preparation on guinea pigs' weight and other physiological changes, each group of guinea pigs was evaluated to ascertain the cathinone dose specific effects-based weight and obesity from Miraa and Muguka extracts, The dopaminergic like effects on various Brain centers was also identified. Therefore, Miraa and Muguka (Khat) requires urgent attention to extract molecules of value. This study enhanced integration of Miraa and Muguka (Khat) Medicinal extracts into various forms and ingredients into tablets, suspension, Chewable pills, and parenteral infusions vehicles.management.

Keywords: *Anti Appetite, Dopaminergic Action, Cathine, Cathinone, Herbal, Medicinal. Nutraceutical Extracts, Miraa, Muguka, Khat, Weight/Obesity Management,*

110. Strengthening social accountability for improved Occupational Health and Safety of manual pit emptiers in Korogocho, Kenya

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Subtheme: Innovative Health Solutions for Global Health Challenges and Community Wellbeing

Abstract

Majority of the population living in slums rely on pit latrines, which are emptied by hand by Manual pit emptiers (MPEs) and the septage is poured into nearby streams and rivers. This practice is illegal under Kenyan law, but a sustainable solution is yet to be found. Despite providing an essential service, MPEs are excluded from the present sanitation service delivery system and they have no access to public infrastructure or funding. They earn their livelihoods by providing services that residents pay for, but poorly. Hand-emptying offers considerable health dangers to them, especially when no protective clothing is worn. Glass and sharp objects in the faecal sludge also cause injuries. Further, emptiers are exposed to toxic gases like ammonia and methane. This action research project sought to strengthen accountability, collaboration and relationships between the rights holders (manual pit emptiers, environmental service providers, citizens of Korogocho), and the duty bearers (government agencies and other primary actors). The project facilitated the actors to jointly consider safer solutions to the sanitation and health challenges raised by manual emptiers and stakeholders during co-creation sessions. Activities included, community mobilisation, participatory needs assessment, development and implementation of social accountability and training tools, peer learning, capacity building of MPEs on financial literacy, social accountability, occupational health and safety, communication and advocacy, and action planning. A multi-sectoral approach is necessary for improved service delivery and working conditions of MPEs; On Healthcare for the MPEs, the National Health Insurance Fund was willing to develop a tailor-made product for MPEs; the MPEs are aware of the value of human waste (biogas, briquettes) but lack the capacity to harness these benefits, hence the need for support. The findings will contribute to policies on healthcare and psychosocial support for MPEs. There is need for formalisation of MPEs and inclusion of MPEs concerns during the budget making process at County or Ward level.

Keywords: *Health care, Manual Pit Emptiers, Humanising pit emptying; strongerrelationships, social accountability, Occupational Health and Safety*

111. The Impact of attitudes on workplace dynamics and mental health

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Subtheme: Innovative Health Solutions for Global Health Challenges and Community Wellbeing

Abstract

Introduction: The study was investigating relationships between a person's attitude, impact on workplace dynamics and mental health outcome. Methodology: a systematic review of literature (2000–present) analyzed studies on attitudes, workplace behavior, and mental health. Key sources included peer-reviewed articles and organizational reports. The key Findings were Work Performance-Positive attitudes correlate with higher productivity, while negative attitudes reduce efficiency. Mental Health-Job satisfaction and support mitigate stress, whereas workplace conflicts and AI anxieties worsen mental health. The study found that Attitude comprise cognitive (beliefs), affective (emotions), and behavioral (actions) components-significantly influence work performance and mental well-being. Positive attitudes enhance productivity and job satisfaction, while negative attitudes contribute to stress, burnout, and reduced efficiency. There was also mediating role of attitudes in workplace interactions and the growing impact of anxieties on employee mental health. Attitudes are learned psychological tendencies shaped by experiences. The components interact dynamically, influencing workplace behavior and mental health. Positive attitudes boost motivation, teamwork, and resilience, improving performance and reducing stress. Negative attitudes lead to disengagement, conflict, and mental health issues like anxiety and burnout.

Keywords: *Workplace Attitudes; Mental Health; Employee Productivity; Workplace Dynamics; Stress and Burnout.*

112. Gender differences in help and health seeking behaviors, discrimination and strategies for preventable mortality

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Subtheme: Innovative Health Solutions for Global Health Challenges and Community Wellbeing

Abstract

The study was investigating relationships between a person's Gender identity, Men women, and Intersectionality and help –health seeking behaviors. Methodology: a systematic review of peer reviewed literature, years publications between 2000–present) analyzed studies on help, health seeking behavious by gender. Key sources included peer-reviewed articles book chapters. Results indicate that Help-seeking behavior is a strategic, self-regulated approach to overcoming challenges in learning and health management. It involves seeking assistance from formal professionals or informally family and friends' sources and it is influenced by cognitive, social, and motivational factors. Gender, age, and education significantly shape help-seeking tendencies, with women generally more likely to seek help due to social norms, while men may avoid it due to traditional masculinity expectations. Health-Seeking Behavior and Gender Disparities, Health-seeking behavior includes symptom recognition, care decisions, and recovery. It is shaped by socio-demographic, economic, cultural, and healthcare system factors. Gender norms heavily influence these behaviors: Men often delay medical care due to societal expectations of self-reliance, leading to worse outcomes in preventable conditions such., cardiovascular diseases, injuries). Women are more proactive in seeking care but may face biases in diagnosis and treatment. Socioeconomic status, cultural beliefs, and healthcare access further exacerbate disparities. The study further identified that deaths by not seeking help is area of preventable Mortality. Intersectionality: Health outcomes are shaped by overlapping identities like race, class, sexuality. The study Recommends that, Gender Sensitive Interventions: Promote men's health literacy and proactive care-seeking., Provider Training: Address implicit biases and improve cultural competence. Intersectional Approaches: Research and policies should consider how gender intersects with other social determinants, Systemic Reforms: Ensure equitable healthcare access through inclusive policies and community engagement. The study Concludes that., Addressing gender disparities in health requires dismantling harmful norms, improving healthcare access, and adopting intersectional frameworks. Tailored interventions, provider education, and policy changes are essential for reducing inequities and improving outcomes for all genders.

Keywords: *Help-seeking behavior, health seeking behaviour, gender health disparities, Men and health seeking behaviour, health disparities, Women and help in health-care*

113. Assessment of self-care behaviors amongst *diabetes mellitus* patients attending selected health facilities in Maara Sub-County, Tharaka Nithi County, Kenya

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Subtheme: Innovative Health Solutions for Global Health Challenges and Community Wellbeing

Abstract

Diabetes mellitus is a chronic metabolic disease characterized by hyperglycemia due to absolute or relative deficiency of insulin hormone in the body. In Kenya it is estimated that 1 in every 17 Kenyans has diabetes mellitus and lack of proper self-care has led to treatment complications and premature deaths. Approximately, more than 50% of all hospital admissions and more than 55% of hospital deaths in Kenya are due to non-communicable diseases (NCDs). About 27% of all deaths in Kenya are thought to be secondary to NCDs, with diabetes-related about approximately 10,000 annually. Self-care behaviors, such as adherence to medication, diet, exercise and monitoring of blood sugar, are critical in effectively managing diabetes mellitus. Majority of this is done independently by patients and family members. There are technical guidelines and programs to facilitate diabetes self-management education to the patients. The objective of this study is to assess self-care behaviors amongst diabetic patients attending selected facilities in Maara sub-county in 2025. A descriptive cross-sectional study design will be used on patients aged between 18 and 65 years old and under diabetes mellitus follow-up. Data will be collected using a questionnaire which will be in English and Swahili. The findings will provide current selfcare behaviors, identify areas for improvement and guide on targeted interventions to promote patients' outcomes., thereby reducing complications and mortality.

Keywords: *Diabetes mellitus, self-care, behavior, lifestyle.*

SUBTHEME 6: NURSING - Innovations in Nursing Practice and Community Health for Empowered Populations

NURSING PRECONFERENCE PAPERS

114. Knowledge, challenges and utilization of health insurance among staff at Meru University of Science and Technology, Kenya

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Subtheme: Innovations in Nursing Practice and Community Health for Empowered Populations

Abstract

Access to equitable healthcare remains a challenge in Kenya, despite constitutional guarantees and institutional health insurance provisions. This study assessed knowledge, challenges, and utilization practices of health insurance among staff at Meru University of Science and Technology (MUST). A cross-sectional design was employed, with data collected via structured questionnaires from 135 administrative and faculty staff sampled through stratified random techniques. Quantitative data were analyzed descriptively using Excel, with knowledge scores categorized as "knowledgeable" (4–5 on a 5-point scale) or "less knowledgeable" (1–3). The study revealed that 56.6% of respondents rated their understanding of insurance coverage as "good," while 23.8% reported only "fair" comprehension. Despite 86.1% being aware of their coverage, 55.7% faced utilization challenges, primarily due to lack of clarity on benefits (37.1%), high out-of-pocket costs (18.6%), and complex claims processes (15.7%). Preventive care utilization was low, with only 18% regularly accessing services, and 63.9% had never used insurance for major medical expenses. Affordability ratings were moderate (53.3% satisfied), but 24.6% exhausted annual coverage, resorting to out-of-pocket payments (85%). The study concludes that gaps in knowledge, accessibility, and affordability hinder optimal insurance utilization at MUST. Recommendations include targeted staff education, simplification of claims processes, and policy adjustments to expand coverage limits. These measures align with Kenya's Universal Health Coverage (UHC) goals and can enhance institutional healthcare resilience.

Keywords: *Health insurance, institutional coverage, utilization challenges, Universal Health Coverage, Kenya*

115. Assessment of healthcare professionals' skills in pain management in Meru Teaching and Referral Hospital and St Teresa Mission Hospital Kiirua, Meru, Kenya.

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Subtheme: Innovations in Nursing Practice and Community Health for Empowered Populations

Abstract

Background: Pain is a public health problem and affects millions of people globally. According to Bisher et al 2023, analysed medical literature reveals a concerning gap of up to 30% of healthcare professionals lack training in pain assessment and management. Effective pain management is essential and possible through comprehensive pain management guidelines, trained healthcare professionals and adequate facilities. It helps ensure patient recovery, comfort and overall quality of life. However, studies suggest that health care professionals often demonstrate varying levels of competency in pain assessment and management. Therefore, this study aimed to assess the healthcare professionals 'skill in pain management in Meru Teaching and Referral hospital and St Teresa mission hospital Kiirua. Methods: Design was a Cross-sectional study (Mar 23 – May 5, 2025).Participants included 140 HCPs (22 doctors, 33 clinical officers, 102 nurses).Tool Used was Adapted KASRP questionnaire and practice questions developed from literature review and a checklist to validate skill practice, and identify theory-practice gaps. Ethics approval from MIRERC, NACOSTI, Meru County Research office and a consent from participants were sought. Analysis was by descriptive, Chi-square, logistic regression, and multinomial logistic regression at a Significance set at $p < 0.05$. Results: N= 135. 17(89.5%) out of 19 question assessing the HCPs skills in pain management were answered correctly. The Mean Knowledge on pain assessment Total scores obtained by doctor, clinical officers and nurses were (32.7222, N=18), 28.4333, N=30), (30.4419, N=86) respectively. (96.3%) consider treatment modalities for acute, chronic, centralized, or neuropathic pain to be often different, 95.6% often follow guidelines to effectively manage pain in their unit and 56 (41.5%) healthcare professionals use the pain assessment tool every time they meet the patients. Clinical officers used it more frequently as compared to doctors and nurses. A significant difference between the KASRP score, sample characteristics and the checklist results where ($p<0.001$). 48 (100%) of the sampled patient files had a prescription of pain medication, only 11(22.9%) of the files had pain classification and only 2 (4.2%) had finding according to assessment scale documented. The post hoc test results confirm the lack of significant pairwise differences. DOCTOR vs CLINICAL OFFICER: Mean Difference = 1.52222, Sig. = 0.573, DOCTOR vs NURSE: Mean Difference = 0.15079, Sig. = 0.992 and CLINICAL OFFICER vs NURSE: Mean Difference = -1.37143, Sig. = 0.444. Conclusion: All pairwise comparisons show significance levels greater than 0.05, supporting the conclusion from the ANOVA that there are no significant differences in the mean total pain management skill score based on professional designation. With this findings, HCP have good knowledge of what to practice in pain management but poor documentation.

Keywords: *Antenatal care, utilization of Antenatal care, Social-cultural factors influencing utilization of Antenatal care.*

116. Determinants of high blood pressure management among patients experiencing stroke: A case of Meru Teaching and Referral Hospital (MeTRH).

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Subtheme: Innovations in Nursing Practice and Community Health for Empowered Populations

Abstract

Introduction: Non-communicable diseases (NCDs) are a major cause of illness globally, with 77% of NCD-related deaths occurring in low- and middle-income countries. Hypertension is a key contributor to cardiovascular diseases and a leading cause of mortality in Kenya. The risk of stroke has increased significantly, with 1 in 4 people expected to experience one in their lifetime (World Stroke Day 2022). This study aimed to identify determinants affecting blood pressure management among hypertensive patients experiencing stroke at Meru Teaching and Referral Hospital (MeTRH), and to evaluate current management strategies. The objectives were to determine the prevalence of hypertension/stroke comorbidity, explore patient experiences with self-management programs, and determine the quality of hypertension healthcare delivery at MeTRH. Methods:A mixed-methods approach with a convergent design was used. The study was conducted at MeTRH's outpatient department, medical wards, and non-communicable disease clinic. Participants included 42 healthcare workers, 80 stroke patient files, and 10 hypertensive patients who later developed stroke. Data was collected using medical checklists for patient files, questionnaires for healthcare workers, and interviews for qualitative insights. Findings: The prevalence of hypertension-stroke comorbidity was higher in females and the elderly (mean age 58.6). Many healthcare workers at MeTRH had limited experience in hypertension management (47.4% with less than five years). Knowledge gaps existed among healthcare workers regarding hypertension management (only 18.4% knew the current definition). Regular blood pressure screening was common (94.7%), and lifestyle modification counseling was frequently provided. However, non-adherence was a major barrier to effective management, with self-care practices hindered by work demands and financial constraints. Conclusion: Hypertension-stroke comorbidity is more prevalent among females and the elderly, compounded by limited experience and knowledge among healthcare workers. Despite regular screening and counseling, patient adherence to self-care is a significant challenge due to work and financial constraints, hindering effective hypertension management. Addressing these factors is crucial for improving blood pressure control and preventing stroke..

Keywords: *Hypertension; Stroke; Comorbidity; Self-Care Management; Healthcare Workers.*

117. Assessment of healthcare-related factors Influencing health outcomes in Traumatic Brain Injuries among Patients at MeTRH

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Subtheme: Innovations in Nursing Practice and Community Health for Empowered Populations

Abstract

Traumatic brain injury is the disruption of the brain structure with its function caused by the application of an external force, characterized by confusion, loss of consciousness, coma, or seizure. TBI is a public health concern globally and among the leading causes of admissions in hospitals, increased morbidity, mortality, and disability. The objective of this study is to assess the health care-related factors that influence health outcomes of patients with traumatic brain injuries seeking treatment at Meru Teaching and Referral Hospital In Kenya, particularly at Meru Teaching and Referral Hospital (MeTRH), the burden of traumatic brain injury (TBI) continues to rise amid evolving healthcare systems. Limited data exist on how healthcare-related factors affect TBI outcomes in regional referral settings, creating a gap in evidence needed to guide policy and clinical interventions. A cross-sectional study design was adopted, targeting TBI patients, healthcare providers, and medical records. Using Cochrane's formula, a representative sample of 75 healthcare workers was selected. Data collection instruments comprised self-administered questionnaires. Quantitative data were analysed using SPSS v27 through descriptive statistics, chi-square tests, and logistic regression. The reliability of the questionnaire was confirmed with a Cronbach's alpha coefficient of 0.825, indicating a high level of internal consistency among the survey items. The tool used was adopted from the brain injury screening questionnaire and questions developed from the literature review. Ethics approval from MIRERC, NACOSTI, Meru County Research Office, and consent from participants. Key findings revealed that delayed access to neurosurgical care, inadequate rehabilitation services, and insufficient TBI management protocols significantly influenced patient health outcomes, including mortality, functional recovery, and quality of life. The Glasgow Outcome Scale and related metrics showed poorer outcomes among patients lacking access to critical interventions such as ICU admission and timely surgery. Healthcare provider knowledge and practices also varied widely, with significant gaps noted in assessment procedures and standardized treatment protocols. The study concludes that healthcare-related factors, particularly availability of specialised care, emergency responsiveness, and structured rehabilitation, are pivotal in determining the recovery trajectory of TBI patients. Strengthening institutional capacity through training, protocol standardisation, and investment in neurocritical care infrastructure is essential. The study recommends policy reviews to integrate national TBI management guidelines, the establishment of neuro-rehabilitation units, and regular capacity-building programs for surgical and emergency staff. Future research should explore longitudinal outcomes and the cost-effectiveness of enhanced TBI care models. This research presents novel insights into the intersection between healthcare delivery and TBI outcomes within a Kenyan referral hospital context. It offers empirical evidence necessary for transforming trauma care policy and practice in low-resource settings.practices

Keywords: *Traumatic Brain Injury, healthcare factors, patient health outcomes, Meru Teaching and Referral Hospital, Kenya.*

118. Exploring Childbirth Experiences among adolescents in Imenti South Sub County.

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Subtheme: Innovations in Nursing Practice and Community Health for Empowered Populations

Abstract

Introduction: Adolescent childbirth experiences is a critical global health issue. Annually, 21 million girls aged 10-19 give birth, facing heightened risks of maternal/infant mortality, complications are the second leading cause of death in this group. This study examined childbirth experiences among adolescents seeking services in Imenti South Sub County, Meru County. Methods: A qualitative descriptive design was employed. Twenty (20) adolescents 15-19 years receiving antenatal/postnatal care at Imenti South's public level four hospital participated. Purposive sampling identified participants from hospital records (MOH 333 register), contacted via telephone. In-depth interviews guide captured experiences. Data was analyzed thematically using NVivo. Ethical clearance was obtained from MIRERC and NACOSTI and informed consent/assent was secured. Findings: Adolescents experienced significant family rejection (emotional/material) and social isolation post-pregnancy, leading to lasting emotional distress and economic vulnerability. Interactions with health systems revealed age-linked inconsistent care and neglect, particularly during labor/postnatal periods, despite positive antenatal experiences. Sexual and reproductive health (SRH) education during/after childbirth was critically inadequate, with minimal family planning information shared. While safe delivery, preterm management, and breastfeeding initiation needs were largely met, key unmet needs included: emotional support during labor, comprehensive family planning information, timely health worker responses, respectful/non-discriminatory treatment, and family/community support. Insights for improvement centered on compassionate, non-discriminatory healthcare and better school-based SRH education to prevent early pregnancies. Conclusion: Adolescents in Imenti South face substantial challenges including family rejection, social isolation, inconsistent healthcare, and deficient SRH education. Critical psycho-social and informational needs remain unaddressed despite some clinical needs being met. Recommendation: Urgent implementation of compassionate, non-discriminatory healthcare and enhanced SRH education is needed to effectively support adolescent mothers and prevent early pregnancies.

Keywords: *Adolescent Childbirth, Maternal Health Services, Sexual and Reproductive Health (SRH), Healthcare Discrimination, Imenti South Sub-County.*

NURSING CONFERENCE PAPERS

119. Collaborative Implementation of a Standardized Transfer Protocol: engaging Stakeholders for change

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Subtheme: Innovations in Nursing Practice and Community Health for Empowered Populations

Abstract

Untreated acute ischemic stroke kills up to 27 million brain cells per minute1. Rapid treatment is time sensitive and may include mechanical thrombectomy (MT)2,3. A 46-bed rural community hospital lacked internal resources to perform MT, necessitating transfer to a tertiary care center. Door-in door-out (DIDO) is the time of patient arrival to departure in the Emergency Department (ED). The hospital goal was a DIDO less than 90 minutes and in 2019, the median DIDO was 140 minutes. A nurse-led quality improvement (QI) project was conducted with the objective of implementing and sustaining a standard transfer protocol to achieve the DIDO goal. The outcome measure was a DIDO less than 90 minutes. Implementation processes included a process map and a fishbone diagram. Stakeholders were ED physicians, ED nurses, case management, and radiology technicians. All stakeholders were invited to give input on the current state and make recommendations for change. Physician and nurse champions were trained in the protocol. The fishbone diagram revealed root causes of increased DIDO and process mapping led to 5 process changes. Stakeholders were consulted throughout the process to ensure feasibility. Two patients were transferred during implementation with a mean DIDO of 82 minutes. Three years after completion, two process changes were sustained and the median DIDO increased to 110.5 minutes. Analysis revealed a change in the DIDO goal to less than 120 minutes, and a turnover of stakeholders; however, the physician and nurse champions remained. Engagement and collaboration with all stakeholders during pre-implementation was essential. A key factor was identifying the unit champions as informal leaders. Stakeholder support can be obtained through transparency and inclusion, which improves engagement. Recommendations include an evaluation of compliance with the protocol, a review of hospital goals, identification of new stakeholders, and completion of a repeat fishbone diagram and process map.

Keywords: *stroke, QI, protocol, transfer*

120. Assessment of Psychosocial Needs of patients with prostate cancer attending Meru and Embu Cancer Centers, Kenya

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Subtheme: Innovations in Nursing Practice and Community Health for Empowered Populations

Abstract

Introduction: Literature shows minimal utilization of psychosocial oncology services among cancer patients although many have reported that some of their psychosocial needs remain inadequately addressed. It is for this reason that Kenya's Ministry of Health recommends offering psychosocial care to all patients with cancer in order to improve Kenya's comprehensive approach to managing cancer illnesses. Aim: The aim of this pre-intervention study was to identify the psychosocial needs of patients with prostate cancer attending Embu and Meru Cancer Centers. Methodology: A descriptive cross-sectional study design was used to obtain data from 58 participants. Simple random sampling method was used to recruit the study participants, and data was collected using a researcher-administered questionnaire. Results: The mean age of the participants was 72.98 (±7.6) years. The majority were married, 81% (n=47), had secondary education and above, 51.7% (n=30), were on chemotherapy, 77.6% (n=43), and had been diagnosed while in stage III, 39.7% (n=23). The mean duration of the illness was 27.83 (±24.4) months, with a range of 1 – 79 months. The areas with the highest reported needs included healthcare staff needs, information needs and family/social support needs with a mean score (±SD)) of 2.33 (±0.54), 2.21 (±0.56), and 2.15 (±0.79), respectively. The least psychosocial needs were observed under the domains of physical symptoms needs 1.54 (±0.56) and religious/spiritual needs 1.35(±1.01). Majority of the participants had a low level of psychosocial needs, 56.9 % (n=33). Recommendation: Targeted psychosocial support should focus on enhancing involvement from healthcare providers, improving information dissemination, and strengthening family and social support systems.

Keywords: *Prostate Cancer; Psychosocial Needs; Cancer Patients; Support Systems; Kenya.*

121. Prevalence of hypertension and associated factors among young adults aged 18-35 years attending Meru Teaching and Referral Hospital, Kenya

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Subtheme: Innovations in Nursing Practice and Community Health for Empowered Populations

Abstract

Water pollution is a significant concern because it affects the quality and availability of water resources essential for various purposes. Kuuru River is a tributary of the Tana River that serves as a source of drinking water, irrigation, and other domestic uses in Meru County. This study aimed to assess the drivers of water pollution in tributaries of the upper Tana River catchment within the Kuuru River. The study determined the water quality, land use, and environmental conservation activities in the riparian zone of the Kuuru River from the source to the Kathita River, a tributary of the Tana River, and evaluated the contribution of institutions provided by the legislative framework to the conservation of the Kuuru River. Standard methods were used to analyze turbidity, total dissolved solids (TDS), pH, temperature, electrical conductivity (EC), nitrates, and nitrites from 18 water samples collected along the Kuuru River. A descriptive survey using semi-structured questionnaires was administered to 384 household heads to obtain data on land use and environmental conservation practices. Key informants from relevant institutions were also interviewed using semi-structured questionnaires to gather insights into their interventions and oversight of river protection activities. The water quality of the Kuuru River met the standards set by the World Health Organization (WHO), the National Environmental Management Authority (NEMA), and the Kenya Bureau of Standards (KEBS) for drinking water. However, levels of EC and turbidity were elevated, indicating the presence of pollutants. Anthropogenic activities in Maskani, Kanthiari, and Kimachia markets were identified as the main drivers of pollution. A lack of awareness regarding riparian conservation was noted and was attributed to insufficient stakeholder involvement and inadequate technical and financial support for conservation efforts. A periodic assessment of the water quality in the Kuuru River is recommended to determine the overall impact of the anthropogenic activities in the study area. Effective stakeholder involvement to raise awareness of riparian conservation is essential.

Keywords: *Water Pollution, anthropogenic activities, pollutants*

SUBTHEME 7: ICT- Digital Transformation and Technological Innovations for Community Empowerment

PRE-CONFERENCE PAPERS

122. Stateful Firewall Packet Analysis Model for filtering session fixation attack

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Subtheme: Digital Transformation and Technological Innovations for Community Empowerment

Abstract

In the contemporary landscape of network security, protecting the networks against session fixation attacks has become increasingly critical. Session fixation attacks pose a significant threat to web security by exploiting vulnerabilities in session management to hijack authenticated user sessions. As network attacks continue to evolve in complexity and sophistication, stateful firewall solutions have proven to be insufficient in defending against web attacks. Existing stateful firewall models can filter attacks such as denial of service, distributed denial of service, man-in-the-middle, malware, ransomware and spamming. However, they are unable to filter session fixation attacks due to their filtering mechanisms.The aim of this study was to develop a stateful firewall packet analysis model that operates in network layer to detect and filter session fixation attack. By maintaining state information across network sessions, the model analyzed packet sequences and patterns to identify anomalies indicative of session fixation attempts. Gradient booster classifier algorithm was incorporated into the model to enhance accuracy in analyzing the packet. Virtual machine simulation experiment was performed to evaluate the accuracy of the model using Cross-Site Scripting (XSS) datasets vulnerable to session fixation attacks alongside normal user traffic. The model detection rate, false positive and false negative metrics was measured to assess the accuracy of the model. The experimental results demonstrated that the model effectively detected and mitigated session fixation attacks by analyzing session parameters and maintaining session state consistency. Experimental evaluation validated the high model detection accuracy level of 98.5 % with minimal false positives.

Keywords: *Stateful Firewall; Session Fixation Attack; Packet Analysis; Network Security; Gradient Boosting Classifier.*

123. Transformer Deep Neural Networks in Detecting Vulnerabilities in Web Software: A Review

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Subtheme: Digital Transformation and Technological Innovations for Community Empowerment

Abstract

Web based software support important platforms for day to day activities in diverse environments such as emailing, learning, ecommerce and social network platforms. The presence of vulnerabilities in web software could lead to security breaches resulting in negative impacts such as economic and reputation loss for organizations. It is essential that vulnerabilities existing in such software are detected and attended to before software is released to a production environment. Vulnerability prediction models utilize a data centric approach by use of shallow and deep learning to detect vulnerabilities. To build a vulnerability detection model, characteristics of software have are identified that best act as vulnerability indicators. Deep neural sequence models are able to capture richer properties of the code including syntax and semantics aspects leading to better vulnerability detection outcome. The Transformer deep neural architecture has become the go to architecture for sequence processing including tasks in natural language processing. This research presents a review of various Transformer deep neural models in vulnerability detection. Specifically the research paper presents the history of the Transformer architecture as an architecture for sequence processing tasks; a comparison between the Transformer and other sequence processing architectures such as the Recurrent Neural Networks, Long Short Term Memory and the Gradient Recurrent Units; sample types of Transformers; applications in sequence processing tasks and the application of Transformers in software security assurance. The research presents a detailed review of the application of Transformer architectures in the detection of web software input based vulnerabilities.

Keywords: *Sequence processing, Transformers, Transformer Deep Neural Networks, Software Security, Vulnerability*

124. Enhanced Security Monitoring in Internet of Things Systems Through Intrusion Detection Model

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Subtheme: Digital Transformation and Technological Innovations for Community Empowerment

Abstract

Intrusion detection systems (IDS) play a pivotal role in identifying and mitigating potential threats and vulnerabilities in IoT devices. IoT devices holds critical data with Internet of Things (IoT) rapidly evolving into a field of interconnection and interaction of smart objects, which have embedded sensors, on-board data processing capability, and a means of communication, to provide automated services and applications. The proliferation of Internet of Things (IoT) devices usage has exponentially increased the attack surface, necessitating robust security mechanisms. This is because many IoT devices operate with limited computational resources, constrained memory, and low-power capabilities, making them susceptible to security breaches. Kenya has witnessed an alarming surge in cyberattacks, with a staggering 860 million incidents recorded in the past year, according to the country's regulator, Communications Authority (CA). This study developed a model on intrusion detection to enhance security for IoT devices in real time monitoring. The study conducted a baseline study on intrusion detection Systems for Internet of Things (IoT), developed an intrusion detection model and validated accuracy of the model. Positivism and Deductive methodologies were used as the study is highly structured and relies on measurable data for analyzing network traffic logs and attack patterns. The model was developed based on existing intrusion detection technologies and test hypotheses like known attack signatures in NSL KDD dataset. The model achieved an accuracy of 97.8% indicating the overall correctness of the model's predictions and positive predictions of 97.6 %. Hence the model provided insights into the ability to correctly classify network traffic as either normal or malicious, as well as its effectiveness in detecting specific attack types in IoTs. The model is applicable to key industry players that cyber security is of great importance in safe guarding its critical digital assets.

Keywords: Intrusion Detection System (IDS), Machine Learning (ML), Internet of Things (IoT), Network Security Laboratory - Knowledge Discovery in Databases (NSL-KDD)

125. Effective Cloud-Based Ensemble Learning System for Coronary Artery Disease Risk Prediction in Low-Resource Settings

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Subtheme: Digital Transformation and Technological Innovations for Community Empowerment

Abstract

Coronary Artery Disease (CAD) screening remains inaccessible in many Kenyan communities due to infrastructure limitations. This research developed an innovative cloud-based ensemble learning system that enables accurate CAD risk prediction using minimal clinical parameters. The solution combines Random Forest, XGBoost and LightGBM algorithms in a hybrid architecture optimized for low-bandwidth environments. Implemented as a REST API with mobile client support, the system processes 12 routine patient variables to generate risk scores with 91.3% accuracy (F1-score=0.89). Field tests across 15 health facilities demonstrated 40% reduction in computational requirements compared to existing solutions, with 78% adoption rate among community health workers. The technology currently serves 3 county hospitals, with planned integration into Kenya's Community Health Strategy. Key innovations include offline prediction capability, automated data quality checks, and explainable AI visualizations tailored for non-technical users. This work provides a blueprint for implementing advanced health analytics in resource-constrained settings while maintaining clinical reliability. Future development will focus on Swahili-language interfaces and expansion to other non-communicable diseases.

Keywords: Health Informatics, Cloud Computing, Ensemble Learning, CAD Prediction, Digital Health.

126. Robust number plate recognition using YOLOv10 and PADDLeOCR under simulated adverse weather conditions

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Subtheme: Digital Transformation and Technological Innovations for Community Empowerment

Abstract

Adverse weather conditions such as fog, rain, and mud significantly degrade the accuracy of conventional number plate recognition systems, posing a major challenge to intelligent traffic monitoring and law enforcement applications. To address this problem, we developed a robust number plate recognition pipeline that integrates YOLOv10 for detection and PaddleOCR for character recognition. YOLOv10 was selected for its enhanced architecture, which provides a balance of high accuracy and computational efficiency, even under visually challenging scenarios. For the OCR component, PaddleOCR outperformed alternatives such as EasyOCR and Tesseract in controlled evaluations, achieving an average accuracy of 68.2% across adverse weather conditions, compared to 14.6% and 3.9% respectively. The pipeline's effectiveness was further tested using datasets generated by applying Python-based simulations to introduce fog, rain, and mud effects to clear images, ensuring realistic and repeatable conditions. Experimental results demonstrated strong detection performance across all environments, with accuracies ranging from 92.93% in foggy conditions to 98.99% in clear and rainy settings. Recognition accuracy varied from 80.61% in clear scenarios to 56.25% under muddy conditions. These findings confirm the resilience of YOLOv10 and PaddleOCR against environmental distortions. The proposed system shows promise for deployment in smart city surveillance, law enforcement, and traffic management systems, and future enhancements will explore adaptive OCR and image enhancement techniques to further mitigate visual challenges.

Keywords: Number Plate Recognition, YOLOv10, PaddleOCR, OCR Comparison, Adverse Weather Simulation, Smart Mobility

127. An Ai-Driven circular economy model for e-waste sorting using explainable Ai (XAI) With Adaptive Learning

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Subtheme: Digital Transformation and Technological Innovations for Community Empowerment

Abstract

The growing volume of e-waste presents significant environmental and health challenges, particularly in developing regions lacking sustainable management systems. This study develops an AI-driven circular economy model for e-waste sorting in public institutions, integrating Explainable AI (XAI) and adaptive learning to enhance transparency and continuous improvement. Using a mixed-methods approach, the research combines qualitative insights from stakeholder interviews with quantitative analysis of 500 annotated e-waste images from Meru County. The technical implementation features a fine-tuned EfficientNet-B4 model with Grad-CAM++ for explainable decisions and Elastic Weight Consolidation for adaptive learning. An accompanying mobile application provides geolocation-based collection points and real-time waste categorization. Following a hybrid Waterfall-Agile methodology, the system undergoes rigorous testing for accuracy (target ≥90%) and interpretability. Quantitative analysis employs ANOVA to compare model performance ($p<0.05$) and descriptive statistics for user trust metrics, while qualitative data undergoes thematic analysis. The results aim to advance Kenya's e-waste policy framework and offer a scalable prototype for similar contexts, demonstrating how AI can enhance both efficiency and transparency in circular economy approaches to e-waste management.

Keywords: Circular Economy, E-Waste Sorting, Explainable Ai, Adaptive Learning, Hybrid Waterfall-Agile

128. An AI-Powered virtual examination system for automated question generation and evaluation

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Subtheme: Digital Transformation and Technological Innovations for Community Empowerment

Abstract.

Traditional methods of administering assessments often face delays in grading, inconsistent evaluation, human error, and the risk of misplacing physical exam scripts. These limitations are especially evident in growing academic institutions and online learning environments. This study introduces an AI-powered virtual examination system designed to enhance assessment efficiency, accuracy, and scalability. The system automates the exam cycle from question generation to grading minimizing human involvement while ensuring academic quality. The methodology integrates several technological components to achieve these goals. The system's backend is built using Django (Python) and SQLite as the inbuilt relational database, it manages users, questions, and results. The core AI component, Gemini AI, facilitates intelligent question generation and response evaluation using advanced natural language processing and rubric-based logic algorithms, capable of assessing both objective and open-ended questions. A comparative analysis between traditional Continuous Assessment Tests (CATs) and the AI-enhanced approach showed that manual tests took days to prepare and mark, often delaying feedback. In contrast, the AI system enabled instant question creation, automatic evaluation, and real-time feedback, reducing educator workload and eliminating incidents such as lost exam scripts. The system is highly applicable in universities, e-learning platforms, and certification programs where timely and accurate assessments are essential. Recommendations include integrating plagiarism detection tools to uphold academic integrity, enhancing Gemini AI's performance in evaluating open-ended and complex responses, and conducting tests in diverse academic settings to validate effectiveness.

Keywords: Gemini AI, virtual examination, Django, automated grading, question generation, e-learning

129. Enhancing maize production through iot, machine learning, and predictive analytics

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Subtheme: Digital Transformation and Technological Innovations for Community Empowerment

Abstract

Maize (Zea mays) is one of the world's most essential staple crops that plays an important role in global food security and economic stability. In Kenya, it is the primary source of food for millions of citizens mainly grown by small holding farmers. The total areas under maize production in Kenya is estimated about 1.5 million hectares with an annual production estimate of 3.0 million metric tons giving a national yield of 2 metric tons per hectare. Constrains towards increasing maize production have been attributed to droughts, low soil fertility and diseases. As a result, there is need to address these issues towards attaining food sustainability for the ever-increasing human population. However, despite many actions being put in place to increase the yield gap, a challenge has always been associated with suboptimal data-driven decision making specifically for the small hold farmers. In this regard, advanced technologies would play a critical role in modernizing agriculture by adopting tools and methods that would enhance production. This study integrates Internet of Things (IoT) and Machine Learning (ML) technologies in mitigating constrains related to soil quality for improved maize production. SHaple`y Additive exPlanations (SHAP) analysis was employed to interpret the impact of six major variables, Phosphorus (P), Potassium (K), Humidity, Nitrogen (N), Temperature, and pH on maize yield prediction. To facilitate real-time monitoring, IoT-enabled sensors were deployed across selected maize farms, collecting data on the six variables after every six hours. The data was then stored in a cloud-based MongoDB database, ensuring seamless retrieval and processing for analytical purposes. Then by utilizing a Bayesian optimization, a recommendation was done to adjust soil quality parameters to maximize suitability score, with SHAP analysis confirming the impact of the recommendations while providing an understanding of the importance o each soil quality parameter. Results reveal that high humidity (90.26%) and low nitrogen levels (13.0 mg/kg) negatively impacted maize growth, reducing prediction values by -0.15 and exposing maize to risk of diseases and nutrients deficiency. Conversely, Phosphorus with a contribution factor of +0.062 and Potassium with contribution factor of +0.023 were identified as the strongest positive influencers enabling targeted fertilizer application for increased yield. Other factors, such as temperature (+0.002) and pH (0.000), exhibited minimal impact on maize growth predictions suggesting prioritization and optimization of Potassium, Phosphorous and Nitrogen. These findings align with the SHAP dependence plot, reinforcing the importance of strategic nutrient management to enhance maize suitability and productivity. By integrating computational approaches, the study demonstrated how technology can transform traditional farming practices for improved maize production, sustainability, and food security, despite challenges with regard to sensor availability, cost and limited connectivity.

Key Words: Internet of Things, Machine Learning, SHAP, Gradient Boosting Algorithm, Precision Agriculture, Predictive Analytics.

130. Enhanced financial fraud detection in saccos using ai and machine learning: a real time monitoring approach

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Subtheme: Digital Transformation and Technological Innovations for Community Empowerment

Abstract

Fraud drains Kenyan SACCOs of an estimated Kshs. 118 million over two years, yet fewer than 5% Saccos have adopted AI based detection tools. This study proposes a hybrid machine learning framework combining decision trees, random forests, and K-means clustering for real time fraud detection in SACCOs within Meru County, an area noted for high number of SACCOs and also high exposed to fraud vulnerability. The framework intends to achieve 94% accuracy (F1-score = 0.92) with a false positive rate of 2%, outperforming conventional rule based audits by 25%). Further, it supports real time transaction monitoring using cloud APIs and integrates with SACCO core systems through REST interfaces (Vallarino;2025). Deployment can be achieved via cloud or hybrid or on premise solutions, with an estimated annual operational cost of less than Ksh 500,000 per Sacco. Usage of low code platforms will enable SACCO staff to manage configurations with minimal IT support, ensuring sustainability and scalability.Further, this study empowers SACCOs to adopt fraud resilient systems without extensive infrastructure investments.

Keywords: SACCOs; Financial Fraud Detection; Machine Learning; Real-Time Monitoring; Cloud-Based Systems.

CONFERENCE PAPERS

131. Survey of Security and Privacy Challenges and Solutions in the IoT Realm

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Subtheme: Digital Transformation and Technological Innovations for Community Empowerment

Abstract

Internet of Things (IOT) is a transformative technology that has brought change in numerous industries including health sector, transport sector, smart homes, agriculture sector and manufacturing. It connects devices together, enabling seamless communication and data exchange. IOT has turned the world like a global village where the devices can communicate remotely without human intervention. However, large-scale implementations of internet of things are rapidly escalating and as a result security issue arises. This study through a systematic review explores IOT security and privacy problems and provides a roadmap as future of IoT unfolds.

Keywords: Global village, Internet of things (IOT), Smart home, transformative technology, security issues, privacy issues and operating systems (OSs), Denial of services (DOS)

132. Bridging Theory and Practice: Embedding Critical Thinking, Design Thinking, and Ethics in IT Student Project Development

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Subtheme: Digital Transformation and Technological Innovations for Community Empowerment

Abstract

Computer Science and Information technology are programs offered by most of the universities in Kenya at both the undergraduate and post graduate levels. Artificial intelligence an emergent technology is a key course of both programs and needs to be embedded into the existing curricula to promote solutions directed toward real world challenges. The aim of this project was to enhance the students learning process by integrating critical thinking, design thinking and ethics as a way of enhancing their skills development especially in the development of scalable and sustainable artificial intelligence projects. 100 students undertaking the systems analysis and design course were selected to participate in the study. The students were taken through an intensive six month out-of-class training that incorporated design thinking techniques cognizant of team dynamics. Subgroups were formed and assigned a faculty member as an advisor to guide in the project. Thematic areas of investigation included solving societal problems using design thinking and responsible artificial intelligence in mental health, climate change, learning experience, agriculture, productivity among Employees, longevity of life, productivity for persons living with disabilities, and transport sector. Results show that there was improvement in the overall student's problem-solving capabilities, innovativeness and ethical reasoning as compared to the control group which did not participate in the training. The trainees could effectively apply user-centred design principles, were more creative in problem solving and could align their results to the research problem as compared to the control group. Therefore, this kind of training is necessary to equip students with critical thinking skills that can enable them to integrate responsible computing skills in solving societal problems in the 21st century.

Keywords: Critical Thinking; Design Thinking; Responsible AI; Student Projects; Ethics in IT Education.

133. Blockchain for Tamper-Proof System Logs in Dynamics NAV ERP

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Subtheme: Digital Transformation and Technological Innovations for Community Empowerment

Abstract

Traditionally, super admins and power users wield significant influence over system logs, presenting a potential security risk as they possess the capability to alter or erase critical information. This study aimed to investigate the integration of blockchain as a robust solution to mitigate such risks and establish an immutable and transparent log management system. In contemporary digital environments, ensuring the integrity and authenticity of system logs is paramount for maintaining the security and trustworthiness of information systems. Microsoft Dynamics NAV (Navision) employs a change log feature that allows users to track changes made to data in the system. It provided a historical record of modifications to records, helping organizations maintain transparency and traceability in their business processes. Changes were associated with the user accounts that made them, helping organizations identify who was responsible for specific modifications. This is however susceptible to modification by privileged users. The study delved into the fundamental principles of blockchain technology, emphasizing on its immutability and transparency. The research successfully developed a framework to improve on the existing solution and ensured an indelible record of system activities, ensuring that any attempt at manipulation is immediately detectable. The transparency and security of blockchain offer a resilient defense against unauthorized alterations, providing a trustworthy audit trail for system administrators and auditors.

Keywords: Blockchain, Enterprise Resource Planning (ERP), Microsoft Dynamics NAV

134. Leveraging ISO Standards for Systems Librarianship in Digital and Smart Libraries: Strategic Recommendations for Policy Makers and Curriculum Development

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Subtheme: Digital Transformation and Technological Innovations for Community Empowerment

Abstract:

This systematic review of literature investigates the integration of internationally recognized ISO standards into library management practices to enhance the effectiveness and sustainability of digital libraries within an increasingly complex technological landscape. Focusing on the evolving role of systems librarians in digital and smart libraries, the review synthesizes research related to aligning library management with key ISO frameworks, including ISO 9001 (Quality Management Systems), ISO/IEC 20000-1 (IT Service Management), ISO 30405 (Human Resource Management), and ISO/IEC 27001 (Information Security Management). By analyzing existing studies, this review identifies strategic approaches for adopting these standards to improve technological services, operational efficiency, and security protocols in modern library environments. It highlights the critical role of systems librarians as facilitators of technological innovation and service optimization. The findings provide valuable insights for policymakers and educators to inform library policy development and curriculum design, thereby preparing future systems librarians to address the challenges of the evolving digital landscape.

Keywords: Systems Librarianship, Digital Libraries, ISO Standards, IT Service Management, Information Security Management.

135. Fostering Responsible Computing Practices in Undergraduate Group Projects: Insights from a Classroom-Based Study

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Subtheme: Digital Transformation and Technological Innovations for Community Empowerment

Abstract

Computing technologies are increasingly shaping societal structures. This makes it essential to integrate responsible computing principles into undergraduate education. This study explores the impact of embedding ethical conduct and responsible computing practices into third-year group projects across computing disciplines at Meru University of Science and Technology. The study evaluates a pedagogical intervention embedding responsible computing as defined by responsible computing principles and practices in Mozilla Manifesto. Drawing on survey responses from over 230 students across six academic programs, the research investigates students' prior familiarity with responsible computing, the extent to which their understanding evolved through project work, and the ethical principles most commonly applied in team settings. Findings indicate a significant improvement in students' awareness and application of ethical practices, with post surveys (α=0.82) showing 72% of students improved in applying data privacy norms, while plagiarism persisted in 25% of teams due to unclear citation guidelines. The study also highlights the importance of structured ethical guidance and reflective practices in promoting accountability and professional conduct. This paper contributes to the growing discourse on responsible computing education by offering empirical insights and practical recommendations for integrating ethics into technical curricula through experiential learning.

Keywords: Responsible Computing, Ethics Education, Data Privacy, Project-Based Learning, STEM Curriculum

136. Mentoring the Mentors: A Framework for Tutorial Assistant-Led Responsible Computing Education in Kenyan Universities

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Subtheme: Digital Transformation and Technological Innovations for Community Empowerment

Abstract

This study evaluates an innovative Tutorial Assistant (TA) mentorship model for teaching responsible computing principles through project-based learning. As digital transformation accelerates across Kenya, integrating ethical considerations in tech education becomes imperative for sustainable development. We analyzed six TA experiences mentoring 36 students across six projects (including secure file storage systems and password managers) using mixed methods: (1) quantitative surveys on engagement metrics, (2) qualitative analysis of mentorship narratives, and (3) accessibility evaluation of teaching tools. Results indicate that TAs who implemented weekly structured check-ins (50% of cases) and rotational leadership saw 30% higher student accountability scores (μ=4.5/5) compared to ad-hoc mentoring. While 83% of TAs effectively taught cybersecurity principles, only 16% spontaneously addressed accessibility considerations, revealing a critical gap in inclusive design education. The study demonstrates that TA-led interventions significantly improve ethical computing practices when: (1) integrated early in curricula, (2) supported by institutional training programs, and (3) incorporating universal design principles. We propose a three-pillar framework for scaling this model: (i) mandatory TA training in disability-inclusive pedagogy, (ii) development of screen reader-compatible project management tools, and (iii) formalized TA roles in curriculum design. These findings contribute to SDG4's quality education targets while offering practical implementation strategies for Kenyan universities undergoing digital transformation. The research particularly highlights how peer mentorship models can democratize ethics education when properly structured and supported.

Keywords: Responsible computing education, peer mentorship model, accessible pedagogy, project-based learning, SDG4 implementation

SUBTHEME 8: ENGINEERING - Innovative Engineering and Infrastructure Solutions for Sustainable Communities

ENGINEERING PRE-CONFERENCE PAPERS

137. Evaluating the Use of Interlocking Concrete Hollow Blocks in Construction: Perceptions, Practices, Performance and Opportunities.

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Subtheme: Innovative Engineering and Infrastructure Solutions for Sustainable Communities

Abstract

In Kenya, interlocking concrete hollow blocks (ICHBs), are becoming a more popular building material alternative to the use of conventional machine cut-stones in construction. This is as a result of their ability to reduce mortar consumption, shorten construction time, and make installation easier, making them a cost-effective solution. Despite these potential benefits, their use remains limited. There is limited understanding regarding their practical performance and overall acceptance among construction professionals and end -users. This study investigated the current use and performance of (ICHBs) within Kenya's construction industry by collecting insights from key stakeholders such as engineers, contractors, masons, and site supervisors. Structured questionnaires were used to gather data on usage and application, perceived advantages, construction and installation practices, performance and maintenance challenges, overall satisfaction and future recommendations. Findings reveal a growing awareness of the benefits of ICHBs particularly in terms of alignment accuracy and reduced need for mortar. However, barriers such as limited technical knowledge, inconsistent block quality and a lack of clear guidelines hinder their adoption. These results reveal the need for targeted promotion strategies, enhanced training, quality control and standard practices to improve confidence in ICHBs. Addressing these gaps could help unlock the full potential of ICHBs as a sustainable, affordable and efficient alternative building component. The findings offer valuable insights for policy-makers and industry stakeholders seeking to diversify building materials and promote sustainable construction practices.

Keywords: Interlocking concrete hollow blocks (ICHBs), sustainable construction, building materials, adoption barriers, construction methods

138. Assessment of Stabilization Practices and Awareness of Sustainable Binders for Road Stabilization

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Subtheme: Innovative Engineering and Infrastructure Solutions for Sustainable Communities

Abstract

Road infrastructure is a key driver of socio-economic growth, connecting communities, enabling trade, and facilitating access to essential services. In Kenya, a large proportion of the road network remains unpaved, and the few roads that are paved often suffer from poor performance due to the use of substandard materials and the limited effectiveness of traditional chemical stabilizers. This has resulted in high maintenance costs and reduced service life of road infrastructure, posing challenges to long-term sustainability. Commonly used stabilizers such as lime and cement are associated with high costs, poor compatibility with certain soils, and environmental drawbacks. This study aimed to better understand the current stabilization practices, challenges, and opportunities for integrating sustainable alternatives. A survey using structured questionnaire was conducted targeting contractors, engineers, consultants, researchers, and regulatory bodies stakeholders in the road sector. The survey gathered data on the types of stabilizers used, factors influencing their selection, dosage practices , and awareness and perception of sustainable binders. The findings reveal widespread reliance on conventional stabilizers, limited familiarity with sustainable alternatives, and a strong interest in adopting more cost-effective and environmentally friendly binders if proven effective. This study presents the survey results, draws insights into the current state of stabilization practices in Kenya, and identifies critical areas for research, policy development, and capacity building to support the transition to more sustainable road construction practices.

Keywords: Road Stabilization, Chemical Stabilizers, Sustainable Binders, Hydraulic Road Binders, Maintenance Costs

139. Utilization of Masonry Cement in Kenya's Construction Industry: Perceptions, Barriers, and Opportunities.

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Subtheme: Innovative Engineering and Infrastructure Solutions for Sustainable Communities

Abstract

Masonry works such as block laying, brickwork, and plastering account for approximately **20% of total cement usage** in a typical building. However, the use of masonry cement—a material specifically formulated for such applications—remains low across construction sites in Kenya. This mismatch has led to reduced work efficiency, inconsistent quality, and missed opportunities for performance improvement in masonry construction. There is a growing need for practical, cost-effective strategies to enhance the adoption of masonry cement and improve construction outcomes. This study investigated the extent of masonry cement utilization, identified the factors contributing to its underuse, and assessed awareness and perceptions among key stakeholders in the building industry. Structured questionnaires were distributed to professionals including contractors, masons, engineers, and suppliers to gather data on current practices and challenges. Findings revealed that while many professionals were aware of masonry cement, few actively used it in their work. Contributing factors included limited availability in the local market, lack of training on its benefits and application, and absence of clear national guidelines promoting its use. The majority of respondents continued to rely on ordinary Portland cement, even for masonry tasks where specialized cement would be more suitable. The results point to a critical gap between knowledge and practice, emphasizing the need for targeted awareness campaigns, technical education, and policy support. Enhancing the proper use of masonry cement could lead to better workmanship, reduced material waste, and increased structural durability. This study supports the development of community-informed strategies to promote masonry cement adoption and strengthen the overall quality of construction in Kenya.

Keywords: Masonry cement, cement utilization, material performance, sustainable construction, mortar applications.

140. Infrastructure Resilience on Expansive Soils: A Case Study of Community Challenges and Solutions in Kenya

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Subtheme: Innovative Engineering and Infrastructure Solutions for Sustainable Communities

Abstract

Infrastructure in both rural and urban areas of Kenya faces significant challenges due to expansive soils, which are prone to swelling and shrinkage with moisture variations. These soil behaviors often lead to structural issues such as cracking, distortion, and even failure in roads, bridges, pavements, and buildings – posing risks to public safety and economic stability. There is a pressing need for sustainable and cost-effective solutions to mitigate these effects and support infrastructure development. This study investigates the extent of infrastructure damage caused by expansive soils, identifies contributing factors, and assesses community awareness and perceptions regarding soil stabilization methods. Data were collected through structured questionnaires distributed to residents in affected regions, providing insight into the scale of the issue and local understanding of soil-related challenges. The findings are intended to inform practical, community-driven strategies for enhancing infrastructure resilience through increased awareness and adoption of stabilization techniques, ultimately contributing to safer and more sustainable built environments across Kenya.

Keywords: Expansive Soils, Soil Stabilization, Infrastructure Damage, Swelling and Shrinkage, Sustainable Development

141. Influence of Social Factors on Management of Faecal Matter in Arid and Semi-Arid Areas: A Case of Isiolo Sub - County, Kenya

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Subtheme: Innovative Engineering and Infrastructure Solutions for Sustainable Communities

Abstract

Access to safe and adequate sanitation remains a significant challenge in low- and middle-income countries, including Kenya. To address this issue, onsite sanitation facilities have gained global acceptance, particularly in arid and semi-arid areas, where financial constraints often hinder the installation of conventional centralized systems. However, fecal matter accumulating in these technologies is usually poorly managed, posing risks to public and environmental health and could lead to adverse economic and social effects. The objective of the study was to establish the influence of social factors on the management of fecal matter. Convergent mixed methods design was used in data collection. Quantitative data was gathered using structured questionnaires from household heads and qualitative data from two focus group discussions. Cluster and proportionate random sampling techniques were employed to select 355 household heads. Quantitative data was analyzed using Statistical Package for Social Science (SPSS) version 26.0 for descriptive statistics and logistic regression analysis. The regression was computed in univariable and multivariable analyses to determine the relationship between predictors and dependent variables, and results were presented as odds ratio at 95% Confidence Interval (CI). Qualitative data was analyzed thematically and presented in narratives. Results showed that about 46.5% of the resulting excreta was poorly managed. The study established that level of education (tertiary education) (AOR 4.085, 95% CI: 1.921-8.687, p = 0.000), age group 36-50 years (AOR 0.575, 95% CI: 0.333-0.991, p = 0.046), gender roles (AOR 0.558, 95% CI: 0.358-0.869), p= 0.010), Knowledge of safe disposal (AOR 22.503, 95% CI: 4.106-123.319, p < 0.000), and social norms (AOR 0.347, 95% CI: 0.187-0.643, p=0.001) were among the social factors that influenced the management of fecal matter. The study concluded that the management of fecal matter in Isiolo Sub-County is still a challenge and is influenced by multiple factors. The study recommends that Government, sanitation experts and Non-Governmental Organizations should incorporate social aspects in the development and implementation of government policies. There is need of sanitation agencies to promote awareness, training and education campaigns on safe disposal practices of excreta.

Keyword: Arid and Semi-arid areas, Fecal matter, Management of fecal matter, Onsite Sanitation, Kenya.

142. Floods and Collapse of Latrines: Sanitation Facility Design as a Promoter of Safe Faecal Management in Nyando Sub-County, Kenya

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Subtheme: Innovative Engineering and Infrastructure Solutions for Sustainable Communities

Abstract

Flood prone areas cover about 10% of the Earth's surface and pose major constraints in the achievement of Sustainable Development goal agenda 6.2 on universal access to safe sanitation. Collapse of toilets is common in Nyando Sub-County, a flood-prone area which consequently reverse the rates of access to safe sanitation facilities. The study aimed at investigating the influence of Sanitation Facility Design on the promotion of safe fecal management in Nyando Sub-County. The area was selected due to prevalent flooding which led to the collapse of pit latrines stemming open defecation and reversal in sanitation access between 2013 and 2023. The study employed a convergent design where survey and observation techniques will be used to collect quantitative and qualitative data and analyzed through quantitative and qualitative techniques. The target population was household heads in Nyando Sub-County. A sample size of 177 household head was chosen as a representative of the 38,460 total households using stratified random sampling technique in the study area. Random sampling with snowballing to identify the subsequent contributors was used to identify participants in the qualitative study. Structured questionnaire was used to collect quantitative data while focus group discussions were used for qualitative data collection. (SPSS) version 26 was used to analyze quantitative data and the relationship between the variables was examined using Pearson's Product Moment correlation at a 5% significance level. Similarly, MAXQDA software was used to group coded data from qualitative methods into themes. From the results, raised superstructure and pit lining had the strongest influence on the regressor variable with correlation coefficients of ($r = .766$; $P \leq .026$) and ($r = .718$; $P \leq .038$) respectively indicating stronger influence of the variables on the promotion of safe fecal management in the study area. Additionally, the study revealed that 18.4%, (n=30) of the respondents did not have toilets, 77.4%, (n=126) of the toilets were not lined, and 37.2%, (n=61) of the toilets had their superstructure raised above the flood level revealing the extent of vulnerability of the existing pit latrines to the impact of flooding. In conclusion, the choice of affordable pit latrine design incorporating pit lining and raised superstructure may increase sanitation access during floods events. Similarly, training of local artisans on the technology of choice may enhance scalability guaranteeing reduced water-borne disease incidences during inundation. Future studies should focus on affordable pit lining solutions that promote adsorption of pit latrine contaminants to increase the efficacy of pit latrines in fecal sludge management to reduce the impact of flooding on sanitation facilities and public health.

Keywords: Open defecation, Sanitation access, Safe fecal management, Scalability, Sanitation disparities, Sanitation Facility Design

143. Assessment of Shallow Well Water Quality in Relation to Well Distance from the Pit Latrine: A Case Study of Moiben Sub-County, Uasin –Gishu County

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Subtheme: Innovative Engineering and Infrastructure Solutions for Sustainable Communities

Abstract

Informal settlements in urban areas of sub-Saharan Africa often rely heavily on shallow dug wells for their water supply. However, these wells are susceptible to contamination from various sources due to a lack of protection. The study assessed the microbial quality and physicochemical parameters of shallow wells in Moiben Sub-County, Uasin Gishu County. Specifically, the study aimed to determine the level of microbial contamination in shallow wells, analyze the physicochemical parameters of the water, and establish the relationship between shallow well water contamination and the distance of the wells from nearby pit latrines. The study population was 62 shallow wells in five zones of the sub-county. Stratified sampling technique was utilized in proportionally sampling wells for examination. Laboratory analysis measured microbial indicators, including total coliforms (33–1600 MPN/100ml), fecal coliforms (22–1600 MPN/100ml), and E. coli (26–1600 MPN/100ml), all exceeding the WHO limit of 0 MPN/100ml.Physicochemical parameters included pH (5.5–8.5, WHO: 6.5–8.5), Total Dissolved Solids (150–1000 mg/L, WHO: ≤1000 mg/L), electrical conductivity (150–1500 μS/cm), turbidity (7–40 NTU,WHO: ≤5 NTU), ammonia (0.023–0.985 mg/L, WHO: ≤0.5 mg/L), nitrates (0.24–7.17 mg/L, WHO: ≤10 mg/L), and nitrites (0.004–0.200 mg/L, WHO: ≤0.1 mg/L). Observations confirmed that wells closer to pit latrines had higher contamination levels. Data was inferentially analyzed using ANOVA, and microbial contamination was measured using the Most Probable Number (MPN) method. Results showed that there was a significant correlation between microbial contamination and distance from the well ($p < 0.001$) and that 72.8% of microbial contamination was explained by distance. Similarly, 98.7% of physicochemical parameter contamination was explained by distance. The study highlights the importance of maintaining a minimum of 50 meters of distance between pit latrines and groundwater sources to prevent fecal contamination. The final beneficiaries of these results are policymakers, community members, and local health administrators, who can use the data to improve public health, sanitation, and water quality in the region. The study concludes that shallow wells in Moiben Sub-County are highly contaminated with microbial and physicochemical pollutants, posing serious health risks. Contamination is strongly linked to the proximity of pit latrines, with several parameters exceeding WHO standards. It is recommended that sanitation infrastructure be improved by ensuring proper well placement, regular monitoring, and community education on safe water practices. Additionally, better waste management and sustainable agricultural practices should be implemented to prevent further groundwater contamination.

Keywords: Shallow Wells; Water Quality; Pit Latrines; Microbial Contamination; Uasin Gishu County.

144. Influence of Economic Factors on Access to Safe Sanitation in Pastoral Communities: A Case of Saku Sub-County, Marsabit, Kenya

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Subtheme: Innovative Engineering and Infrastructure Solutions for Sustainable Communities

Abstract

Universal access to safe sanitation has been given priority in the United Nation's development agenda and in the Kenyan Constitution. Efforts towards improving sanitation standards have been put in place yet challenges still persist in less-developed regions. Although access to safe sanitation has been significant in most Kenyan Counties, Pastoral Counties, Marsabit included, contribute to the highest rates of open defecation in Kenya. The study examined the influence of economic factors on access to safe sanitation in Saku Sub-County in Marsabit. A cross-sectional descriptive survey design was employed and semi-structured questionnaires used to collect data. Cluster sampling was used to classify the area into wards and 100 household heads selected from the clusters using proportionate simple random sampling technique. The data was analysed using Statistical Package for Social Sciences (SPSS) version 26 in descriptive and inferential statistics. Findings showed that more than 80% of the population earned less than Ksh. 10, 000 a month with only 18% earning between Ksh.10, 000 and Ksh. 30, 000 which demonstrated economic vulnerabilities of the pastoral communities. The average latrine construction cost was rated by most of the participants to be between Ksh. 30, 000 and 40, 000 which hindered the low-income earners from investing in improved sanitation options. Results indicated a lower likelihood of constructing safe toilets for households with school-aged children ($p<0.05$) as they prioritized educational expenses, like school fees and food, over sanitation improvements. The study established that occupation was a significant predictor of access to safe sanitation, with higher engagement linked to the spouse's occupation ($\beta = 0.8158$, $p < 0.001$). Absence of toilets at the households was significantly influenced by wealth quantile ($\beta = -0.2520$, $p=0.006$) and average latrine cost ($\beta = 0.1356$, $p = 0.044$), indicating that lower income and latrine costs contributed to increased toilet absence at households. Women, who were mostly found at households reported that safe sanitation was important to them, however, they lacked capacity to adopt them due to financial struggles and convincing their able husbands that safe sanitation was a good investment was impossible. Findings demonstrated that high financial priority was given to livestock wellbeing compared to establishment of toilets in pastoral communities ($p<0.05$). It was concluded that investment in safe sanitation facilities was affected by inadequate money for adoption of sanitation facilities and low priority to safe sanitation in pastoral communities. The study recommended the need for sanitation-marketing on subsidized but improved infrastructure options to cover the low-income residents and to boost their capacity to afford safe toilets for use in their households. The approach could inform strategies for achieving Sustainable Development Goals agenda 6.2, contributing to public health improvements and sustainable development in marginalized pastoral regions.

Keywords: Economic factors, Pastoral communities, Safe sanitation

145. Economic Barriers and Enablers in Managing Shared Sanitation in Nakuru Town West Slums, Kenya.

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Subtheme: Innovative Engineering and Infrastructure Solutions for Sustainable Communities

Abstract

Sanitation remains a challenge worldwide, especially in developing countries such as Kenya. Global efforts are underway to eradicate open defecation and promote improved sanitation systems in slums, often using shared toilets. However, access to these facilities and notable benefits, such as the prevention of diarrheal diseases and improving the quality of life, may be hampered by contextual aspects. The objective of this study was to examine the influence of economic factors on the management of shared sanitation in Nakuru Town West Slums, Nakuru County, Kenya. This study employed a convergent parallel mixed method design. Quantitative data were obtained from 288 randomly selected household heads using a structured questionnaire. Qualitative data were obtained through interviews with purposively identified informants. Binary logistic regression analysis was used to determine the relationship between the predictor and outcome variables. Qualitative data were transcribed, organized into themes, and presented in a narrative form. The study found significant associations between employment status (aOR =2.34, p = 0.041), affordability of sanitation services (aOR = 0.334, p=0.015), membership of informal financial groups, awareness of financial organizations (aOR= 0.463, p=0.029), and willingness to take loans (aOR= 0.36, p=0.003) and management of shared sanitation. In conclusion, shared toilets in the study area were poorly managed, likely due to economic aspects such as affordability, which may hinder households from making the necessary investments in sanitation improvements. This study recommends that sanitation agencies, such as local governments, offer financial assistance programs, enhance financial literacy and skills, and promote sanitation-related entrepreneurship.

Keywords: Economic determinants, Informal settlements, SDGs, Shared Sanitation, Nakuru Town west

146. Influence of Sanitation Coping Strategies on Raw Sewage Disposal in Water Sources: A case Study of Mukuru Slums, Nairobi County, Kenya

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Subtheme: Innovative Engineering and Infrastructure Solutions for Sustainable Communities

Abstract

Globally, 1.7 billion people lack access to basic sanitation, and 494 million practice open defecation issues exacerbated in informal settlements. Despite global and national sanitation efforts, over two million tons of untreated sewage are discharged into water bodies annually, especially in slum areas such as Mukuru, Nairobi, Kenya. This study assessed coping strategies influencing raw sewage disposal into local water sources in Mukuru slums. A descriptive cross-sectional design was used, combining both quantitative and qualitative approaches. Stratified random sampling selected 235 household heads for surveys, while purposive sampling identified participants for focus group discussions and in-depth interviews. Quantitative data were analyzed using SPSS (version 25) with descriptive statistics and Chi-square tests; qualitative data were thematically analyzed. Findings showed that 96.1% of respondents acknowledged sewage disposal into nearby water sources, with 87.7% having directly observed such practices. While 49.4% used pour-flush toilets, 76.2% lacked knowledge of safe disposal methods. Coping mechanisms included relocation (43.5%), passive waiting for services (34.9%), and neglect (79.1%). Chi-square tests revealed significant associations between unsafe disposal and behaviors such as relocation ($p = 0.044$) and neglect ($p = 0.030$). The study concludes that raw sewage disposal in Mukuru is not only a matter of infrastructural inadequacy but also deeply influenced by adaptive coping behaviors. Addressing this issue requires holistic, community-centered interventions that integrate bahaviour change, health education, and locally sustainable sanitation technologies. The findings offer a foundation for targeted policymaking and further research in similar urban informal settlements.

Keywords: Coping strategies, raw sewage disposal, sustainable sanitation systems

147. Assessment of Health Risk Associated with Sanitation Service Chain. A Case Study of Iten Municipality, Kenya

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Subtheme: Innovative Engineering and Infrastructure Solutions for Sustainable Communities

Abstract

Sustainable Development Goals (SDGS) advocate for access to adequate sanitation and safe water for all, which is essential for public health. However, deficiencies in sanitation infrastructure remain a significant concern in many urban areas. The objective of the study was to examine the health risks associated with the existing sanitation service chain in Iten Municipality, Kenya. A mixed-methods research design was employed to obtain quantitative data using structured questionnaires and water sampling forms, and qualitative data using interview guides. Purposive, Cluster, and proportionate simple random sampling were employed to identify 388 household heads, four water points, and informants. Quantitative data was analyzed using Statistical Package for Social Sciences (SPSS) version 27 using descriptive statistics techniques and Pearson's R correlation, while qualitative data was analyzed through categorization into various themes. The study showed that only 69% of the excreta generated was safely managed. The study also revealed a significant correlation between inadequate waste management and sanitation-related illnesses ($r = .30$, $p = .03$), waterborne diseases ($r = .33$, $p = .014$), contamination of water sources ($r = -.33$, $p < .001$), pest infestations ($r = -.19$, $p < .001$) and strong odours ($r = -.21$, $p < .001$). Laboratory tests of water collected from four main sources revealed high levels of total coliforms and E. coli. The presence of these bacterial indicators is a clear sign of potential feacal contamination in the water, posing serious health risks to the community through waterborne diseases such as diarrhea, cholera, and typhoid. These findings underscore the failure of current sanitation systems to adequately protect water sources from contamination. In the context of Iten Municipality, Kenya, this contamination reflects gaps in the sanitation service chain, directly contributing to the prevalence of sanitation-related illnesses reported in the study. Therefore, without urgent improvements in sanitation infrastructure and water quality monitoring, public health will continue to be compromised, undermining progress toward Sustainable Development Goals related to safe water and sanitation.

Keywords: Health risk, Sanitation system, SDG, Kenya

148. Knowledge, Attitudes, and Practices Associated with Access to Selected Public Toilets - A Case of Nairobi City.

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Subtheme: Innovative Engineering and Infrastructure Solutions for Sustainable Communities

Abstract

Access to safe and hygienic toilet facilities in public spaces is an ongoing public health priority. Despite global initiatives, disparities remain stark, especially in low- and middle-income countries, where restricted access to sanitation continues to be a major barrier to achieving universal sanitation and advancing sustainable development goals. Public toilet facilities in many African countries continue to be overlooked and inadequately maintained. In Kenya, despite efforts to enhance sanitation infrastructure, ensuring access to functional and hygienic public toilets remains a significant challenge, especially in urban areas. This ongoing problem underscores critical infrastructural and policy gaps that obstruct progress toward achieving inclusive and sustainable urban sanitation. This study analyzed knowledge, attitudes and practices associated with access to selected public toilets in Nairobi city. A descriptive quantitative cross-sectional study design was employed to obtain data from the participants who frequented the central business district (CBD) and used available sanitation facilities. Study participants were randomly selected upon exiting public toilet facilities until the target sample was achieved. Data was collected using structured open-ended questionnaires, interviews and observational spot checks. Data obtained from the sample was analyzed using the statistical package for the social sciences (SPSS) V29 and results were interpreted using tables with reference to global sanitation standards. Results showed that majority of the respondents (76.5%) indicated the importance of good sanitation in the public areas. About eighty-nine percent (89.3%) of the respondents confirmed having used public toilets in the city. However, they also alluded to inadequacy of these facilities leading to open defecation, where some indicated to often urinate behind the buildings. This was clearly observable during the spot checks made during the study period. Daily use was low at 6.7%. Reports also indicated accessibility problems where most respondents did not know exact location of the toilets, with 39.3% indicating dissatisfaction with the unhygienic and unsafe conditions of the public toilets. While 88.9% agreed to pay to use the toilet facilities, the remaining 11.1% were either unwilling to pay or lacked finances to pay for the service highlighting the importance of willingness to pay for environmental services. In conclusion there is a need to improve the existing facilities with 71.5% agreeing that maintaining these facilities requires collective responsibility to improve the population's overall health and hygiene. This study recommends proper maintenance of existing sanitation facilities to improve accessibility and quality-of-service delivery coupled with targeted educational campaigns on the importance of sanitation and hygiene.

Keywords: Public toilets, sanitation access, toilet accessibility, hygiene practices

149. Selection of Remanufacturing Alternatives of Product Returns in a Reverse Supply Chain: A Modified Fuzzy MOORA Multi-Criteria Decision Algorithm

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Subtheme: Innovative Engineering and Infrastructure Solutions for Sustainable Communities

Abstract

The concept of reverse supply chain is gaining more importance in the overall recycling/reuse industry, because of the environment and business factors in circular economy(CE). Planning and implementing a suitable reverse supply network could bring about profit maximization, customer satisfaction, and a nice social picture for companies. However, most logistics networks are not equipped to handle the reprocessing of returned products in reverse channels. In this study, modified Fuzzy MOORA Multi-criteria decision making (MCDM) techniques is used to develop a group decision support algorithm that categorizes returned products and makes the best reprocessing alternative selection using carefully considered decision criteria. Finally, one example, using a product from market/stock out returns and another using a product from the end-of-life (EoL) or used returns from the consumer/customer, has been illustrated two case studies, to highlight the procedural implementation of the proposed algorithm considering six evaluation criteria. The results of the analysis using the proposed method ranked repackaging and reselling as the best reprocessing alternative for products from market/stock-out returns whereas disposal was ranked as best option for reprocessing EoL product returns. The study specifically provides an efficient way of selecting the best remanufacturing alternatives for the real-world supply chain problems using qualitative criteria.

Keywords: reverse logistics; circular economy; fuzzy MOORA; MCDM; product returns; reprocessing alternatives

150. Techno-Economic Optimization of a Microgrid for University Campuses in Kenya using HOMER

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Subtheme: Innovative Engineering and Infrastructure Solutions for Sustainable Communities

Abstract

The growing demand for sustainable and cost-effective energy solutions in institutions for higher education presents a great need for the integration of Hybrid Renewable Energy System (HRES). This study investigates the design and techno-economic feasibility of a hybrid renewable energy system for Meru University of Science and Technology (MUST), located in Tigania West, Kenya. The integration of renewable and conventional energy sources to meet the university's average daily electrical load of 1,158kWh is modeled using the Hybrid Optimization Model for Electric Renewables (HOMER) software. The optimization process considers economic and technical constraints and local resource availability i.e., solar, wind, hydro, and biomass. The simulation results reveal that the optimal system configuration comprises 169 kW of solar photovoltaic (PV) capacity, 100 kW biomass generator, 1 kW wind turbine, 5.5 kW hydro power generator and 308 kWh of battery storage. This configuration successfully meets the university electrical energy demand with an Annualized System Cost (ASC) of Ksh 3.64 million per year. The simulation results highlight the potential for significant operational cost savings and enhanced energy reliability through strategic deployment of hybrid renewable technologies in academic institutions. The study further highlights the role of system optimization tools such as HOMER in informing sustainable energy planning in off-grid systems.

Keywords: Hybrid Renewable Energy System, HOMER, Energy Optimization, Annualized System Cost, Techno-Economic Analysis

151. Assessment of Borehole and Shallow Well Water Quality in Nchiru Location, Meru County

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Subtheme: Innovative Engineering and Infrastructure Solutions for Sustainable Communities

Abstract

Groundwater remains a critical source of drinking water in rural parts of Kenya, particularly in regions like Nchiru, Meru County, where water scarcity is prevalent. However, the increasing pressure from agricultural activities and inadequate sanitation infrastructure poses serious risks to groundwater quality. This study assessed the physico-chemical and microbiological quality of water sourced from selected boreholes and shallow wells in Nchiru Location to determine its suitability for domestic use. Fieldwork involved the systematic collection of samples from 10 sites (5 boreholes, 5 shallow wells), followed by laboratory analysis using UV-V spectrophotometer for chemical parameters (nitrates, sulphates, and carbonates) and MacConkey agar culture media for bacterial contaminants (E. coli, total coliforms, Salmonella spp.). Physico-chemical parameters such as pH, temperature, electrical conductivity, total dissolved solids (TDS), and dissolved oxygen were also measured and benchmarked against WHO and KEBS drinking water standards. Results revealed that while most chemical parameters remained within permissible limits, nitrate levels in some shallow wells exceeded 10 mg/L, indicating contamination from agricultural runoff and nearby latrines. Moreover, the microbiological analysis showed alarmingly high concentrations of fecal coliforms and pathogenic bacteria in all water sources, far surpassing safe limits (0 CFU/100 mL), rendering the water unfit for consumption without treatment. The findings highlight the urgent need for targeted interventions including chlorination, improved waste management, and public education on water safety. This research supports Sustainable Development Goal 6 on clean water and sanitation for all by contributing data-driven insights to inform water resource management and protect public health in rural communities.

Keywords: Borehole, Contamination, Shallow well, Water quality

152. Influence of Water, Sanitation, and Hygiene Practices on Diarrhoeal Diseases in Children Under Five Years of Age in Westlands Sub-County, Nairobi County, Kenya

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Subtheme: Innovative Engineering and Infrastructure Solutions for Sustainable Communities

Abstract

The health and well-being of under-five children are significantly influenced by water, sanitation, and hygiene (WASH) practices. According to the United Nations (2015), Sustainable Development Goals (SDGs) 6.1 and 6.2 aim to ensure universal access to safe drinking water and adequate sanitation by 2030. In its global Strategy for WASH (2016-2030), UNICEF recognizes the scale of the challenge facing the world if it is to succeed in achieving this vision and singles out urban WASH as one of the priority areas for increased engagement, to reach the most vulnerable, wherever they are. Diarrhoeal diseases, a leading cause of morbidity and mortality in this age group, are closely associated with inadequate WASH practices.The study aims to investigate the influence of Water, Sanitation, and Hygiene Practices on diarrhoeal diseases in children under five years of age. A cross-sectional descriptive study design will be employed utilizing a convergent mixed-methods approach. Quantitative data will be collected through structured questionnaires and observational checklists, while qualitative data will be gathered using key informant interviews and focus group discussions. The target population for this study will consist of caregivers of under five children residing in Westlands Sub-county, Nairobi County with a sample size of 375 households. The study will employ a stratified random sampling technique. Quantitative data will be analyzed using statistical tools to identify patterns and relationships, whereas qualitative data will be subjected to thematic analysis to provide contextual insights. The study will contribute to the achievement of Sustainable Development Goals (SDGs), particularly SDG 3 (Good Health and Well-being) and SDG 6 (Clean Water and Sanitation). By improving WASH practices, it will also indirectly support SDG 1 (No Poverty) and SDG 4 (Quality Education) by minimizing economic strain and educational disruptions caused by preventable illnesses. Furthermore, the study will provide scientific value by filling existing knowledge gaps and laying the groundwork for future research in the field. Approval by the Institutional Research and Ethics Committee of Meru University, and informed consent from all study participants will be sought.

Keywords: WASH Practices; Diarrhoeal Diseases; Under-Five Children; Urban Health; Nairobi County.

153. Impact of Climate Change on Stormwater Management at Kianjai Center and Its Environs in Meru County

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Subtheme: Innovative Engineering and Infrastructure Solutions for Sustainable Communities

Abstract

Climate change is one of the most critical challenges of the 21st century with widespread implications for natural and human systems. Climate change has placed adverse effects on stormwater management systems exposing vulnerabilities to stormwater infrastructure and increasing flooding, erosion, destruction of property and water pollution. In sub-Saharan Africa limited resources and weak infrastructure have compounded the effects into a greater effect. In rural and urban areas, there have been extreme weather changes and the available infrastructure unable to cope with the increased runoffs. The main objective of this study was to analyze the changing weather patterns, evaluate stormwater drainage systems and propose sustainable mitigation strategies. The research addressed the problem of inadequacy of stormwater infrastructure to handle intensified storm arising from climate change. The research used a case study approach of Kianjai area. Kianjai is a ward in Tigania West Sub- County, Meru County. And its environs and secondary data from the year 2003-2005 was obtained from NASA power website, field observations were carried out. There was a sharp increase in daily rainfall from 1.91mm in 2005 to 4.84 mm in 2023. The temperature also fluctuated from 16.80 to 18.20. Field observations identified the stormwater infrastructure poorly maintained and insufficient to handle increased stormwater. Survey data supported these findings with 64.1 % rating existing stormwater ineffective. Stormwater infrastructure has not evolved. This makes it vulnerable to the intense and unpredictable rainfall patterns. Climate resilient systems such as upgrading of the current systems, green infrastructure, rainwater harvesting and desilting of the current methods should be adopted. Climate change is worsening stormwater management and sustainable methods should be adopted.

Keywords: Climate change, Stormwater, Surface runoff, Sustainable drainage systems

154. Performance Evaluation of Mechanical Properties of Polyethylene and Sand Composites for Sustainable Pole Fencing Solution

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Subtheme: Innovative Engineering and Infrastructure Solutions for Sustainable Communities

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Abstract

Kenya faces a significant environmental problem with plastics waste and especially packaging plastic. A substantial portion of this packaging plastic is made up of polyethylene terephalate commonly abbreviated as PET that is used to make containers for liquids and foods among other uses. PET constitutes a significant fraction of single use plastics that is discarded thereby polluting the environment. This study sought to make use of and repurpose this waste by mixing it with sand and cement to make fencing posts. . The study involved preparation of different mix ratios of PET and sand to which 5%, 10%, and 15% with of cement was added.. The plastic was melted then mixed with sand and cement in the predetermined ratios and percentages respectively; the mixtures were then molded into test specimens and cured for 14 days. The samples were thereafter subjected to compressive, tensile and thermal tests. The data collected was analyzed using fundamental statistical methods to determine patterns and compare the performance of each mixture. The 1:2 mix with 15% cement achieved the highest strength at 9.50 kN/mm², followed by the 1:3 mix at 7.83 kN/mm². The lowest strength 0.41 kN/mm² was recorded in the 1:4 mix with 5% cement. The 1:2 mix with 15% cement showed the highest tensile strength at 0.58 kN/mm², while the 1:4 mix with 5% cement had the lowest at 0.38 kN/mm². The composites also displayed greater flexibility compared to concrete, enhancing their suitability in impact-prone environments. Heat resistance tests showed that all mixes remained stable up to 120°C. The 1:4 mix demonstrated the best thermal performance, withstanding heat up to 125°C with minimal deformation. While not as strong as traditional concrete, the polyethylene terephalate-sand-cement composites offer sufficient strength, flexibility, and thermal stability for light-duty fencing thereby providing a viable and eco-friendly fencing alternative.

Keywords: Environmental Pollution, Packaging Plastics, Fencing Concrete, Polyethylene Terephalate, Composites

155. Assessment of the Relationship Between Sanitation Practices and Quality of Drinking Water in Rural Households of Kajiado West Sub-County, Kenya

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Subtheme: Innovative Engineering and Infrastructure Solutions for Sustainable Communities

Abstract

Access to safe drinking water remains a critical public health challenge in rural Kenya, where inadequate sanitation practices contribute significantly to water contamination. This study investigated the relationship between household sanitation practices and drinking water quality in Kajiado West Sub-County, a semi-arid region where only 21.2% of households have access to safe drinking water. A cross-sectional descriptive study was conducted among 100 randomly selected households across the three wards in Kajiado West Sub-County. Data on sanitation and hygiene practices were collected using structured questionnaires administered via Google Forms. Stratified random sampling ensured representation across diverse ecological and socio-economic settings. Findings reveal significant gaps in sanitation infrastructure and practices. While 85% of households use pit latrines with slabs, 13.3% still practice open defecation. Only 10% have designated handwashing stations, and 81.7% received no hygiene education in the past year. Most households (76.7%) do not treat their drinking water, despite relying primarily on boreholes (46.7%) and rainwater (33.3%). Critical deficiencies in sanitation infrastructure and hygiene practices likely contribute to drinking water contamination and waterborne disease transmission. These findings underscore the urgent need for integrated Water, Sanitation, and Hygiene (WASH) interventions in rural Kajiado West.

Keywords: *Sanitation practices, drinking water quality, rural households, Kenya, WASH*

ENGINEERING CONFERENCE PAPERS

156. Adaptive Mesh Compression Algorithm for Near Real-Time Rendering of Large-Scale Static Scenes

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Subtheme: Innovative Engineering and Infrastructure Solutions for Sustainable Communities

Abstract

In the realm of computer graphics, rendering largescale static scenes in real-time poses a considerable challenge for existing mesh compression techniques. This study explores the struggle to balance visual quality and adaptability. Algorithms such as view frustum culling, visibility culling, and occlusion culling play a pivotal role in rendering high-resolution, user placed objects. However, their efficiency comes at the cost of potential slowdowns due to additional object selection operations. This study introduces a novel mesh compression algorithm specifically designed for real-time rendering. By reducing data requirements while preserving visual fidelity and optimizing resource allocation, the algorithm revolutionizes the efficiency and immersion of rendering complex scenes.

Keywords: *Real-time rendering, Geometry details, 3D objects, Large-scale static scenes, Occlusion culling, Computer graphics.*

157. Assessing Service Delivery, Operational Challenges, and Socio-Economic Dynamics in Feacal Sludge Management: A case of Kisumu City

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Subtheme: Innovative Engineering and Infrastructure Solutions for Sustainable Communities

Abstract

Kisumu faces significant challenges in faecal sludge (FS) management due to limited sewer coverage and rapid urbanization. Approximately 70% of households rely on pit latrines, with only 33% of FS safely managed. Private exhauster trucks and manual pit emptiers play crucial roles in FS emptying services. However, these operators encounter challenges including inadequate infrastructure, lack of formal recognition, and health risks. This study aims to assess the current state of FS emptying in Kisumu, focusing on operational capacities, service coverage, and the socio-economic dynamics affecting service delivery. Data were collected through a combination of field observations, interviews with key stakeholders including pit emptiers, sanitation service providers, and local authorities and review of operational records from November 2024. Quantitative data on FS volumes emptied, service coverage, and operational costs were analyzed. Qualitative insights were gathered to understand the challenges faced by manual and mechanized FS emptiers. A total of 376 m3 of FS were emptied daily in Kisumu. Private exhauster trucks handled 343.6 m3, while KIWASCO's trucks managed 21 m3. Manual pit emptiers contributed 5.3 m3, and Fresh Life's Container-Based Sanitation (CBS) model accounted for another 5.3 m3. Notably, 97.8% of the FS originated from septic tanks, despite their 8% coverage, while 2.2% came from pit latrines, having a 78% coverage. The capacity of exhauster trucks ranged from 7,000 to 10,000 liters per trip, with emptying costs varying between 4,000 and 5,000 KES per trip. Manual pit emptiers used capacities ranging from 1,200 to 3,600 liters per trip. All pit emptiers required various licenses to operate, and challenges included high emptying costs, and inadequate protective equipment. Manual emptiers often disposed of FS in pits dug next to filled pits, and landlords were reluctant to offer emptying services. There was no standardized fee for emptying services, and the quality of work varied depending on the amount paid. Additionally, there was no method of tracking waste from emptying to disposal, and a lack of clear regulatory framework for pit emptiers persisted. Poor toilet structures and solid waste management hindered emptying operations, and over-regulation led to informality within the sector. Exhauster trucks faced challenges such as space limitations, accessibility issues due to narrow roads and solid waste like diapers and bottles disposed in pits. Pit emptiers faced health risks due to poor use of personal protective equipment (PPE), limited vaccinations, and use of crude tools. There was also a lack of adequate bathrooms and washing facilities at the lagoons. The data highlights the significant role of private exhauster operators in FS management in Kisumu, despite challenges. Manual pit emptiers are essential in areas inaccessible to mechanized trucks. The Container Based Sanitation model by Fresh Life offers a promising alternative, though its impact is currently limited. Addressing these issues through capacity building, formalization of services, and improved infrastructure is crucial for sustainable FS management in Kisumu.

Keywords: *Service delivery, Challenges, CBS, Pit emptying, Feacal Sludge Management*

158. Assessing the Role of Sanitation Infrastructures in Enabling Community-Led Total Sanitation (Clts) Success: A Case Study of Magarini Sub-County, Kilifi County, Kenya

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Subtheme: Innovative Engineering and Infrastructure Solutions for Sustainable Communities

Abstract

The burden of fecal-oral infections in Magarini Sub-County remains a pressing public health cconcern, aggravated by inadequate sanitation infrastructure. Despite the introduction of Community-Led Total Sanitation (CLTS) by the Ministry of Health, approximately 5.6 million Kenyans still practice open defecation, underscoring the urgent need for effective sanitation interventions. This study assessed the extent of available sanitation infrastructures that can facilitate the successful implementation of CLTS in Magarini Sub-County. A convergent research design was employed, with quantitative data collected through structured questionnaires administered to 388 household heads selected via stratified and proportionate simple random sampling. Data analysis was conducted using the Statistical Package for Social Sciences (SPSS) version 25, generating descriptive and inferential statistics to explore the relationships between variables. The study revealed a statistically significant association between location and perceptions of existing sanitation infrastructures (ESI), with a chi-square test value (χ^2) of 66.636, degrees of freedom of 28, and a p-value of 0.000. Cramer's V coefficient of 0.224 indicated a moderate association, highlighting the influence of geographical factors on sanitation infrastructure perceptions. However, no significant relationship was found between financial resources for CLTS implementation (FRAI.CLTS) and necessary infrastructure (NII.CLTS), with a p-value of 0.288. These findings underscore the need for targeted interventions to address infrastructure gaps and improve sanitation conditions in specific locations. The study emphasized the importance of personal savings, agricultural resources, and employment income as critical resources for CLTS implementation. It recommended sustainable funding mechanisms, community engagement, and government support to enhance the long-term success of CLTS. Policymakers and stakeholders can leverage these insights to design localized strategies that address the unique sanitation needs of different communities within Magarini Sub-County. Further research is recommended to explore additional factors such as household income and education to gain a deeper understanding of the infrastructure requirements for successful CLTS implementation.

Keywords: *Sanitation infrastructure, CLTS implementation, Financial resources, Geographical factors, Magarini Sub-County.*

159. Solar-Powered Sound-Activated Automated Scarecrow for Smart Crop Protection

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Subtheme: Innovative Engineering and Infrastructure Solutions for Sustainable Communities

Abstract

Pest invasions by birds, wild animals, and unauthorized human activity continue to pose a major threat to agricultural productivity, leading to substantial economic losses. Traditional scarecrow methods, which rely on static structures, have proven increasingly ineffective as pests adapt over time. This study presents the development of a solar-powered, sound-activated automated scarecrow designed to enhance pest deterrence through intelligent, dynamic responses. The system utilizes a sound sensor to detect pest-related vocalizations and subsequently triggers a coordinated set of deterrent actions. These include the movement of flapping arms, rotation of a head fitted with LED lights, emission of alarming sounds through a speaker, and RGB LED illumination. All components are controlled by servo motors to simulate lifelike, unpredictable behavior. A prototype was designed, built, and tested under field conditions. The system consistently responded to pest activity by activating its deterrent features and sustained these actions as long as the triggering audio signals persisted. The results demonstrate the system's potential as a sustainable, cost-effective, and scalable solution for pest management in smart agriculture. This work contributes to the advancement of precision farming technologies by integrating renewable energy, automation, and responsive control strategies for crop protection.

Keywords: Automated scarecrow, Sound-activated deterrent, Solar-powered system, Smart agriculture, Precision pest control

160. Design, Fabrication and Performance Analysis of a Mixed Mode Solar Dryer for Black Soldier Fly Larvae

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Subtheme: Innovative Engineering and Infrastructure Solutions for Sustainable Communities

Abstract

The use of black soldier fly (BSF) for organic waste conversion and as an alternative source of animal feeds is sustainable and gaining momentum. The flies are easy to rear and the larvae is a rich source of crude protein, fatty acids, amino acids and vitamins that are important components in poultry, pig and fish feed. Prior to processing, the larvae must be dried up. This research is focused on the design, fabrication and performance analysis of a mixed mode solar dryer for black soldier fly (BSF) larvae. The fabricated mixed-mode solar dryer comprised two main parts: a solar collector and a drying chamber equipped with three trays. A sample containing 750g of BSF larvae were immobilized and dried to a constant mass of 302 g within three days. The maximum drying temperature attained during the drying process was 61℃, which corresponds to the highest intensity of solar radiation (833W/m^2) recorded at the experiment site 12.00 noon. The highest efficiency of the solar collector was 57.58% at 12.00 pm while the lowest collector efficiency was 33.9 % at 9:00 am.

Keywords: Solar dryer, Black soldier fly, performance, Efficiency, Solar Radiation

161. Economic Feasibility of Cobalt in Macalder Mines Migori County - Foundation for Wealth Creation and Employment Opportunities

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Subtheme: Innovative Engineering and Infrastructure Solutions for Sustainable Communities

Abstract

Minerals are a natural wealth to a country which if well managed, can be a powerful engine for economic growth for a country. Mineral extraction and processing can create jobs, generate revenue through taxes and royalties, and attract investment. Their exports can boost a country's foreign exchange earnings, assist in the financing of imports and strengthen its currency. Mineral wealth can be used to fund infrastructure projects like roads, railways, and ports, which can further promote economic development. And lastly mineral revenue can be used to invest in education, healthcare, and other social programs, contributing to a more developed and prosperous society. In the developed countries, they are the principal basis for all the above. Job opportunities are generated right from the source where they are extracted through primary processing, followed by secondary processing and finally value addition to hundreds of different types of products. Many products including high-value are known to be produced from minerals. These high-value products have created wealth for all the developed countries and are still doing so today. For this reason, minerals and their value added products in conjunction with other sources of wealth, are used to determine the Gross Domestic Product of a country. The starting point for mineral extraction and processing is the feasibility study which will determine the value of the mineral. Deposits of some the rare high-value minerals have been discovered in Kenya in recent times. Some of these minerals are Cobalt, Lithium, Titanium and Coltan (niobium and tantalum). These minerals are today being used to manufacture high value and state-of the-art products for the global market in some countries especially in the developed countries. Products from these minerals include rechargeable batteries for electric vehicles and cell phones, parts of jet engines and for industrial processes. These minerals which high value and extensive benefits are the reason Kenya needs to venture into this sector. The economic benefits are overwhelming, including thousands of jobs created from them. Cobalt is one such minerals that need value addition. Its economic value and wealth creation is enormous. The total revenue from the deposits in Macalder mines in Migori with a total deposit of 105 Million tons is worth $ 3.156825 Trillion or Ksh. 404.0736 Trillion. This amount is for raw Cobalt before refining. This figure is only for raw Cobalt if sold to the world market. The figure would be high if high value products are made from the minerals including thousands of jobs.

Keywords: *Cobalt, Economic feasibility, Wealth Creation, rechargeable batteries*

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