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Traditional Knowledge and Its Impact on Diabetes Management in Malaria-Endemic Areas

Ramzi Mohamed Adam Alnour

Kampala International University Teaching Hospital Ishaka

ABSTRACT

The dual burden of infectious and non-communicable diseases, particularly malaria and diabetes, presents a critical public health challenge in many parts of sub-Saharan Africa. Despite the increased prevalence of Type 2 diabetes mellitus in these regions, modern healthcare systems often remain inaccessible or unaffordable to many communities. Consequently, traditional medicine (TM), underpinned by indigenous knowledge systems, remains a vital health resource. This paper examines the impact of traditional knowledge (TK) on diabetes management in malaria-endemic areas, particularly in Northern Tanzania and Malawi. Drawing on interdisciplinary perspectives, it assesses how local beliefs, herbal practices, and community-based health systems support or hinder effective diabetes care. The research investigates intersections between malaria and diabetes, barriers to integrating traditional and modern healthcare systems, and the sociocultural contexts shaping patients' choices. The paper argues for the validation and integration of traditional practices into formal healthcare systems to improve diabetes outcomes, particularly in resource-constrained and malaria-prone regions. It also highlights policy implications, the need for future research, and the ethical considerations of indigenous knowledge rights.

Keywords: Traditional Knowledge, Diabetes Mellitus, Malaria-Endemic Regions, Indigenous Medicine, Herbal Remedies.

INTRODUCTION

Diabetes mellitus is a widespread metabolic condition marked by hyperglycemia due to insulin deficiency or resistance. This condition increases the risk of complications such as heart attacks, strokes, kidney disease, limb amputations, poor vision, and nerve damage. The highest incidence rates of diabetes were observed in the Caribbean, with Africa experiencing a concerning rise in cases projected for 2030 and 2045. Diabetes-related complications are among the leading global causes of death, and about 80% of cases in Africa are undiagnosed. Type 2 diabetes, or adult-onset diabetes, comprises about 90% of cases in Africa. Oral hypoglycemic agents, including sulfonylureas and DPP-4 inhibitors, are used in many countries, with insulin available in Tanzania. As diabetes progresses, the effectiveness of these agents diminishes, prompting many to seek traditional remedies. In Africa and Tanzania, spiritual and alternative treatments are often preferred over conventional care, with studies showing that 80% of individuals in developing countries rely on traditional medicines for various health issues. Despite ongoing research, information on the efficacy and toxicity of herbal medicines remains limited. In Tanzania, traditional medicine is closely linked to community sociocultural beliefs about health, potentially impacting diabetes-related complications. Several studies indicate that diabetes patients often use traditional medicine alongside Western medicine. However, little is known about herbalists' views and practices regarding diabetes management in Northern Tanzania. This study explores the perspectives of patients and herbalists on traditional medicine's role in managing diabetes in Malaria-endemic regions of Northern Tanzania [1, 2].

Understanding Traditional Knowledge

Traditionally, local medicines are widely used, especially in third-world countries where modern healthcare is not accessible or affordable. 'Traditional knowledge/TK' encompasses the practices and skills of indigenous peoples, derived from their relationships with the environment. This knowledge is specific to the communities that practice it. Traditional medicine (TM) includes the skills and practices for diagnosis, treatment, and prevention based on TK that relates to local geographies. In Malawi, with a substantial risk of diabetes and high childhood malnutrition, this paper explores the role of TK and TM in disease management, as there is limited research on this topic. It investigates local cultivation and beliefs about plants used for diabetes management, which could provide crucial insights for educational campaigns in Malawi and similar regions. Various TM studies across Africa highlight the use of food and herbs for diabetes, but further research is needed on lesser-known plants and patient-held knowledge. Beliefs about TM can enhance disease awareness and management, mitigating the risk of complications. In high-burden areas like Malawi, where many believe a general medical check is unnecessary until major complications arise, understanding the origins of these beliefs is vital for addressing them in educational efforts. There is a pressing need for research on diabetes management in low-resource, less educated countries such as Malawi, and to explore TM and TK at the grassroots level regarding the condition [3, 4].

Diabetes: An Overview

Diabetes mellitus (DM) is characterized by hyperglycemia caused by defective insulin secretion or action. It includes juvenile-onset and maturity-onset DM, and arises when the pancreas fails to produce adequate insulin or the body cannot effectively utilize it. Malaria, a major infectious disease in tropical regions, complicates the situation as these areas face both communicable diseases (CDs) and non-communicable diseases (NCDs). Research on diabetes in malaria-endemic regions is scarce, especially concerning its management and the impact of anti-malarial therapy. Traditional medicine has a longstanding history in treating diabetes, leading practitioners to explore effective herbal remedies, turning it into a lucrative business. Traditional medicines, particularly herbs, are widely used globally due to fewer side effects compared to modern treatments. Studies reveal that about 77 percent of the population utilizes traditional knowledge for diabetes management. However, awareness and perceptions regarding diabetes management through traditional knowledge have not been explored in malaria-endemic areas. Interestingly, knowledge of diabetes management varies significantly between these regions and non-endemic settings, despite both conditions being chronic diseases. Research highlights that traditional knowledge's effects on glucose levels and compliance with modern medicine have received attention, though the global implications of herbal therapies remain under-examined. Moreover, studies from Uganda and India indicate that self-management practices and health-seeking behavior are influenced by awareness, widening the gap in management strategies. Traditional knowledge is emerging as a vital research area, thought to be a more economical and eco-friendly alternative to synthetic drugs [5, 6].

Malaria-Endemic Areas: Challenges and Context

Despite recent successes, malaria remains a significant public health challenge, especially in sub-Saharan Africa, where 90% of deaths occur. Concerns arise that the predicted elimination phase could lead to the disease's resurgence. Most malaria control candidates focus on anthropogenic measures, overlooking the powerful immunity developed through exposure to the disease. This "natural" immunity is often misunderstood as being free from environmental influence. Current indicators regarding malaria burden typically stem from biomedical research, failing to account for the ethnographic perspectives, beliefs, and practices surrounding malaria. Additionally, complex political, economic, and ecological factors influencing malaria are often neglected. Consequently, scientists remain in a defensive posture, using various methods like mathematical modeling and vaccines primarily to address the issue reactively. A more holistic approach is warranted, examining the experiences of individuals, especially women, in the Sidama area of Ethiopia, who engage in traditional strategies to mitigate malaria. These customs appear complementary to modern interventions, which have not fully replaced entrenched beliefs and practices in Sidama. An exploration into the knowledge and practices associated with successful malaria control may reveal valuable insights, particularly when framed against retrospective models like the Geoffrey Watling Garden Festival. This inquiry aims to identify the parameters of effective community practices and their implications for combating malaria [7, 8].

Intersections of Diabetes and Malaria

Diabetes is a chronic condition occurring when the body lacks insulin or cannot use it effectively, raising blood sugar levels. High blood sugar can lead to serious health issues. Type 1 diabetes, often diagnosed in

children, results from the pancreas not producing insulin. Type 2 diabetes, the most common form, typically affects adults, resulting from insufficient insulin production or ineffective use. Gestational diabetes occurs temporarily during pregnancy. The rising diabetes rate in Australia is linked to factors such as obesity, ethnicity, age, and inactivity. Although there is no immediate cure, treatments available help manage diabetes. The report highlights how symptoms differ by gender and social context, along with significant knowledge gaps about diabetes types and complications. These gaps particularly affect Ghanaian migrants, who are at a higher diabetes risk due to misunderstandings about risk factors and complications. Many believe diabetes is caused by supernatural influences, complicating healthcare approaches. Such beliefs can undermine biomedical treatments, leading to emotional distress. Furthermore, ignorance about childhood type 1 diabetes results in parents seeking traditional healers, which can cause severe complications or death [9, 10].

Role of Traditional Knowledge in Health Management

Medicinal plants have been an integral part of traditional medicine for decades of years and have played a major role in the management of various diseases among the local population. Traditional medicines remain the first line of treatment for 80% of the population in developing countries. They are used due to their effectiveness, availability, affordability, and mild side effects relative to conventional treatments. However, diabetes remains a challenge due to lifestyle changes and accessibility to conventional treatments. Plant-based food items are mainly adopted as remedies among the local populations, and the ornamental plant Aloe vera L. is traditionally and popularly used by diabetics. Similarly, local herbalists also recommend it for diabetes, and anecdotal evidence shows that it lowers glucose by 43%. Numerous Anti-diabetic plants used worldwide have already been identified and validated scientifically to a certain extent. Furthermore, malt extract-based traditional soup may offer a potential alternative remedy to lower hyperglycemia, as evidenced by a prior experimental study. Pending safety/toxicity evaluation, it may be worth trying to take it regularly for the management of diabetes. However, growing O. sativa throughout the world directly and/or indirectly affects the lives of billions of people. Malaria is endemic in much of the world. Therefore, by merging traditional and modern medicine, it may be possible to reduce the burden of diabetes in malaria-endemic areas and improve a community's health status. A thorough understanding of the disease in traditional aspects may play a crucial role in bridging the gap between traditional and modern medicine [11, 12].

Case Studies: Successful Integration

Diabetes is a healthcare problem in urbanized settings worldwide and has become a common household menace in developing settings. Diabetes management in developing countries is through a combination of modern health services and traditional community-based health knowledge and practices. This reliance on indigenous systems is attributed to declining approachability, affordability, acceptance, and availability of modern health services. On their part, herbal medicines for diabetes are becoming a ubiquitous household and food ingredient in developing regions. This situation provokes the need to explore the ways traditional knowledge for diabetes management and protection has sufficiently addressed health burdens, necessitating an understanding of what works, how, for whom, and under which conditions. Empirical evidence on public health agencies to embrace and integrate traditional knowledge with contemporary systems is advanced by soliciting views of knowledge custodians. Such reasoning provides reliable evidence in time for public health agencies to accelerate advocacy for human rights, empowerment, and protection of traditional knowledge in a just and equitable manner. The setting is Tumaini University Makumira, where 676 members aged 18-65 are participants. The conclusion re-emphasizes the importance of communication for health enhancement and health policy information as advocacy tools to support public health agencies in Tanzania to work sustainably toward ameliorating childhood mortality. Communication for development is an interdisciplinary science that studies how communication can be used to bring about social change. It is both an academic field and a practice. The study recommends that health information for health enhancement, health policy information for the public health, and health systems in Tanzania should be documented and told through appropriate and credible channels to improve health literacy rate in Tanzania for better health. By the year 2025 it is anticipated that all health practitioners will work as a team in a collaborative manner for improved health literacy rate in Tanzania. Such a conclusion allows program evaluation as a formative and process action research. The study ends with a suggested future research agenda of program evaluation. It is suggested that communication for health enhancement, health policy, and health marketing information be documented in text, audio-video magazines, and displayed through/about appropriate audio-visual as programs be concluded for advocacy dissemination [13, 14].

Barriers To Integrating Traditional Knowledge

Health systems in developing countries often integrate traditional and non-traditional medicines. This study explored the relationship between traditional knowledge and diabetes management negotiations, particularly in malaria-endemic regions. It compares contexts, focusing on definitions of 'traditional' and 'traditional knowledge' to assess access and equity in diabetes care. The findings suggest that utilizing traditional knowledge is essential for equitable diabetes management in these areas. Health systems are influenced by various factors, including social, technical, and political elements. The research emphasizes traditional knowledge's role in diabetes management and outlines implications for access and equity, especially where malaria complicates care. Two studies were contrasted: diabetes management experiences among health workers in western Uganda and western Kenya. The literature review predominantly discussed 'traditional' and 'traditional knowledge' to evaluate current diabetes management issues more effectively, considering local challenges. The conclusion highlights an urgent need for resources in developing countries, where by 2030, a significant number of diabetes patients will reside. Enhancing the use of traditional knowledge is critical for equitable diabetes management in malaria-endemic areas [15, 16].

Policy Implications

There is promising clinical evidence that traditional medicinal plants are effective against diabetes. Notably, several traditionally used plants have researched efficacy against diabetes in the global space, indicating resonance and affirmation of their effectiveness across diverse contexts in zoogeography, biodiversity, ecosystem, and cultures. There is however very low representation of African plants on global databases of plants researched and found to have an anti-diabetic effect. This is surprising given that Africa is a unique arid hotspot of plant diversity and richness with a large artisanal herbal medicine sector. African plants must increasingly be sampled to fill the knowledge gaps and affirm their efficacy against diabetes at the global scale. While anti-diabetic medicinal plants across different contexts are resonating, there are also many unique plants endemic to certain regions. Indigenous knowledge-sharing practices must be harnessed to ensure persistence of this information. Though goods that are moved in informal commerce is significantly large, under-utilized plants in the global space with potential for commercial scaling such as extraction of active ingredients and formulation of phyto-drugs exist. There is an opportunity to ensure that African biodiversity is benefit-sharing to African populations while being used to bolster the global phyto-medicine market. Since swathes of Africa experience both plights of high malaria exposure and diabetes emergence, African plant biodiversity space should be explored for potential co-treatment phyto-medicines. Such treatments if attested by pharmacological and clinical evidence will vastly empower Western trained health systems to ultimately do good with traditional medicine. The sturdy uptake of traditional medicine and natural products in the West in the absence of good science should embolden Africans to do likewise [17, 18].

Future Directions for Research

Many studies with varied objectives have been undertaken to look into the role of TM in the management of Type 2 DM. The following are some of the researches, presented in reverse chronological order: A recent interview study illustrated the role of TM practitioners in the management of DM. This study has documented the types of TM used in the management of Type 2 DM, the types of TM practitioners involved in using, dispensing and prescribing TM, the sources of information for the TM practitioners, the practices and additional responsibilities of TM practitioners, education and training of TM practitioners and other additional learnings sought by TM practitioners. The manuscript was published in a peer-reviewed journal in 2015. Interestingly, nearly four years after this manuscript was published, a qualitative study on TM across Africa was conducted, which included the two countries of Kenya and Mozambique. This manuscript partly discussed the financial aspects of using TM with respect to DM, but lacked details on the TM used and the methodology to ascertain the TM used. Also in 2019, a descriptive cross-sectional survey was conducted to explore the TM used in the management of Type 2 DM using patient reported outcome measures. This paper documented the use and features of dietary TM, and also highlighted how the dietary TM is a window to unrecognized TM plants. Despite the TM research on diabetes in Kenya to date, the following key areas are recommended for future exploration: Future studies on management strategies that draw on both conventional and traditional medicine should be encouraged. These should explore the potential benefits of these two approaches for patient care. Future research needs to examine the evidence that supports effectiveness, safety and quality of TM practices. Efforts to validate TM practices should be undertaken by introducing aspects of evidence-based medicine to the TM space, including the need for clinical trials where possible and adherence to good practice

guidelines. Future research studies should document and create a bank of TM knowledge. This should be undertaken in collaboration with the TM community under guidelines that respect intellectual property issues that place the TM community in the centre and ensure that they also benefit from this exercise [19, 20].

Ethical Considerations

Ethical considerations arose in the study on the use of traditional medicines in managing diabetes, particularly in areas endemic to malaria, where treatment dangers exist. Issues of cultural sensitivity surrounding diabetes perceptions, expected remedies, and culturally linked parameters were addressed throughout the study process. Conducting focus groups emphasized creating an environment of mutual understanding and respect for cultural perspectives regarding diabetes and its treatment. Furthermore, informed consent was sought and obtained from the participants to avoid inadvertently expounding information that could harm the individual and/or community. Ethical issues regarding data presentation were considered. A desire to present findings to and in a way that would benefit participants and communities typified ethical concerns. Those unable to participate in the health fair were provided with pamphlets about the study's findings and strategies to combat discrimination. To allow participants decision-making opportunities in the data presentations, presentations were offered as a focus group format to fill an unmet need in the community. Efforts were made to share findings in a way cognizant of, with value placed on maintaining holistic relationships throughout the knowledge acquisition process. This influenced how the information was displayed during the fair, making it accessible to many, whether literate or bi-literate in English or Swahili. Tanzania's ethics and research approval processes place much emphasis on protection from harm, as well as bias. To avoid potential bias and harm to participants, recommendations about specific medicines, dosages, health professionals, etc., were omitted from the report. However, low-literate communities may be denied access to findings in the form originally intended, as qualitative inquiry writing standards differ from local abilities and styles. It was hoped that the process of presenting findings along with data interpretation to empower communities could be followed in future studies about diabetes and traditional medicine [21, 22].

Community Engagement Strategies

Community engagement is crucial for guiding health interventions in low-resource countries. Successful interventions depend on community understanding and support, necessitating that high-level diseases are recognized as priorities. Interventions must be culturally acceptable and appealing. Essential to this process are clear, accurate, timely, and relatable information from trusted sources. Evaluating community engagement processes is important for understanding successful interventions in new contexts and adapting them accordingly. In Kayin State, Myanmar, a low-dose weekly supervised treatment using artemisinin-based combination therapy was introduced for those testing positive for sub-microscopic malaria. The acceptance and response to this project are key questions. A multidisciplinary, mixed-methods approach assessed community engagement in the first 14 communities, with follow-up until 2017 when funding ended. The insights gained will enhance the implementation and evaluation of community engagement for malaria treatment in Myanmar, Southeast Asia, and other low-resource malaria-endemic nations. Furthermore, this evaluation represents one of the few studies applying social science research to a targeted treatment approach. While global health organizations offer guidance on physical interventions like drug treatments, there's a lack of literature on effectively involving communities in public health responses. Engagement often relies on trial and error, missing chances for flexibility and adaptation. At community meetings, participants discussed medical concepts and the project's benefits, challenging aspects they found problematic. Ongoing discussions fostered project ownership, co-produced knowledge, and encouraged wider participation beyond larger meetings [23-29].

Monitoring and Evaluation

Monitoring and evaluation (M&E) is a process to ensure that planned health programs deliver needed services. Effective M&E is crucial to assess the extent of raw materials, drugs, supplies, service delivery, and health indicators. M&E provides data to ensure the use of funds as specified, measure success, enable mid-course corrections, and help correct weaknesses. Evaluation assesses trends over time and availability. Implementation is assessed by comparing actual with expected deliverables, excluding funding issues. Monitoring is a data collection process through reporting procedures. The term monitoring and evaluation is mostly used for data collection procedures and M&E for recording, reporting, and supervision processes. Five methods of collecting M&E data are highlighted, and the emphasis is on the data collection tool, termed recording and reporting formats. Respondents expressed difficulty in assessing M&E completion. Directions for filling M&E forms should focus on M&E data,

standardize definitions for consistency, and understand the practicalities involved in program execution. Training processes should also enable field knowledge dissemination to ensure a comprehensive understanding and an appropriate response to action. Given the context, respondents correctly reported the key indicators used for overseeing malaria control interventions, including rates of attendance at primary health care centers. Rates of compliance with treatment protocols were also perceived as an M&E measure. However, attempts to document health worker losses and shortages were lacking. Staff shortages have been ignored in all discussions of the Nigerian health system, and as health workers are a crucial part of malaria control efforts, malaria M&E development should include considerations of health worker availability and newer proposals for shifts to community health worker models. Although computers and mobile technology are not yet standard in Nigeria, M&E forms should be digitized, particularly in regard to health worker monitoring and recruitment costing, and allocation analysis [30-33].

CONCLUSION

In malaria-endemic regions such as Northern Tanzania and Malawi, traditional knowledge plays a pivotal role in diabetes management, offering affordable and culturally accepted alternatives to biomedical treatments. As diabetes prevalence continues to rise alongside persistent malaria challenges, healthcare strategies must adapt to address the dual burden of disease. The widespread reliance on traditional medicine highlights its potential as both a complementary and primary healthcare resource. However, integration into formal systems requires rigorous evaluation of safety, efficacy, and sustainability. Bridging traditional and modern health systems necessitates respecting indigenous knowledge, building community trust, and developing inclusive health policies that promote equity. Future research should focus on validating traditional remedies, documenting plant-based knowledge, and fostering collaborative frameworks between biomedical practitioners and traditional healers. A holistic, culturally sensitive approach could not only enhance diabetes outcomes in malaria-endemic regions but also serve as a model for managing chronic diseases in similarly resource-limited settings worldwide.

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