Book of Abstract

UNIVERSITY OF THE GREEN LAND

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Dilla University

THE 14th ANNUAL NATIONAL RESEARCH CONFERENCE

Grand Theme:
Research for Societal Transformation: From Insight to Action

April 3 – 4, 2025

Dilla, Ethiopia

ETHIOPIAN JOURNAL OF ENVIRONMENT AND DEVELOPMENT (EJED)

Aims and Scope

The Ethiopian Journal of Environment and Development (EJED) is hosted by Dilla University and has proved to be an exciting forum for understanding and advancing our knowledge and implementation of environmentally resilient sustainable development.

Sustainable development is now of primary importance as the key to future use and management of finite world resources. It recognizes the need for development opportunities while maintaining a balance between these and the environment.

EJED is a multidisciplinary journal covering all aspects of the complex interactions that occur between development and the environment. Its purpose is to seek ways and means for achieving sustainability in all human activities and the environment aimed at such development. The journal welcomes scientific research papers, review papers, and discussion papers dealing with environmental sustainability issues from fields such as the biological sciences, agriculture, forestry, geology, meteorology, energy, food sciences, soil and water sciences, geography, nutrition, physical sciences, politics, economics, law, and other related fields. The journal particularly welcomes papers that highlight more than one dimension of the nexus between environment and development.

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BOOK OF ABSTRACTS

THE 14th ANNUAL NATIONAL RESEARCH CONFERENCE

UNDER THE GRAND THEME
"RESEARCH FOR SOCIETAL TRANSFORMATION: FROM INSIGHT TO ACTION"

Organized by Research, Publication, Ethics and Dissemination Directorate

UNIVERSITY OF THE GREEN LAND

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Dilla University

April 3-4, 2025

Dilla, Ethiopia

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Welcoming Address from the Vice President for Research and Technology Transfer

Dilla University (DU) hosts an annual research conference as part of its mission to disseminate knowledge and promote academic excellence. On April 3, 2025, the university proudly convened its 14th Annual National Research Conference, bringing together scientists, policymakers, researchers, and stakeholders to share insights on sustainable development and research outcomes. The conference featured a keynote speaker, presentations from distinguished researchers, and interactive discussions with various stakeholders, creating a vibrant platform for interdisciplinary collaboration.

The theme of this year's conference, *"Research for Societal Transformation: From Insight to Action,"* sought to bridge the gap between research outcomes and actionable policies, aligning with DU's institutional vision. As a leading applied sciences university, DU emphasizes Agriculture, Natural Resources Management, Health, and Education. The conference succeeded in fostering dynamic exchanges between decision-makers, scientists, young researchers, private sector representatives, and local community members. These interactions shaped future research agendas and strengthened strategic partnerships, bolstering the transformation of researchers and institutions with a focus on internationalization. This was particularly beneficial for DU's dedicated and energetic faculty.

I am pleased to share that research initiatives and the application of their outcomes at DU are conducted with strict adherence to lawful and ethical management practices. To address potential ethical challenges associated with institutionally funded research, DU employs a rigorous review process, engages external reviewers, and utilizes advanced tools such as the TURNITIN similarity-checking software.

Furthermore, to elevate the visibility of our scholars and institution, as well as to foster international collaborations and partnerships, DU has achieved certification for the functionality and standards of its institutional systems. A key highlight of our achievements is the prestigious Gold-Level Good Financial Grant Practice (GFGP) Certification. This recognition significantly enhances DU's credibility in managing international grants, solidifying its reputation as a reliable and exemplary research institution.

Recognizing the interplay between social, economic, technological and environmental factors, the conference highlighted the critical role of research in addressing sustainable development challenges. A primary focus was on translating and disseminating key scientific findings nationwide, emphasizing their transformative impact on society. The conference also welcomed valuable feedback and insights from participants and readers of its research outputs, reinforcing its commitment to continuous improvement and inclusivity.

Finally, I extend heartfelt gratitude to the conference organizers, keynote speakers, paper presenters, participants, DU community members, Dilla town administration, and the security team

for their collective efforts in making this event a success. With this, I kindly invite Dr. Elias Alemu, DU's President to deliver his opening remark to the conference.

I thank you!

Habtamu Temesgen (Ph.D., Associate Professor)
Vice President, Research & Technology Transfer
Dilla University

Opening Remark from the President of Dilla University

It is with immense pleasure and pride that I welcome you all to Dilla University, the University of Green Land, for our 14th National Research Conference, centered on the theme: ***"Research for Societal Transformation: From Insight to Action."*** This gathering signifies our collective commitment to harnessing the power of research to effect meaningful change in our society.

Situated in the Southern part of the country, Dilla University stands as a beacon of academic excellence in the areas of Agriculture, Natural Resources, Health, and Education. Our institution is renowned for its focus on agroforestry, leveraging the diverse climatic zones of our region to pioneer sustainable practices that benefit both our local and global communities. In recognition of this, Gedeo Agroforestry is inscribed as a UNESCO world heritage in which our university professionals play significant roles. This has, in fact, attracted the attention of researchers, policymakers, and practitioners from different walks of life. In this regard, our dedication to applied research ensures that the knowledge we generate directly addresses real-world challenges, embodying our mission to bridge the gap between theory and practice. To this end, Dilla University is vigorously working to make its vision and mission a reality through collective leadership, trust, and teamwork.

Ladies and gentlemen;

We are also privileged to be located within the catchment area of the famed Yirgacheffe coffee, internationally acclaimed for producing some of the finest coffees in the world. The unique combination of altitude, climate, and rich soil imparts distinctive floral and fruity notes to the Yirgacheffe coffee, making it a cherished brand among coffee connoisseurs globally. This regional treasure not only contributes to Ethiopia's rich cultural heritage but also plays a vital role in the local economy, reflecting the profound connection between our natural resources and societal well-being. I, therefore, invite you to enjoy world-class coffee brands while you stay here at Dilla University and Dilla town. In the meantime, coffee might be your point of discussion to enrich its production, value-chain and change the livelihood of our society through applied research. In addition, Science and technology, health-related issues, Language and culture, population dynamics, governance and indigenous knowledge could be discussed on.

These all will significantly contribute to the holistic development that our country demands. I, once again congratulate you as you are the parts and parcel of this important event both as academicians to sustain the development and the prosperity we aspire for.

Las but not least, I extend my heartfelt gratitude to all our distinguished guests who have honored us with their presence. Your participation enriches our discourse and inspires us to strive for greater heights.

A special thank also goes to the organizing committee members, whose unwavering dedication and meticulous planning have made this conference possible. Your efforts behind the scenes ensure that we can come together to share knowledge and inspire action.

As we embark on this conference, let us remember that the true measure of research lies not only in the knowledge it generates but in the positive transformation it brings to society. May our discussions over the coming days be fruitful, our collaborations be enduring, and our resolve to effect change be unwavering.

With this, I declare that this conference is officially convened and I wish you all a nice time for academic discourses, debates, and arguments for the common good of our society and our country at large.

Thank you all,

Dr. Elias Alemu, President of Dilla University

April 3rd, 2025

Dilla, Ethiopia

Multiple Indices Based Agricultural Drought Assessment in Guba Lafto and its Environs, Northern Ethiopia

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Abstract

Agriculture is one of the sectors most adversely affected by drought and is heavily dependent on rainfall. This study employs multiple drought indices to detect and characterize agricultural droughts in Guba Lafto and its surrounding areas in Northern Ethiopia. We utilized remote sensing data products from two Moderate Resolution Imaging Spectroradiometer (MODIS) datasets (MOD13Q1 and MOD11A2), soil moisture data from the Soil Moisture Active Passive (SMAP) datasets, and rainfall data from the Climate Hazard Group Infrared Precipitation with Stations (CHIRPS) to generate six different indices: the Normalized Difference Vegetation Index (NDVI), Land Surface Temperature (LST), Vegetation Condition Index (VCI), Temperature Condition Index (TCI), Vegetation Health Index (VHI), Soil Moisture Condition Index (SMCI), and Standard Precipitation Index (SPI). All six indices indicated that there was no year free from drought during the study period. Notably, severe to extreme drought conditions were recorded in 2013 and 2014, with 2015 being the most severe year, affecting over 65% of the area. The analysis of the 1-month SPI revealed that during the dry year of 2015, the study area experienced mild to extreme dry conditions (SPI < 0) due to low rainfall during the growing season. Furthermore, significant positive correlations were found between monthly VCI and TCI, VHI and 1-month SPI, and SMCI and 1-month SPI for both the dry (2015) and wet (2018) years. Conversely, NDVI and LST showed a negative correlation (r/p = -0.505/0.000 to r/p = -0.717/0.000) within the study area. By integrating these indices, we produced a map of agricultural drought severity, indicating that 78% and 21.97% of the study areas were under mild and moderate drought, respectively, throughout the study period. The findings provide valuable insights for stakeholders and decision-makers in the agricultural sector, aiding in the development of effective mitigation and adaptation strategies to address future droughts in the region.

Keywords: Agricultural drought, MODIS dataset, Soil moisture, Multiple drought indices, Guba Lafto and Its Environs.

Measuring Household Resilience to Food Insecurity: A Case of Rural Northern Ethiopia using the RIMA and TANGO Approach Perspectives

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Abstract

Measuring household resilience to food insecurity is essential as many regions confront increasing challenges in this area. Ethiopia, particularly the Mekiet district in the Amhara region, is highly vulnerable to food insecurity. This study examined rural household resilience in Mekiet by comparing two common resilience measurement approaches: RIMA (Resilience Index Measurement and Analysis) and TANGO (Technical Assistance to Non-Governmental Organizations). Data analysis employed factor analysis and structural equation modeling. The RIMA approach indicated that adaptive capacity, assets, and social safety nets had significant negative values (-1.45, -0.66, and -0.99, respectively), while access to basic services exhibited a significant positive value (1). In contrast, the TANGO approach revealed strong positive loadings for absorptive and adaptive capacities (0.98 and 0.79, respectively), while transformative capacity showed a significant negative loading (-0.78). Both RIMA and TANGO methods produced similar household resilience capacity indices (0.54 and 0.51, respectively). Households with better access to resilience dimensions in either method were found to be more resilient to food insecurity. The study recommends implementing resilience-building programs at both the district and household levels to enhance food security resilience.

Keywords: Resilience, Food insecurity, Rural household, Mekiet, Asset, Factor analysis, Structural equation modeling.

The Role of Enset Based Farming Systems in Enhancing Carbon Stocks: Insights from Central Regional Ethiopia

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Abstract

Enset-based farming systems play a crucial role in supporting food security and climate change mitigation by providing essential ecological services. However, comprehensive understanding of the livelihood benefits and carbon stock potential of these systems in Ethiopia remains limited. This study investigated biomass, biomass carbon, and soil organic carbon within Enset-based farming systems in Central Regional Ethiopia. Data were collected from 45 farms, estimating total above-ground and below-ground biomass (t ha^{-1}) for fruit trees, Enset, and coffee plants. Soil samples were taken from depths of 0-20 cm and 20-40 cm at four corners and the center of each 10×10 m plot, then composited by layer for soil organic carbon analysis. The study revealed that mean above-ground biomass ranged from 79.6 to 257.7 t ha^{-1}, while below-ground biomass ranged from 34.7 to 74.4 t ha^{-1}. The highest carbon stock was observed in systems containing Enset, coffee, and fruit trees, while the lowest was found in Enset-dominated farming systems. Although no statistically significant differences were noted in soil organic carbon stocks among the three Enset-based systems, the carbon stocks were higher than those reported for some tropical forests. Additionally, Enset farming systems exhibited significantly greater soil organic carbon content compared to adjacent crop fields, indicating their substantial potential to contribute to climate change mitigation. The findings of this study can inform the design of more effective policies and promote sustainable farming practices.

Keywords: Biomass, Carbon stock, Enset, Enset based farming system, Central regional Ethiopia.

Bacterial Halo Blight of Coffee (Pseudomonas coronafaciens pv. garcae) Epidemic and Characterization of the Pathogen in Gedeo Zone, Southern Ethiopia

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Abstract

Bacterial halo blight (BHB) of coffee, caused by Pseudomonas coronafaciens pv. garcae, is the most damaging disease affecting coffee in the Gedeo zone, resulting in substantial yield losses. To update the status of the disease, a survey was conducted over two consecutive years in five districts of the Gedeo zone to assess the distribution of BHB and characterize the causal pathogen using cultural and biochemical methods. The assessment was carried out in 125 fields across Gedeb, Yirgacheff, Wonago, Dilla Zuria, and Kochere districts. Disease incidence and severity indices were computed. The causal pathogen was characterized culturally, and 16 bacterial isolates were further confirmed biochemically. The results revealed that BHB was prevalent in all assessed peasant associations, with varying degrees of intensity. The disease incidence ranged from 30.67±2.67% to 89.56±8.03% in 2021, and from 36.67±11.55% to 88.36±1.98% in 2022. The severity index ranged from 20.95±9.45% to 58.17±6.41% in 2021, and from 26.6±5.57% to 53.75±8.15% in 2022. The results indicated that as altitude increased, both disease incidence and severity index also increased (p < 0.001). Additionally, the coffee cultivars grown in the study area exhibited different reactions to BHB. The mean maximum severity rating score was noted in cultivar Wolisho (7.4%), while cultivars 74110 and 74112 had a minimum score of 1.4%. The study further confirmed the presence of Pseudomonas coronafaciens pv. garcae through cultural and biochemical testing, marking the first report of this pathogen from Gedeb and Kochere districts in the Gedeo zone. These findings highlight the need for further epidemiological studies of this pathogen and for the development of effective coffee breeding strategies.er feasible managements for Pseudomonas coronafaciens pv. garcae control.

Keywords: Bacterial halo blight, Coffea arabica, Incidence, Severity and Pseudomonas coronafaciens pv. garcae.

The Role of Traditional Coffee Management in Woody Species Diversity and Climate Change Mitigation Through Live Carbon Storage in Ilu Abba Bora Zone Ale District, Southwest Ethiopia

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Abstract

Many tropical countries, including Ethiopia, have experienced significant forest loss, with remaining patches often existing as various coffee forest management systems. These systems include semi-forest coffee and forest coffee, where forest areas are simultaneously protected and managed for coffee production. The objective of this study was to explore the role of traditional coffee management in climate change mitigation and woody species diversity. A total of 60 plots, each measuring 20 m by 20 m, were surveyed using stratified random sampling techniques. All individuals with a diameter at breast height (DBH) of 5 cm or greater and a height of 2 m or more were measured using diameter tapes and clinometers. The data were analyzed using descriptive statistics and one-way ANOVA. The survey recorded a total of 67 species across 41 families and 52 genera, with diversity indices of 1.877, 2.677, and 2.252 for home gardens, semi-forests, and nearby natural forests, respectively. The live carbon stock was measured at 66.4 t/ha in home gardens, 81.92 t/ha in semi-forest coffee, and 116.29 t/ha in the nearby forest, resulting in an average CO_2 stock of 323.7 t/ha for the study area. The ANOVA comparison, with a p-value of 0.416, indicated no significant difference in carbon stock among the three forest management methods. Farmers in the Ale district demonstrate a strong cultural practice of protecting and managing forests as shade trees, which significantly contribute to woody species diversity and climate change mitigation. Government bodies should recognize and support such traditional practices that promote biodiversity conservation and climate change adaptation.

Keywords: Ale district, Semi forest, Garden coffee, Nearby natural forest and live carbon

Evaluation of Selected Medicinal Plant Extracts against Protoscoleces of Hydatid Cysts from Animals Slaughtered at Asella Municipal Abattoir

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Abstract

Hydatidosis is a significant neglected zoonotic parasitic disease caused by the larvae of Echinococcus granulosus. There is a need for the development of new, effective protoscolecidal agents that act quickly without side effects, as an alternative to conventional chemotherapeutic agents. This study aimed to assess the in vitro efficacy of methanolic extracts from the leaves and flowers of Hagenia abyssinica, cloves of Allium sativum, and roots of Zingiber officinale on the mortality of hydatid cyst protoscoleces. An experimental study design was conducted using a purposive sampling method on hydatid cyst protoscoleces collected from animals slaughtered at the Asella municipal abattoir. Individual and combined extracts were prepared at three concentrations (25 mg/ml, 50 mg/ml, and 100 mg/ml) using normal saline. The minimum protoscolecidal concentration was determined by mixing higher and lower concentrations of the serially diluted plant extracts. The mean mortality rate was assessed after various incubation times (15 min, 30 min, 45 min, 1 hour, and 2 hours). The protoscolecidal activity of A. sativum reached 100% at 45 minutes, which was higher than that of the other individual plant extracts. Notably, the combined extracts of A. sativum with Hagenia flowers achieved a 100% mortality rate at just 15 minutes, demonstrating the highest scolicidal activity compared to other extracts and the positive control (Albendazole). The study indicated that the combined extracts of A. sativum and H. abyssinica at a 15-minute incubation time resulted in a 100% mortality rate at a concentration of 96.87 mg/ml, marking it as the lowest effective protoscolecidal concentration. These findings highlight the protoscolicidal activity of A. sativum and its combination with H. abyssinica, paving the way for future research. Further studies are needed to evaluate the toxicity of the extracts and conduct in vivo investigations to confirm the in vitro scolicidal effects.

Keywords: Albendazole, A. sativum, H. abyssinica, E. granulosus, Protoscoleces, Z. officinale

Evaluation of Enset (Ensete ventricosum) Clones for Reaction against Pathogenic Xanthomonas campestris pv. musacearum Isolates from Southwestern Ethiopia

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Abstract

Enset (Ensete ventricosum) bacterial wilt (EBW), caused by Xanthomonas campestris pv. musacearum (Xcm), poses a significant threat to enset production in southwestern Ethiopia. This study aimed to determine the pathogenicity of Xcm isolates and select enset clones resistant to these pathogenic isolates collected from the study areas. A total of 30 Xcm isolates were subjected to pathogenicity tests on a susceptible enset clone, Yeko, under controlled conditions at temperatures of 25-30 °C during the day and 15-18 °C at night. All isolates were found to be pathogenic. From the 30 pathogenic isolates, three were selected to represent three altitude groups: lowland (1470 m.a.s.l.), midland (1938 m.a.s.l.), and highland (2360 m.a.s.l.). In the clonal evaluation trial, 15 enset clones (13 local clones, along with a tolerant and a susceptible check) were assessed over two years (2017 and 2018) under screen house conditions at the Tepi National Spice Research Center, southwestern Ethiopia. The treatments were arranged factorially in a completely randomized design (CRD) with three replications. An aliquot of 10 mL of bacterial cell suspension at a concentration of 1×10^8 cfu/mL was inoculated into the second innermost leaf petiole of enset using a sterile hypodermic syringe. Data were collected starting 15 days after inoculation (DAI) on the incubation period (IP), disease incidence (DI), percentage severity index (PSI), days to complete wilting/death (DD), area under the disease progress curve (AUDPC), and disease progress rate. Analyses of variance for IP, DI, DD, and AUDPC revealed significant differences ($p \leq 0.05$) among the tested enset clones, while significant differences for PSI were observed in the interaction effect of enset clones and bacterial isolates. Disease incidence ranged from 0 to 90%, with IP ranging from 0 to 23 days. The days to complete wilting for the susceptible clone reached up to 63 days, while AUDPC values ranged from 0 (for Gudiro, Maziya, and Nobo) to 3190%-days (for Arkia, Ataro, Chikaro, Ogisso, and Yeko). Disease progress rates varied from -0.00165 to 0.04398 units per day. The clones Gudiro, Maziya, and Nobo exhibited resistant or tolerant reactions to EBW, while Arkia, Ataro, Chikaro, Ogisso, and Yeko were the most susceptible. Based on these results, it is recommended that additional enset clones be evaluated across different agro-ecological areas over time to identify those with stable resistance to the disease. Furthermore, clone selection should consider adaptability, as well as quantitative and qualitative yield traits, to enhance adoption and promote sustainable production and productivity.

Keywords: AUDPC, Disease progress rate, EBW, Incidence, Incubation period PSI, Severity, Yield traits

Impact of Climate Change on River Hydromorphology: The Case Study of the Upstream Abay (Blue Nile) Channel, Ethiopia

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Abstract

This study examined the impact of climate change on river morphology in the upstream Blue Nile River channel in Ethiopia. The analysis utilized data on rainfall, temperature, river flow, lake levels, sediment, satellite imagery, and the CMIP6 simulation dataset (2030-2090). The Mann–Kendall trend test, Sen's slope estimator, R Packages, and ArcGIS were employed to analyze the hydroclimatic and morphological data. The rainfall data indicated that over 63% of the monitoring stations experienced increasing trends, while some stations reported decreasing annual rainfall patterns. Temperature data confirmed that all stations exhibited upward trends. Flow from the four tributary rivers to Lake Tana showed a strong correlation with rainfall; however, monthly rainfall was only weakly correlated with monthly flows of the Abbay River and Lake Tana water levels. Inflow from major tributary rivers had a moderate correlation with Abbay River flows and Lake Tana water levels, although the correlation strength diminished following the construction of the Chara-Chara Weir. Morphological analysis revealed significant changes in stream channel width between upstream and downstream reaches. Specifically, the channel width is decreasing in the upstream areas while expanding downstream. From 1978 to 2021, the channel area changed by 2.83 km² (16.62%) over 43 years. Under both the SSP4.5 and SSP8.5 scenarios, rainfall is projected to decrease and the average annual temperature is expected to significantly increase from 2030 to 2090 ($p < 0.05$). Overall, the annual rainfall trend in the upstream Abbay River catchment is highly variable, leading to significant changes in river hydro-geomorphology. Therefore, careful monitoring and management are essential to mitigate potential adverse changes in the river system.

Keywords: Climate change, River flow, Lake-level, Channel morphology

Plasmodium Falciparum Histidine Rich Protein 2/3 Gene Deletions Status by a Highly Sensitive and Novel Digital Polymerase Chain Reaction Among Febrile Patients at Dilla Zuria Woreda Health Facility, South Ethiopia

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Abstract

Background: Plasmodium falciparum parasites with deletions of the hrp2 gene lead to false-negative results in rapid diagnostic tests (RDTs), posing a significant threat to the accurate clinical diagnosis of febrile patients. The widespread distribution of parasites with hrp2 deletions presents a new challenge for malaria control and elimination efforts.

Objective: To determine the prevalence of Plasmodium falciparum Histidine Rich Protein 2/3 gene deletions among febrile patients at the Dilla Zuria woreda health facility in South Ethiopia.

Methods: A health facility-based cross-sectional study was conducted from September to November 2024, involving 384 malaria-suspected febrile patients at the Dilla Zuria woreda health facility. Finger-prick blood samples were collected for malaria diagnosis using microscopy, RDT, and quantitative polymerase chain reaction (qPCR). Digital polymerase chain reaction (dPCR) was utilized to detect the deletion status of the Plasmodium falciparum HRP 2/3 genes.

Results: Among 99 CareStart RDT-negative samples, Pfhrp2 and Pfhrp3 exon 2 gene deletions were observed in 23.2% (46/198) and 27.7% (55/198) of the PCR-positive samples, respectively. Double deletions in pfhrp2 and pfhrp3 were detected in 13.1% (26/198) of the PCR-positive samples.

Conclusion and Recommendations: The prevalence of Pfhrp2/3 gene deletions at the Dilla Zuria woreda health facility exceeds the 5% threshold, rendering HRP2/3-based rapid diagnostic tests unreliable for malaria diagnosis in this area. This study confirms a 13.1% rate of pfhrp2/3 gene deletions, indicating the need for alternative diagnostic tools, such as Pf-pLDH, in the region. A further nationwide survey on the prevalence of hrp2/3 gene deletions is crucial.

Keywords: Plasmodium falciparum, Histidine Rich Protein 2/3, dPCR, Ethiopia

Excessive Screen Time and its Associated Factors Among Under-five Children in Woliso City Administration, Central Ethiopia: A Community-based Cross-sectional Study

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Abstract

Background: Screen time refers to the amount of time an individual spends daily using screen devices. Excessive screen time leads to sedentary behaviors and negatively impacts various aspects of developmental health. Despite the increasing availability and accessibility of screen devices, there has been limited attention given to this issue both globally and locally, particularly in Ethiopia.

Objective: This study aimed to assess excessive screen time and its associated factors among children under five years of age in Woliso City Administration, Central Ethiopia.

Methods: A community-based cross-sectional study was conducted from January 10 to February 30. Guardians of under-five children were selected using systematic random sampling. Data entry was performed using EpiData version 3.1, and analysis was conducted with Statistical Product and Service Solutions (SPSS) version 25.0. Findings were presented using in-text narratives, tables, and graphs. Binary logistic regression analysis was utilized to identify factors associated with excessive screen time, with the adjusted odds ratio (AOR) and p-value < 0.05 indicating statistical significance.

Results: Of the 506 study participants approached, 498 responded. Approximately 75.9% (CI: 71.9, 79.6) of participants reported excessive screen time. Significant factors associated with excessive screen time included: father's age ≥ 30 years (AOR 0.225, CI: 0.080, 0.630), mother's age (AOR = 1.775, CI: 1.045, 3.015), child's age ≥ 24 months (AOR 0.464, CI: 0.251, 0.858), parental supervision (AOR 4.329, CI: 1.367, 13.71), parental perception of maximum screen time as <60 minutes (AOR 5.894, CI: 2.255, 15.41), parental perception of maximum screen time as 1 hour and above (AOR 4.30, CI: 1.577, 11.743), parental restrictive practices (AOR 0.495, CI: 0.354, 0.691), and the availability of screen devices in the bedroom (AOR 1.869, CI: 1.069, 3.629).

Conclusion and Recommendations: Three out of four children in the area experienced excessive screen time. Factors such as parental supervision, perception of maximum screen time, restrictive practices, and the presence of screen devices in areas where children eat, play, or sleep were identified as modifiable influences on screen time. Therefore, responsible organizations should educate parents to limit children's screen time according to recommended guidelines and encourage regular supervision of young children.

Keywords: Screen time, Screen device, Under-five children, Woliso city

Lived Experience of Unsafe Abortion Among Commercial Sex Workers in Gedeo Zone, Southern Ethiopia: A Phenomenological Qualitative Study

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Abstract

Introduction: Unsafe abortion is a significant cause of maternal morbidity and mortality in low- and middle-income countries. Female sex workers in Ethiopia are particularly vulnerable to unwanted and unplanned pregnancies, often leading to unsafe abortions. In the absence of access to quality abortion care services, the likelihood of experiencing unsafe abortion increases. However, there is limited evidence regarding female sex workers' experiences with abortion services and their exposure to unsafe abortion. This study aimed to explore the lived experiences of female sex workers regarding unsafe abortion.

Methods: The study was conducted among female sex workers in the Gedeo zone of South Ethiopia from April to June 2024. A qualitative, phenomenological design was employed, focusing on female sex workers with a history of unsafe abortion in the past two years. Both establishment-based and street-based sex workers were recruited using a snowball sampling method. Face-to-face in-depth interviews were conducted in locations chosen by the participants to ensure privacy. Data saturation was achieved after interviewing 18 participants. The collected data were transcribed verbatim, translated into English, and analyzed thematically using Open Code 4.03 software. Trustworthiness was maintained throughout the data analysis process.

Results: The findings revealed that poor knowledge of safe abortion services and low socio-economic status are the primary reasons female sex workers seek unsafe abortion services. Unsafe pregnancy terminations were predominantly conducted using commercial medications obtained from private pharmacies and through traditional practices involving herbal and mechanical methods. Many sex workers resorted to self-induced medication abortions and traditional methods, resulting in adverse health, psychosocial, and economic consequences.

Conclusion: This study highlights the lack of information and limited access to safe abortion services for sex workers, leading to unsafe practices and subsequent physical and psychological suffering. Therefore, stakeholders should collaborate to enhance female sex workers' knowledge and access to safe abortion services.

Keywords: Unsafe abortion, Lived experience, Female sex workers, Ethiopia

Ameliorative Potential of Moringa Stenopetala Leaf Extract on Acrylamide-Induced Hepatorenal Toxicity in Rats

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Abstract

Background: Ethiopia is currently undergoing a significant structural transformation and industrialization process. This industrialization has increased exposure to toxic chemicals, such as acrylamide, which pose severe health risks, particularly to factory workers. While synthetic antioxidants can reduce toxicity, they may also have side effects, underscoring the need for safer alternatives. Natural antioxidants are promising due to their effectiveness and lower toxicity. Moringa stenopetala, an herbal plant used in various industries, possesses potent antioxidant properties that may counteract acrylamide toxicity, offering a safer solution to chemical exposure and promoting better health outcomes.

Objective: This study aimed to examine the ameliorative potential of M. stenopetala leaf extract on acrylamide-induced hepatorenal toxicity in rats.

Materials and Methods: Moringa stenopetala leaves were dried, powdered, and extracted with 70% ethanol, then filtered and evaporated. Acrylamide was purchased for the study. Forty rats were divided into four groups of 10 each: Group I received distilled water, Group II was administered acrylamide (15 mg/kg/day), Group III received acrylamide plus M. stenopetala (500 mg/kg/day), and Group IV received M. stenopetala only. After 14 days, the animals were sacrificed, blood samples were collected, and liver and kidney tissues were prepared for histopathological examination. All results were evaluated using one-way ANOVA with SPSS version 26.

Results: In animals exposed to acrylamide, there was a significant reduction in hemoglobin levels (9.8±0.6 g/dL) and red blood cell (RBC) counts (4.4±0.3 million/µL), along with an increase in white blood cell (WBC) levels (11.3±0.7 thousand/µL). Microscopic evaluations revealed severe liver and kidney injuries. However, in animals treated with acrylamide and M. stenopetala leaf extract, hemoglobin and RBC levels increased, WBC counts decreased, and tissue integrity of the liver and kidneys showed improvement.

Conclusion: Moringa stenopetala leaf extract protects blood parameters and liver and kidney tissues from chemical-induced damage, suggesting its potential as a natural therapeutic agent. Consequently, factory workers exposed to chemicals could benefit from its use to mitigate toxicity and safeguard their health.

Community Health Workers (CHWs) Programs in Urban Settings: What is the Best Fit? A Scoping Review

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Abstract

Introduction: With nearly half of the global population residing in urban areas, particularly in Africa and Asia, rapid urbanization presents significant health challenges. Poor living conditions, economic instability, and fragmented healthcare systems contribute to disparities in access to care. Community Health Worker (CHW) programs have emerged as a strategy to address these challenges; however, there is limited guidance on how to effectively design these programs for urban settings.

Objectives: This scoping review aims to (1) identify the distinct features and responses of urban CHW programs, (2) develop a conceptual framework, and (3) propose considerations for improving the implementation of urban CHWs.

Methods: A systematic search of published and grey literature in English (up to May 24, 2024) was conducted using databases such as PubMed and Web of Science. The review adhered to PRISMA-ScR, JBI guidelines, and Arksey and O'Malley's framework. Inclusion criteria focused on CHW programs with urban-specific features. Data were extracted and synthesized into key themes.

Results: Twenty-seven studies met the inclusion criteria: 15 focused on CHW programs and 12 on urban health determinants. Urban-specific factors affecting CHW programs included high population density, linguistic diversity, insecure environments, and fragmented healthcare systems. Key responses identified were the use of peer CHWs, flexible work schedules, targeted outreach, and community engagement. However, barriers such as inadequate infrastructure and low community trust were prevalent. Notable gaps in the literature include a lack of operational strategies for reaching vulnerable groups, integrating CHWs into health systems, and promoting multisectoral collaboration.

Conclusion: Urban CHW programs require tailored approaches to address socio-economic, policy, environmental, and epidemiological challenges. Strengthening integration with health systems, targeting vulnerable populations, and fostering multisectoral collaboration are essential for sustainability. Further research is needed to refine strategies for effective urban CHW implementation.

Keywords: Community health worker, Community health worker programs, Urban health, Urban settings

Nasal Bacterial Colonization, Antimicrobial Susceptibility Patterns, and Risk Factors for Colonization among Cancer Patients at Dessie Comprehensive Specialized Hospital, Northeast Ethiopia

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Abstract

Background: The frequency of nasal bacterial colonization is higher in immunocompromised patients compared to healthy individuals. These colonizing bacteria can potentially lead to infections in cancer patients, particularly as they tend to have weakened immune systems.

Objective: To determine the prevalence of nasal bacterial colonization, antimicrobial susceptibility patterns, and risk factors for colonization among cancer patients at Dessie Comprehensive Specialized Hospital in Ethiopia.

Methods: A hospital-based cross-sectional study was conducted from March 1 to June 30, 2024. Socio-demographic and other relevant data were collected using structured questionnaires and by reviewing patient records. Each nasal swab sample was cultivated on blood agar, chocolate agar, MacConkey agar, and mannitol salt agar at 37°C. Bacterial species were identified using Gram staining, colony morphology, and standard biochemical tests. Antimicrobial sensitivity was tested using the Kirby-Bauer disc diffusion method on Mueller–Hinton agar.

Results: The nasal carriage rate of bacterial isolates was 112 out of 260, or 43.1% (95% confidence interval: 37.7%-49.2%). Among the isolates, Staphylococcus aureus was the most common bacterial species (24.1%), followed by coagulase-negative staphylococci (21.4%), Streptococcus pneumoniae (14.3%), and Pseudomonas aeruginosa (10.7%). The overall rate of multi-drug resistance among nasal bacterial isolates was 46%. Significant risk factors for colonization included a history of hospital admission, smoking, and habits related to nose and hand washing.

Conclusions and Recommendations: Nasal bacterial colonization in cancer patients can lead to significant health issues. The relatively high levels of antimicrobial resistance may reflect the patients' history of hospitalization. It is recommended to implement strict health education and training programs for these patients to help mitigate nasal bacterial carriage.

Keywords: Cancer, Bacterial colonization, Antimicrobial susceptibility, DCSH, Dessie, Ethiopia.

Effect of Pharmacist Facilitated Antimicrobial Stewardship Intervention on Antimicrobial use and Clinical Outcomes in Nigist Eleni Mohammed Memorial Referral Hospital, Southern Ethiopia: A Quasi-experimental Interventional Study

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Abstract

Background: Antimicrobial resistance (AMR) poses a significant threat to global human health. Although pharmacists play an integral role in antimicrobial stewardship (AMS) to combat AMR, there is limited data on their impact in low-resource healthcare settings. This study aimed to assess the effect of pharmacist-facilitated AMS on antimicrobial use and patient outcomes at Nigist Eleni Mohammed Memorial Referral Hospital (NEMMRH) in Southern Ethiopia.

Methods: A prospective quasi-experimental interventional study was conducted from March 2023 to February 2024 at NEMMRH. In the pre-intervention phase, pharmacists audited antibiotic use without providing feedback. During the intervention phase, pharmacists audited prescriptions and offered feedback to the treating team. Descriptive statistics and multivariable logistic regression analyses were performed using SPSS version 26 to present the data and assess factors associated with all-cause mortality. Statistical significance was defined as a p-value < 0.05.

Results: A total of 128 (44.4%) antibiotic prescriptions requiring intervention were identified by the AMS team during the intervention period. Recommendations included discontinuing 71 (24.7%) prescriptions, changing 42 (14.6%), and adding 15 (5.2%) additional antibiotics. The most prescribed antibiotics before and during the intervention phase were Ceftriaxone (175 [60.8%] vs. 211 [73.3%]), Vancomycin (91 [31.6%] vs. 161 [55.9%]), and Azithromycin (82 [28.5%] vs. 83 [28.8%]), respectively. The average duration of antibiotic treatment significantly decreased from 10.02 ± 3.30 days before the intervention to 6.29 ± 2.58 days during the intervention. The days of therapy per 1,000 patient days decreased from 660 ± 139.2 to 539 ± 114.6 during the six-month intervention period. The average number of antibiotics per patient decreased from 2.53 ± 1.12 in the pre-intervention period to 1.93 ± 0.53 during the intervention ($p < 0.000$). All-cause mortality decreased from 10.4% in the pre-intervention phase to 6.9% during the intervention phase. In

multivariable logistic regression analysis, known prior comorbidities were associated with an increased risk of death (AOR 2.60, 95% CI: 1.35, 5.0).

Conclusion: This study demonstrated that pharmacist-facilitated AMS reduced inappropriate antimicrobial use and improved clinical outcomes at Wachemo University Nigist Eleni Mohammed Referral Hospital. The prospective implementation of such programs could enhance patient care and combat antimicrobial resistance.

Unveiling the Full Picture of Malnutrition: Extended Composite Index of Anthropometric Failure among Children Under-5 in Sub-Saharan Africa: In the SDG Era

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Abstract

Introduction: The burden of malnutrition among children under five in Sub-Saharan Africa is a significant public health concern, with traditional indices often failing to capture its multifaceted nature. The Extended Composite Index of Anthropometric Failure (ECIAF) provides a comprehensive measure by integrating weight-for-age, height-for-age, and weight-for-height, addressing the overlap and co-occurrence of stunting, wasting, underweight, and obesity/overweight conditions. This offers a more accurate depiction of nutritional deficiencies. Aligned with the Sustainable Development Goals, the ECIAF serves as a robust tool for health policymakers and public health practitioners to identify high-risk populations, allocate resources effectively, and improve health outcomes for young children in this region.

Objectives: The aim of this study was to assess the burden of ECIAF and its associated factors among children under five years old in Sub-Saharan Africa.

Methods: A community-based cross-sectional study was conducted with a weighted sample of 176,141 children under five years old. Data were drawn from the recent demographic and health surveys of 26 Sub-Saharan African countries. The ECIAF among these children was assessed using a two-stage cluster sampling technique to select participants. Descriptive statistics were computed in terms of frequencies and percentages. A multilevel binary logistic regression model was fitted to identify factors associated with ECIAF in children under five years old. The adjusted odds ratio with its 95% confidence interval (CI) was estimated, with a significance level set at 0.05.

Results: The pooled prevalence of ECIAF among children under five years old in Sub-Saharan Africa was 36% (95% CI: 33% - 40%). Child, maternity, household, and community-level characteristics were significantly associated with ECIAF. Factors included being female, child age, multiple births, short birth intervals, perceived sizes at birth, presence of comorbidities, mother's educational level, parity, place of delivery, antenatal care visits, wealth index, family size, number of under-five children, place of residence, media exposure, and the specific African region.

Conclusions: The pooled prevalence of ECIAF in children under five is high in Sub-Saharan Africa. Key factors associated with ECIAF include child sex, age, type of birth, preceding birth interval, perceived sizes at birth, comorbidities, maternal education, parity, place of delivery, antenatal care visits, wealth index, family size, number of under-five children, place of residence, media exposure, and region. Efforts to reduce the high prevalence of ECIAF in this population should focus on addressing critical child, maternal, household, and community-level determinants. Targeted interventions, including improving maternal education, enhancing access to antenatal care, promoting birth spacing, and improving socioeconomic conditions, are essential to mitigate the risk factors associated with ECIAF.

Keywords: Extended composite index of anthropometric failure, Children under-5, Sub-Saharan Africa, Demographic and health survey.

Panel 03: Technology and Innovation

Identification and Recommendation of Complaint Posts on Social Media Platform using Machine Learning Approach

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Abstract

With the rapid growth of the internet, social media has revolutionized how people communicate, access information, and engage with the world. Traditional news sources have taken a backseat as individuals increasingly rely on digital platforms for real-time updates. This shift has transformed news consumption and provided an open space for people to express their opinions and feedback on various issues. However, the sheer volume of user-generated content presents a significant challenge for organizations attempting to identify and address customer complaints effectively and promptly. Without an efficient system in place, valuable feedback may go unnoticed, leading to unresolved issues and poor service management. To tackle this challenge, our study introduces a machine learning-driven approach for automatically detecting and classifying complaint-related social media posts, streamlining complaint management. The research follows a structured process that includes data collection, annotation, preprocessing, feature extraction, model training, and evaluation. Complaint-related posts were gathered, cleaned, and transformed into numerical representations using advanced techniques such as TF-IDF and word embeddings. Multiple machines learning models, including Naïve Bayes, SVM, and Random Forest, were tested. The Random Forest model, combined with Word2Vec, achieved an impressive accuracy of 98.67% for Amharic text classification. By automating complaint detection, this research offers a scalable and efficient solution for organizations to enhance service quality, improve response times, and build stronger relationships with their customers in an increasingly digital landscape.

Keywords: Social media, Complaint posts, Machine learning, Classification, Detection.

Transforming Linseed Stalk Residue into Crystalline Nanocellulose (CNC): Extraction and Characterization

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Abstract

The improper disposal of agricultural crop residues significantly contributes to greenhouse gas emissions and environmental degradation. Linseed stalk residue, a byproduct of linseed harvesting, is often burned or left in the field, raising environmental concerns. This study developed a multistep extraction process to transform this agricultural waste into value-added materials. First, an optimized water retting process was established for fiber extraction. The extracted fibers were purified into micro cellulose through a chlorine-free sequential treatment and further converted into cellulose nanocrystals (CNC) via acid hydrolysis and post-treatment. The resulting materials were characterized using scanning electron microscopy (SEM), transmission electron microscopy (TEM), X-ray diffraction (XRD), Fourier-transform infrared spectroscopy (FTIR), thermogravimetric analysis (TGA), and viscosity measurements. The optimized retting process, conducted at room temperature for 216 hours, yielded 30% fiber. The purified micro cellulose achieved a 70% yield with 90% purity and an average fiber length of 14.6 ± 6.77 μm. The resulting rod-like CNC exhibited a yield of $79.87 \pm 1.35\%$, with a mean diameter of 7.06 ± 1.95 nm, a length of 66.14 ± 28.58 nm, and an aspect ratio of approximately 10.02 ± 4.87. Further analysis revealed a crystallinity index of 73.29%, a crystallite size of 5.61 nm, an average molecular weight of 2.36×10^4 g/mol, a degree of polymerization of 146, and a peak decomposition temperature of 515 °C. These findings highlight the potential of the extracted CNC as a nanofiller in polymer composites, transforming linseed stalk residue into valuable CNC, contributing to waste reduction, and promoting a circular economy.

Keywords: Linseed stalk residue, Nanocellulose, Extraction, Characterization

Synthesis and Characterization of Coal Ash Reinforced Clay-based Bricks as Construction Materials as Means of Environment Management

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Abstract

Coal ash is a byproduct of coal-burning electricity generation facilities, which have been established in Ethiopia to meet substantial energy demands. Utilizing these byproducts positively impacts the environment by diverting materials from the waste stream, reducing the energy required to process raw materials, conserving natural resources, and lowering pollutant emissions. The purpose of this research was to explore the use of coal ash as a partial substitute for clay in brick production. The production process involved several steps, including raw materials preparation, proportioning and batching, mixing, molding, curing, and drying. The Design-Expert 13.0 software, utilizing a three-level, three-factor Box-Behnken design, was employed to design experiments and analyze results effectively. A total of 17 experiments were conducted under varying conditions: coal ash percentages of 10%, 20%, and 30%; particle sizes of 1 mm, 1.5 mm, and 2 mm; and curing times of 7, 14, and 28 hours. Key brick properties, including flexural strength, compressive strength, density, and water absorption, were examined. The maximum flexural strength of 4.83 MPa and compressive strength of 35 MPa were achieved at the optimal process variables: 10% coal ash, a particle size of 1 mm, and a curing time of 28 hours. The maximum water absorption of the bricks was recorded at 3.95%. The resulting bricks are lighter and exhibit better physicomechanical properties compared to standard bricks, demonstrating their suitability for various construction applications. This study concludes that bricks can be manufactured by partially substituting clay with coal ash, as the fundamental parameters are within the range of commonly reported values.

Keywords: Coal ash, Clay, Bricks, Compressive strength, Water absorption

Synthesis, and Characterization of Graphitic Carbon (GC) Integrated Zinc Oxide (G/ZnO) with Improved Band Gap Energy for Various Optoelectronic Applications

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Abstract

This research focuses on the production of nano-engineered zinc oxide integrated with graphitic carbon (G/ZnO) using the hydrothermal technique for the development of advanced photoanodes. The modification of ZnO reduces the band gap energy, enhancing its optoelectronic properties and improving performance in various optoelectronic applications. A critical evaluation of the band gap is essential for understanding the optical and electronic properties of the incorporated ZnO semiconductor materials. Ultimately, the improved band gap of ZnO opens up new avenues for solar cells and other optoelectronic applications. The optical absorption, crystalline structure, surface adsorption, and morphology of the prepared nanoparticles were analyzed using ultraviolet-visible spectroscopy (UV-Vis), X-ray diffraction (XRD), Fourier-transform infrared spectroscopy (FTIR), and scanning electron microscopy (SEM), respectively. The optical band gap shift was calculated from the absorption spectra using the Tauc plot. The band gap energy of G/ZnO was found to be 2.7 eV and 3.0 eV, depending on graphitic carbon concentrations of 0.57 mole% and 1.71 mole%, respectively. These values indicate a lower energy gap compared to pristine ZnO, which has a band gap of 3.2 eV. This research demonstrates that the modified ZnO nanoparticles' band gap contributes to a better understanding of their optical and electronic properties, paving the way for potential applications in solar cells and other optoelectronic devices.

Keywords: Optical Energy Gap, Nano-engineered Zinc Oxide, Tauc Plot Analysis, Optical absorption, Hydrothermal Synthesis, Solar Cell Applications

Enhanced Flood Simulation using a Novel CNN-ED-DLSTM Hybrid Deep Learning Model in Kulfo Watershed, Ethiopia

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Abstract

Accurate hydrological modeling is essential for sustainable water management, while reliable flood simulation is crucial for public safety and risk mitigation. However, traditional models often struggle to capture the dynamic and heterogeneous nature of hydrological processes, resulting in inaccuracies in flood forecasting. This research evaluates the performance of an advanced deep learning (DL) model that integrates Encoder-Decoder Double-Layer Long Short-Term Memory (ED-DLSTM) networks with one-dimensional Convolutional Neural Networks (CNNs) for flood simulation in the Kulfo Watershed, Ethiopia. This hybrid approach aims to enhance flood simulation accuracy by combining sequence modeling and spatial feature extraction. To assess its performance, two alternative models were considered: ED-DLSTM, which utilizes a stacked LSTM with an encoder-decoder architecture, and a Multi-Layer Perceptron (MLP), a fully connected neural network that serves as a baseline for comparison. The dataset underwent rigorous quality assurance to ensure its integrity and reliability before being split into training (80%) and evaluation (20%) sets. Model performance was evaluated using various graphical and statistical metrics. Results demonstrate that DL models show significant promise for flood simulation, with the CNN-ED-DLSTM model outperforming the others. It achieved a Nash-Sutcliffe Efficiency (NSE) of 0.96, a Root Mean Square Error (RMSE) of 1.41, a Mean Absolute Error (MAE) of 2.85, and a Coefficient of Determination (R^2) of 0.97. The study highlights the importance of input data selection and lag times, identifying precipitation as the most influential predictor. Scenario 4, which prioritized precipitation, achieved the best performance, underscoring the necessity of carefully selected input variables for accurate flood simulation.

Keywords: Deep Learning, CNN-ED-DLSTM, MLP, Flood Simulation

Panel 04: Science for Sustainable Development

Improved Ethanol Production from Pineapple Peel Wastes by Co-culture of Thermo-Tolerant Wild Yeasts under Statistically Optimized Fermentation Conditions

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Abstract

This study aimed to enhance ethanol production from pineapple peel (PAP) hydrolysates using co-cultures of thermotolerant wild yeast species, specifically Saccharomyces cerevisiae and Scheffersomyces stipitis. The process involved hydrolyzing PAP with acid using autoclave steam, followed by fermentation of the peel hydrolysate by the yeasts. Using Response Surface Methodology (RSM), the fermentation conditions—such as temperature, pH, incubation duration, and substrate concentration—were optimized. Ethanol and reducing sugar concentrations were measured using a UV-Vis spectrophotometer and a digital refractometer, respectively. Under optimized conditions, the co-culture of S. cerevisiae 9Li2 and S. stipitis 39L1 increased ethanol production by 17.1%, rising from 26 g/L to 31.35 g/L from sugar concentrations extracted from PAP hydrolysates. The ethanol yield, productivity, and yield efficiency from PAP hydrolysates were found to be 0.39 g/g, 0.87 g/L, and 76.47%, respectively. This research demonstrates the potential to efficiently transform fruit peel waste into bio-ethanol, thereby reducing organic waste in the environment and providing an alternative energy source.

Keywords: Bioethanol, Wild yeasts, Lignocellulosic substrates, Co-cultures

Surface Engineered Cotton Fabric using Ag/CuO Nanocomposites for Enhanced Antibacterial Durability

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Abstract

Fabrics incorporating metal and metal oxide nanoparticles (NPs), particularly their nanocomposites (NCPs), offer promising options for mitigating the spread of microbial infections due to their synergistic antimicrobial properties. These properties depend on the structure and morphology of the nanoparticles, as well as the fiber functionalization process. This study aimed to exploit the antibacterial synergism provided by bimetallic silver and copper oxide (Ag+CuO) NCPs to produce wash-durable antibacterial cotton fabrics. Cotton fabrics (Cot) were modified with L-methionine (Am) and functionalized with silver (Ag) NPs and bimetallic Ag+CuO NCPs. The nitrate salts of Ag and Cu were reduced in situ to form Ag+CuO NCPs sequentially on the surface of AmCot using $NaBH_4$ as a reducing agent. Fourier transform infrared spectroscopy (FTIR) confirmed the chemical modification of the fabrics by Am. X-ray diffraction (XRD) studies revealed the crystallographic structure, purity, and sizes of the Ag NPs and CuO NPs, measuring 30 nm and 12 nm, respectively. X-ray photoelectron spectroscopy (XPS) studies demonstrated successful coordinate bonding of the NPs onto the fabrics. Scanning electron microscopy (FESEM) and energy-dispersive X-ray (EDX) mapping revealed good coverage of NPs on the fabric fibers. The functionalized fabrics exhibited excellent antibacterial activity against E. coli and S. aureus, with laundering durability of up to fifty wash cycles. The antibacterial activity of the Ag+CuO NCPs functionalized fabric was superior due to the synergistic effects of Ag and Cu, compared to the fabric functionalized with Ag NPs alone. Additionally, the change in fabric water absorptivity and vapor permeability characteristics after functionalization was approximately 11%, which is acceptable regarding essential properties and comfort.

Keywords: Cotton fabric, L-methionine binder, Ag nanoparticles, Ag+CuO nanocomposite particles, Immobilization, Antibacterial durability.

A Caputo Fractional Order Modeling and Analysis for the Dynamics TikTok Social Media Addiction

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Abstract

The widespread use of social media platforms has created new opportunities for entertainment and social interaction, but it has also led to a growing tendency toward addiction among users. Among these platforms, TikTok has emerged as a significant player, captivating millions of users worldwide with its short-form video content. Understanding the dynamics of addiction to TikTok is crucial for mitigating its adverse effects on mental health and well-being. The fractional order model is an effective tool for capturing the non-local behaviors and memory effects that characterize TikTok addiction dynamics. The objective of this study is to develop and analyze a Caputo fractional order model for the transmission dynamics of TikTok addiction. By applying the Caputo operator, fixed point theorems were used to examine the existence and uniqueness of the model's solutions. The basic reproduction number was calculated using the next-generation matrix. Locally asymptotically stable equilibrium points (both endemic and addiction-free) were identified for the model. Additionally, a global stability analysis of the equilibrium points was performed using the Lyapunov function. The forward normalized sensitivity index was utilized to determine which factors are most sensitive and crucial for managing TikTok addiction. To verify the analytical conclusions, a numerical simulation of the TikTok addiction model was generated using the fractional Adam-Bashforth-Moulton method. The findings from our study provide valuable insights for developing effective intervention strategies to address TikTok addiction and promote healthier digital habits.

Keywords: Social media TikTok addiction, Modeling, Caputo fractional order, Numerical simulation.

Benefits of Small-Scale Biogas Digesters: A Comparative Study of Adopters and Non-adopters in Ada'a District of East Shawa Zone, Oromia, Ethiopia

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Abstract

In the highlands of Ethiopia, extreme fuel wood scarcity has arisen due to deforestation, leading to a widespread shift toward using agricultural waste, such as straw and dung cakes, for household energy. This transition has disrupted nutrient recycling in farmlands and increased exposure to critical indoor air pollution. The main objective of this study was to assess the multiple benefits that users of small-scale domestic biogas digesters derive compared to non-users. The Kitchen Performance Test was employed to determine the amount of biomass fuel saved by adopting small-scale biogas digesters in comparison to non-users. An independent T-test was utilized to compare biomass fuel consumption rates between adopters and non-adopters. Descriptive statistics, including tables, frequencies, and graphs, were also used. Qualitative data obtained through field observations and interviews were analyzed narratively. The study revealed a significant reduction in straw and dung cake consumption by adopters of small-scale biogas digesters, averaging 2423 ($\pm$18) kg per year ($P < 0.01$) compared to non-adopters. This indicates that adopting biogas digesters enhances the availability of agricultural waste for application to farmland. Additionally, the bioslurry produced from the biogas digesters serves as a superior organic fertilizer, reducing reliance on and costs associated with chemical fertilizers. Biogas adopters also appreciated the clean nature of biogas energy, which significantly reduced indoor air pollution. However, several factors constrained the uptake of biogas digesters, including disinterest, low awareness of their benefits, lack of access, and limited financial capacity to cover installation costs. To enhance the adoption of biogas digesters, it is highly recommended to provide awareness training on their benefits and improve access to spare parts.

Keywords: Adopters, Agricultural waste, Bioslurry, Biogas Digester, Dung cake

Fabrication of Eu3+ Substituted Ni-Zn Spinel Ferrite-reduced Graphene Oxide Nanocomposite for Photocatalysis under Visible Light Irradiation

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Abstract

In the industrial sector, productive and effective treatment of toxic dye-based color pollutants is a key issue. In this study, nanocrystalline, Ni0.75Zn0.25EuxFe2-xO4, and their composite with rGO were synthesized by sol-gel auto-combustion and ultrasonication routes respectively. XRD, FT-IR, HRTEM/SAED, EDX, BET, XPS and UV-DRS analysis were conducted to confirm the formation of the synthesized samples. The XRD pattern analysis confirmed the formation of face centered cubic structure of spinel ferrite. Reduced graphene oxide synthesized by Tour's method was used as a substrate to fabricate the composite of Ni0.75Zn0.25EuxFe2-xO4 spinel ferrite. The polycrystaillinity and dispersion of ferrite nanoparticles over the surface of rGO was confirmed by TEM/SAED analysis. The composition and purity of the fabricated samples were also analyzed using EDX and XPS analysis. The photocatalytic activity of the Ni0.75Zn0.25Eu0.06Fe1.94O4@rGO NCs was investigated comparatively with Ni0.75Zn0.25Eu0.06Fe1.94O4 nanoparticles. As compared to the nanoparticles the synthesized Ni0.75Zn0.25Eu0.06Fe1.94O4@rGO NCs exhibited excellent photocatalytic efficiency for degradation of binary dyes (MB and MO) in the aqueous solution of their mixture. After visible light irradiation for 40 min 97% of MO and 92% of MB dyes were removed by using Ni0.75Zn0.25Eu0.06Fe1.94O4@rGO NCs, whereas 82% of MO and 75% of MB dyes were removed by Ni0.75Zn0.25EuxFe2-xO4 nanoparticles. The effect of various factors including: pH, catalyst dosage, initial dye concentration was also explored. The excellent photocatalytical performance for simultaneous degradation of binary organic pollutants, the NZEF@rGO NCs possess high potential for their practicability.

Keywords : Eu substitution, Ni-Zn spinel ferrite, rGo nanocomposite, organic dyes, photocatalysis.

Responses of Ecosystem Services Value to Land Use/Land Cover Changes: The Case of Koore's Agricultural Landscape of Southern Ethiopia

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Abstract

Changes in land use and land cover (LULC) have led to the loss of ecosystem services (ES). This study aimed to analyze the responses of ecosystem service value (ESV) to changes in LULC in Koore's agricultural landscape (KAL), Southern Ethiopia. Geospatial analysis tools were employed to identify LULC trends, and a CA-Markov model was used for change prediction. ESV was estimated monetarily using the ES coefficients from Costanza et al. (2014) through the benefit transfer method. The results indicated a reduction in ESV from 918.1 million USD in 1990 to 827.3 million USD in 2020, with a further decline to 824.8 million USD projected for 2035. Over the study period, a net loss of 90.8 million USD in ESV was recorded, with wetlands experiencing the highest reduction. Overall, approximately 64.71% of ecosystem services have declined or are expected to decline. Therefore, reversing these trends and restoring natural habitats is crucial to prevent further loss of ESV in KAL.

Keywords: Ecosystem services valuation, Land use/land cover, Sensitivity analysis

Hidden Guardians: Discovering Heat Shock Proteins in the MIA Pathway of Catharanthus Roseus through RNA-Seq and Clustering

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Abstract

Catharanthus roseus is a widely studied medicinal plant known for producing pharmacologically significant alkaloids. While substantial progress has been made in understanding its terpenoid indole alkaloid (TIA) biosynthetic pathways, the identification of unannotated genes in the monoterpenoid indole alkaloid (MIA) biosynthesis pathway remains incomplete. This study aims to identify unannotated genes involved in the MIA biosynthetic pathway by analyzing RNA-Seq data derived from paired-end raw sequences. The data were processed using the Hisat2 alignment tool, generating SAM files by mapping trimmed paired-end FASTQ reads to an indexed reference genome. Hierarchical clustering was performed on approximately 30,000 unannotated genes, incorporating expression values from root, MeJA-treated seed, flower, leaf, and root tissues. Co-expression analysis identified clusters of unannotated genes with significantly similar expression patterns, particularly within the methylerythritol phosphate (MEP) pathway. Genes such as unannotated-474, -601, -551, -624, and -678 exhibited high similarity scores, visualized as deep blue regions in the hierarchical clustering heatmap. Subsequent annotation using BLASTX against the NCBI non-redundant database revealed that several of these unannotated sequences correspond to heat shock proteins (HSPs). The presence of multiple heat shock proteins in C. roseus suggests a potential role in the plant's adaptive response to environmental stressors. This research underscores the importance of exploring unannotated RNA transcripts and demonstrates that hierarchical clustering based on Euclidean distance can effectively group these transcripts by expression patterns. The findings provide novel insights into the role of heat shock proteins within the MIA biosynthetic pathway and contribute to a deeper understanding of the plant's molecular mechanisms.

Keywords: Catharanthus roseus, Unannotated genes, Heat shock proteins, RNA-Seq, MIA biosynthesis.

Panel 05: Private Enterprise Development, Industrialization, Governance and Economic Development

Green Business Practices and Social Sustainability Performance in Ethiopia's Leather, Textile, and Garment Industries: The Mediating Role of Green Innovation-A PLS-SEM Analysis

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Abstract

This study examines how sustainable business practices-specifically green manufacturing, marketing orientation, human resource management, and investment-affect social sustainability outcomes in medium and large textile and leather firms in Ethiopia, with green innovation as a potential intermediary. A quantitative approach was employed, utilizing a survey of 201 participants from top management in these firms. The data were analyzed using partial least squares structural equation modeling (PLS-SEM). The findings reveal that green practices-namely, green manufacturing practices (GMFP), green marketing orientation (GMO), green human resource management training and development (GHRM), green investment (GINV), and green innovation (GINO)-significantly enhance firms' social performance. Furthermore, the results confirm that, except for GHRM training and development, all green practices substantially influence green innovation. While green innovation fosters connections among GMO, GMFP, GINV, and social sustainability (SoP), it does not serve as an intermediary between GHRM training and development and social sustainability performance. This study offers insights for Ethiopian businesses and policymakers to promote synergistic strategies that enhance social outcomes and environmental responsibility, thereby driving sustainable growth and supporting UN Sustainable Development Goals (SDGs) 8, 12, and 13.

Keywords: Green business practices, Leather, Textile, and Garment Industries, Social Sustainability Performance, PLS-SEM

Challenges and Livelihood Impacts of Micro and Small-Scale Enterprises: The Case of Assosa Zone, Benishangul Gumuz Region, Western Ethiopia

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Abstract

This study aimed to analyze the challenges and livelihood impacts of micro and small-scale enterprises (MSEs) in the Assosa Zone of the Benishangul Gumuz regional state in western Ethiopia. Cross-sectional survey data were collected from 381 randomly selected households (142 MSE participants and 239 non-participants). A logit model and propensity score matching (PSM) method were employed to achieve the study's objectives. The empirical results of the logit model indicated that several variables-such as the sex of the household head, educational status, market linkage, distance to enterprises, distance to markets, access to land, initial investment, and access to credit-were statistically significant and economically meaningful in affecting the probability of participating in MSEs. The PSM results showed that participation in micro and small-scale enterprises had a robust and significant impact, with participants experiencing an increase of 16,953.68 Ethiopian Birr in household income and a difference of 7,655.08 Birr in expenditures compared to non-participants. Furthermore, the average treatment effect on the treated (ATT) indicated that MSE participation improves food security for households involved in MSEs compared to those not participating. The sensitivity analysis also demonstrated that the significance level remains unaffected even when gamma values are relaxed up to 100%. This suggests that the average treatment effect on the treated is not sensitive to external changes. Educational suggest that policies aimed at expanding access to credit services, building strong customer linkages, and providing educational opportunities for households have the potential to increase participation in MSEs, thereby improving household income and food security.

Keywords: Food security, Income, Micro and small-scale enterprise, Propensity score matching, Sensitivity analysis.

Budget Deficits and Current Account Deficits in Ethiopia: Twins or Distant Cousins?

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Abstract

This study examines the relationship between budget deficits and current account deficits in Ethiopia from 1985 to 2023, testing the twin deficit hypothesis. Utilizing the Auto-Regressive Distributed Lag (ARDL) model and the Toda-Yamamoto Granger causality test, the analysis reveals a significant long-run co-integration between the two deficits. The findings confirm that an increase in budget deficits leads to a deterioration in the current account balance, supporting the twin deficit hypothesis. Additionally, the study highlights the role of exchange rates, demonstrating that depreciation improves the current account in the long term, while gross national savings paradoxically worsen the external balance. The Toda-Yamamoto Granger causality test confirms a unidirectional causal relationship from budget deficits to current account deficits, emphasizing the impact of fiscal policy on external imbalances. The study suggests that addressing fiscal imbalances through spending controls, tax reforms, and boosting domestic production is essential for improving Ethiopia's external balance.

Keywords: Twin deficit hypothesis, ARDL model, Toda-Yamamoto Granger Causality, Ethiopia

Panel 06: Society, Culture, Language, Law, Environment and Development

Trend Analysis of Climate Change and its Socioeconomic Consequences: The Case from Nole Kaba District, Southwest Ethiopia

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Abstract

Climate change is an ongoing phenomenon that affects both biophysical and socio-economic activities. The objective of this study was to analyze the trends of climate change and its socioeconomic consequences in the Nole Kaba district of southwest Ethiopia. A longitudinal research design employing a mixed-method approach was utilized for the study. Primary data were collected through key informant interviews (KII) and focus group discussions (FGD). Secondary data on temperature and rainfall from 1990 to 2023 were obtained from the National Meteorological Agency (NMA) of Ethiopia. Data were analyzed using descriptive and inferential statistics, along with the Mann-Kendall (MK) test and Sen's slope estimator. The descriptive results indicated that over the past 34 years, the mean annual temperature was 20.1°C, with a standard deviation of 0.67 and a coefficient of variation of 3.4%. The Mann-Kendall test revealed a significant increasing trend in temperature ($P < 0.05$) for all months and seasons, except for January, May, June, October, and December. In contrast, the temporal pattern of rainfall showed a significant decrease ($P < 0.05$) in all months except January, February, November, and December, including the winter season. Sen's slope analysis indicated that temperature was increasing in all seasons ($P < 0.05$), while rainfall was generally decreasing, with a slight increase observed in the autumn season. The socio-economic consequences related to climate change in the study area include crop failure, irregular rainfall patterns, displacement of households, livestock deaths, crop lodging, and increased incidence of vector-borne diseases. The study concludes that local communities need to implement adaptation and mitigation strategies, supported by governmental and non-governmental organizations through early warning systems and forward-looking policies.

Keywords: Climate change, Climate consequences, Mann-Kendall, Sen's slope

Modeling the Impacts of Climate Change on Flood Hazard in the Rift Valley Basin of Ethiopia

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Abstract

Climate change-induced events, such as flooding, have intensified over the past few decades, particularly impacting developing countries. Developing flood hazard maps is essential for identifying and protecting vulnerable regions and for establishing early warning systems. This paper focuses on the Rift Valley basin of Ethiopia, which has experienced 11 out of 15 recorded flood events in the past. The aim is to forecast the impacts of climate change on flooding under present and future climate scenarios. Using a participatory approach, this study evaluates the reliability of conventional flood risk assessments. Datasets were acquired through field visits and from governmental and non-governmental organizations. Eight flood risk indicators were considered: rainfall, distance from the river, land elevation, slope, topographic roughness index, topographic wetness index, land use/land cover, and soil type. Two shared socioeconomic pathways (SSP245 and SSP585) were employed to project near- and far-future rainfall based on CMIP6 model outputs. The Analytic Hierarchical Process (AHP) and Participatory Geographic Information Systems (PGIS) were used for relative importance analysis. The findings reveal that by 2060, both SSP245 and SSP585 scenarios show an increasing trend in high and very high flood-risk areas, with SSP585 indicating a more significant rise. By 2100, the spatial distribution of very high and high-risk areas concentrates in the northern and central parts of the basin, highlighting greater risk under SSP585. A comparison with the baseline period indicates a spatiotemporal change, suggesting that climate change may contribute to an increased likelihood and extent of flooding in the Rift Valley basin.

Keywords: Analytic hierarchical process, Climate modelling, CMIP6, Flood risk, Near and far future participatory geographical information system, SSP.

Indigenous Knowledge Systems and Practice in North Wollo, Ethiopia: Implications for Sustainable Development Goals

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Abstract

Fostering a positive attitude toward local knowledge-regardless of gender, faith, age, or social class-is crucial, as a nation's development relies on a population that values and integrates diverse indigenous knowledge systems. Indigenous knowledge has evolved over time, adapting to the needs and conditions of local communities while aligning with socio-economic and agri-environmental contexts. This evolution has significantly enhanced the efficiency, effectiveness, and sustainability of development efforts. Within this context, the aim of this study is to examine the role of indigenous knowledge systems and practices in promoting sustainable development goals. Using a case study design, data were collected from 54 purposively selected participants who had relevant knowledge and experience in indigenous knowledge systems within the study area. Data collection methods included interviews, focus group discussions (FGDs), and document analysis, and the collected data were analyzed using thematic analysis. The study findings indicate that although a substantial amount of indigenous knowledge is available in North Wollo, the most dominant practices can be categorized into four themes: 1) spirituality and healing, 2) indigenous construction and rock carving, 3) reconciliation, justice, and traditional administration, and 4) faith, ceremony, social life, and understanding. These indigenous knowledge practices contribute significantly to shaping the foundations of education, nurturing social connections, and reflecting everyday life. Therefore, such knowledge should be expanded, as it becomes a key policy agenda during the implementation of any developmental intervention.

Keywords: Indigenous knowledge, Systems and practices, Sustainable development goals

የነገረ ጾታ መልክእ በሰሜን ወሎ ማኅበረሰብ ዝርው ተረኮች ማሳያነት አጭር ጥናት

ደምስ መሸሻ ዳኜ*

በወልድያ ዩኒቨርሲቲ በማኅበራዊ ሳይንስና ስነስብ ፋኩልቲ የስነፅሑፍና ፎክሎር (የባህል ጥናት) መምህር

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ረቂቅ ጹሑፍ

ይህ ጥናት የነገረ ጾታ መልክእ በሰሜን ወሎ ማኅበረሰብ ዝርው ተረኮች ማሳያነት በሚል ርዕስ የቀረበ ነው ፡፡ የጥናቱ ዋና ዓላማ የነገረ ጾታ መልክእን በሰሜን ወሎ ማኅበረሰብ ዝርው ተረኮች ማሳያነት መፈከር ነው ፡ ፡ ጥናቱ ዓይነታዊ ነው ፡፡ ለጥናቱ አስፈላጊ የሆኑ መረጃዎች ከቀዳማይና ካልዓይ የመረጃ ምንጮች በሰነድ ፍተሻ ፣ ምልከታ ፣ ቃለ መጠይቅና በቡድን ውይይት ተሰብስበዋል ፡፡ መረጃዎቹም በዐውዳዊ ትንተና ስልት እየተተነተኑ እና በእንስታዊ ንድፈ ሃሳብ እየተመሩ ዘልቀዋል ፡፡ የጥናቱ ግኝት የነገረ ጾታ መልክእ በዝርው ተረኮች ውስጥ መንታ የህይወት ገጽታዎችን በልዩ ልዩ ብልኃቶች አስተማስሎ የቀረበ መሆኑ ተመላክቷል ፡፡ አባዊ ስርዓት የኃይል የበላይነቱን አጠናክሮ ለመቀጠል የእኩይ ሴቶችን ምግባርና ተግባር ከነ ቱርፋቱ ማቅረብ ፣ የሴቶችን መልክእ ማጉደፍ ፣ በሴቶች ላይ የአስታዊ ሚዛን እንዲደፋ ማስቻል እንዲሁም የወንዶችን መልክእ አግዝፎ መግለጽ ዋነኛ ብልኃቶቹ መሆናቸው ተመላክቷል ፡፡ ዝርው ተረኮች ሴቶች ከወንዶች እኩል አለመሆናቸውን እንዲሁም ከህዲያች ፣ መሰሪዎችና ቃል አፍራሾች መሆናቸውን በተለያየ መልኩ አስተማስሎ አቅርበዋል ፡፡ በእንስታዊ ንድፈ ሃሳብ የእይታ ማዕዘን ሲመረመሩ ግን ሴቶች ብልሆች ፣ ታታሪዎች እንዲሁም አስተዋዮች መሆናቸው ተመላክቷል ፡፡ የነገረ ጾታ አሰላለፍ የኃይል ሚዛኑን በጠበቀ መልኩ እንዲዳዝ የሴቶችን አዎንታዊ የህይወት መልክእ በአግባቡ የሚያሳዩ ዝርው ተረኮች እያታተሙ ቢሰራጩ ፣ የሴቶችና የወንዶችን ጎንዮሻዊ ዝምድናን የሚገልጹ ፊልሞች እየተሰሩ ለታዳሚያን ቢደርሱ እንዲሁም በስነጽሑፋዊ ስራዎች ውስጥ የሚቀረጹ ሴት ገጸባህርያት ከወንዶች እኩል የኃይል አሰላለፍን እንዲጎናጸፉ ቢደረግ ጠቀሜታው የላቀ ይሆናል ፡፡

ቁልፍ ቃላት: መልክእ ፣ ኃይል ፣ ነገረ ጾታ ፣ አባዊ ዓለም ፣ ዝርው ተረኮች

Learning Indigenous Health Practices its Requirements and Challenges: Ethnographic Insights from Indigenous Health Practitioners

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Abstract

Indigenous health practices (IHP) are prevalent worldwide among indigenous peoples. Understanding IHP is essential for the development of indigenous health systems. This study aimed to identify opportunities for learning IHP within families, determine the requirements for learning IHP, and highlight the challenges associated with this learning process. To achieve these objectives, an ethnographic research approach was employed. Data was collected through in-depth interviews with 13 participants, and thematic analysis was used to identify key themes in the data. The findings revealed that spiritual healers teach their followers the principles of spiritual healing, while herbal healers pass on their knowledge to the next generation or to choose siblings, as designated by the elders who possess knowledge of IHP. Spiritual healers may be required to be virgins or possess the ability to serve as spiritual directors. In contrast, herbal healers need a willingness to help others and the ability to keep the secrets of IHP. Challenges in learning IHP include attitudinal issues, a lack of standardization, competition with modern health practices, and the difficulty of openly sharing IHP knowledge due to its mysterious nature. Finally, the researchers recommend an integrative and collaborative healthcare system that incorporates IHP, aiming to create a sustainable healthcare framework that views IHP as a complement to modern healthcare rather than as a competitor.

Keywords: Herbal medicine, Indigenous health practices, Intergenerational learning, Knowledge transfer, Nature of indigenous health practices, Spiritual healing, Sustainable health system

Determinants of Recidivism and Criminal Behavior Relapse using a Retrospective Longitudinal Study: Implications for Rehabilitation Strategies in Ethiopia's Peace Building

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Abstract

Background: Recidivism, or the relapse into criminal behavior, remains a significant issue in Ethiopia, especially amid ongoing dynamics of peace and conflict. This study employs a competing risks approach to analyze socio-demographic predictors, considering death as a competing risk. It underscores the importance of contextualizing these predictors within indigenous peacekeeping systems.

Methods: A retrospective longitudinal study was conducted using secondary data from correctional facilities in the South Gondar Zone, Ethiopia, to examine post-release criminal relapse patterns. A cohort of 678 inmates released over a six-year period was followed to assess the time to recidivism and its associated socio-demographic determinants. Survival analysis techniques, including cause-specific hazard models and sub-distribution hazard models, were employed to evaluate the competing risks influencing reoffending.

Results: The study identifies gender and age as significant factors in recidivism risk. Women were 72% less likely to reoffend than men (sub-hazard ratio [SHR] = 0.28, $p < 0.05$), while each additional year of age reduced the likelihood of recidivism by 4% (SHR = 0.96, $p < 0.05$). Males had a higher recidivism rate (43.07%) compared to females (9%), although females faced higher mortality rates (2.36% vs. 0.59%). The Cox and Fine & Gray models further reinforced these findings, indicating that older individuals and women had a lower likelihood of reoffending. These results align with criminological theories and provide insights into criminal behavior trends in Ethiopia.

Conclusion and Recommendations: This study highlights the critical roles of gender and age in recidivism risk, with females and older individuals demonstrating a lower likelihood of reoffending. It suggests that gender-responsive and age-targeted interventions, incorporating indigenous peacebuilding practices, are essential for reducing recidivism. Future research should explore factors such as socioeconomic status and rehabilitation programs to enhance understanding and mitigate recidivism.

Keywords: Ex-offender reintegration, Criminal relapse, Gender and rehabilitation, Aging and rehabilitation, Longitudinal study.

THE AFRICAN JOURNAL OF HEALTH SCIENCES & MEDICINE
[AJHSM]

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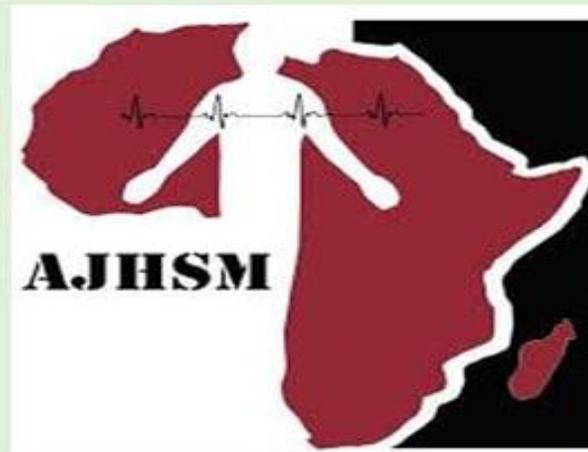
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