

ACCEPTABILITY OF *MORINGA OLEIFERA* SEEDS FLOUR SUPPLEMENT-ADDED TO NORMAL DIET BY WOMEN LIVING WITH HUMAN IMMUNODEFICIENCY VIRUS (PLWHIV) IN RESOURCE-LIMITED SETTING

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Abstract

This study aimed to assess the acceptability of *Moringa oleifera* seed flour supplementation among HIV-positive women in resource-limited settings. The management of HIV/AIDS in resource-constrained settings presents numerous challenges, highlighting the need for affordable supplements to complement standard anti-retroviral therapy (ART). *Moringa oleifera*, known for its nutritional and medicinal properties, has been noted for its immunomodulatory, anti-inflammatory, and antiviral effects. A descriptive study utilising a Likert-scale survey evaluated participants' familiarity with *Moringa oleifera*, perceived health benefits, potential risks, ease of dietary integration, and taste acceptability. The findings revealed a generally positive acceptance of *Moringa oleifera* supplementation, with a mean acceptability score of 2.5750. Notably, 58.2 per cent of participants found the taste palatable, and 72.2 per cent reported ease of incorporation into their daily diet. A significant 90 per cent expressed willingness to use *Moringa oleifera* if proven effective in suppressing HIV viral load. In conclusion, *Moringa oleifera* seed flour supplementation is generally acceptable among People Living with HIV, particularly when supported by healthcare providers. To enhance its use, the study recommends increasing awareness, engaging healthcare professionals, and conducting further research to maximise its potential health benefits for HIV-positive individuals.

Key terms: Acceptability, HIV, *Moringa oleifera* seeds, resource-limited setting, supplement.

1.0 INTRODUCTION

This study aims to investigate the acceptability of *Moringa oleifera* seeds flour supplementation among women living with HIV in resource-limited settings. HIV management is particularly challenging in resource-limited settings, primarily due to the reliance on anti-retroviral therapy (ART) for effective treatment. Accessing ART can be problematic, as long distances to collection points often hinder adherence, side effects such as diarrhoea and nausea, and shortages of ARVs at healthcare facilities further complicate treatment regimens (Hlophe et al., 2023). Consequently, many people living with HIV (PLWHIV) in these settings turn to complementary and alternative medicine (CAM) to supplement their ART, seeking relief from side effects and improved health outcomes. The World Health Organisation (WHO) recognises the potential role of CAM in HIV management, promoting its integration into comprehensive treatment plans (WHO,2021). Among the various CAM options, *Moringa oleifera* is gaining attention for its nutritional and therapeutic properties, making it essential to assess its acceptability among PLWHIV. Understanding its acceptance can provide insights into its potential effectiveness as a supplementary treatment in resource-limited settings, thereby enhancing the overall management of HIV.

Moringa oleifera is native to tropical and subtropical regions and has been traditionally used for its nutritional and medicinal properties (Azlan et al., 2022; Islam et al., 2021; Patel et al., 2010). The tree's seeds, leaves, and roots are rich in essential nutrients, vitamins, and bioactive compounds, resulting in increasing interest in its potential therapeutic effects. Some studies have reported its possible immunomodulatory, anti-inflammatory, and antiviral properties (Ahmad et al., 2014; Ezeamuzie et al., 2008; Jacques et al., 2019), which have sparked curiosity in the context of HIV management. A review by Waruguru et al. (2024) documented that the use of *Moringa oleifera* alongside ART improves body mass index, increases CD4 cell counts, increases red blood cells, improves white blood cells, improves psychological well-being, and increases lipoproteins in HIV-positive patients. This general improvement in the health of PLWHIV underscores the importance of understanding the consumer acceptability of *Moringa oleifera* seeds flour among PLWHIV. This research, thus, aimed to shed light on the current acceptability of *Moringa oleifera* seeds flour added to a normal diet among PLWHIV, exploring factors influencing its usage and the perceived impact on their health and well-being. Testing the consumer acceptability of *Moringa oleifera* seeds flour by incorporating it into local foods determined its potential for use as a food supplement to improve the lives of HIV-positive individuals.

2.0 LITERATURE REVIEW

Awareness of *Moringa oleifera* among populations, including PLWHIV, is generally low, especially in regions with limited access to healthcare and information. Research by (Bahall, 2017) and (Syed et al., 2016) indicated a significant knowledge gap regarding complementary and alternative medicine (CAM), including *Moringa oleifera*, among HIV-positive individuals. Despite its potential benefits, the lack of familiarity can impede its wider adoption. Haile et al. (2017) similarly found that awareness of herbal remedies, including *Moringa oleifera*, is low in Ethiopia, reflecting a broader trend in resource-limited settings where CAM awareness is often inadequate.

Moringa oleifera is commonly perceived to provide numerous health benefits, including immune system support, which is crucial for PLWHIV. Dhakad et al. (2019) and Ruslin et al. (2021) reported that *Moringa oleifera* supplementation has been associated with increased CD4 cell counts, suggesting improved

immune function in HIV-positive patients. Additionally, a systematic review by (Waruguru et al., 2023) documented improvements in body mass index (BMI), psychological well-being, and overall health among PLWHIV using *Moringa oleifera*. However, some individuals remain uncertain about its benefits due to limited access to reliable information, conflicting narratives about its efficacy, and personal variations in experiences (Shiferaw et al., 2020).

Safety concerns about *Moringa oleifera* are mixed. While many studies highlight its safety for consumption, particularly in moderate amounts (Ramamurthy et al., 2021), there are concerns regarding the potential harmful effects when consumed in large doses. (Gopalakrishnan et al., 2016) warned of possible gastrointestinal discomfort and allergic reactions with excessive consumption. Despite this, a significant portion of participants in studies by (Bahall, 2017) and (Mosavat et al., 2023) considered *Moringa oleifera* seeds flour safe for use, reflecting a general acceptance of its safety among PLWHIV.

Studies by Brilhante et al. (2017) and Gopalakrishnan et al. (2016) found that over half of the participants in their research found *Moringa oleifera* seeds flour palatable, making them easier to incorporate into daily diets. The convenience and adaptability of *Moringa oleifera* seed flour for inclusion in local meals also contribute to its acceptability. Leone et al. (2016) highlighted that *Moringa oleifera* can be easily integrated into regular diets, enhancing the nutritional profile of everyday foods and making it a suitable supplement for vulnerable populations like PLWHIV. However, the acceptability of *Moringa oleifera* seeds flour incorporated into a normal diet needs to be established.

3.0 METHODOLOGY

This study utilised a descriptive study design to assess the acceptability of *Moringa oleifera* seeds flour as a potential supplement in HIV viral suppression among HIV-positive women in Marigat, a rural community in Baringo County, Kenya. The study employed a Likert-scale survey to quantitatively measure participants' familiarity with health benefits, potential risks, ease of integrating into the normal diet, and taste acceptability of *Moringa oleifera* for individuals with HIV. The research was conducted at Marigat sub-county hospital, a level 4 facility serving an arid and semi-arid population with a slightly higher-than-average HIV prevalence in Kenya, between August 2022 and August 2023. A sample size of 70 HIV-positive women participated in this study. Women who were willing to consume *Moringa oleifera* seeds flour supplement, with no known allergies to *Moringa oleifera* or any of its derivatives, were randomly selected. Ethical approval was obtained from Kabarak University Institute of Scientific Ethics Review Committee (ISERC) under Ref no. KABU01/KUREC/001/09/06/22 and research license from National Commission for Science, Technology and Innovation (NACOSTI) under ref no. 582620. In addition to this, approval to collect data at Marigat sub-county hospital was obtained from the Department of Health, Baringo County - Marigat Sub-county Hospital head of health. Participants provided informed consent, ensuring adherence to ethical standards throughout the study. Data were gathered using a semi-structured questionnaire administered by trained research assistants, who were also healthcare professionals at the hospital's Comprehensive Care Center (CCC). The questionnaire featured Likert-scale questions assessing participants' familiarity with *Moringa oleifera*, its potential benefits, risks, ease of dietary integration, and overall acceptability. To ensure data quality, the research team underwent training, and a pre-test of the data collection tool was conducted, followed by necessary revisions. Statistical analysis of the data involved coding the Likert-scale responses to rate level of agreement or disagreement ranging from 1=

Strongly Agree, 2= Agree, 3= Neutral, 4= Disagree, and 5= Strongly Disagree and calculating descriptive statistics, including mean scores and frequency distributions using SPSS V26. This analysis provided insights into participants' acceptability of *Moringa oleifera* seeds flour, highlighting patterns and central tendencies in their opinions on the supplement's use as an adjunct to HIV care.

4.0 RESULTS AND DISCUSSION

The general acceptability mean was 2.5750, which is highly acceptable. A substantial portion of participants were not familiar with *Moringa oleifera* (70.8%) mean 3.7519 Standard Deviation (SD) 0.78644 and also were not sure of its health benefits supplementation and thus perceived it to be slightly beneficial (48.5%) mean 2.8556 SD 0.95895 in managing HIV symptoms. Additionally, it was noted a majority (78.1%) mean of 2.1852 SD 0.64162 considered *Moringa oleifera* seeds flour as a safe option for HIV-positive individuals, with 31.8 per cent mean 2.5519 SD 0.91411 somewhat believed in its positive impact on health immune system. The majority 67per cent mean 3.3815 SD 0.96347 of the participants were not very concerned about potential risks or side effects associated with *Moringa oleifera* seeds flour supplementation, with a very small portion (5.6%) expressing a lot of concern. However, participants demonstrated a high willingness (90%) mean 1.5815 SD1.10710 to incorporate *Moringa oleifera* seeds flour into their supplement routine if it proved effective in suppressing HIV viral load, highlighting their openness to exploring alternative treatment options. Confidence in the available information about *Moringa oleifera* seed flour supplementation varied, with a considerable proportion (45.9%) expressing neutral and 34.4 per cent mean 2.7185 SD 0.90559 recording moderate levels of confidence. Moreover, participants indicated that healthcare provider recommendations would significantly influence their decision to try *Moringa oleifera* seed flour supplementation 77.7 per cent mean 2.0296 SD 0.87884. Regarding taste and integration into the daily diet, the majority (58.2%) 2.4444 SD 0.72314 found *Moringa oleifera* seed flour to be palatable and easy to incorporate (72.2%) mean 2.2519 SD 0.64777 into their daily diets routines. As shown in Table 1, these findings underscore the potential acceptability and feasibility of integrating *Moringa oleifera* seed flour supplementation into HIV management strategies among people living with HIV.

Table 1 Acceptability of the use of *Moringa oleifera* seeds flour among HIV+ women in Marigat

Statement/Question	Strongly Agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly Disagree (%)	Mean Score	SD
Individuals living with HIV are familiar with <i>Moringa oleifera</i> seeds flour supplementation.	-	8.5	20.7	57.8	13.0	3.75	0.79
<i>Moringa oleifera</i> seeds flour has potential benefits in managing HIV symptoms.	7.0	25.9	48.5	11.5	7.0	2.86	0.96
<i>Moringa oleifera</i> seeds flour are a safe option for HIV-positive individuals.	8.1	70.0	17.0	4.8	-	2.19	0.64

Statement/Question	Strongly Agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly Disagree (%)	Mean Score	SD
<i>Moringa oleifera</i> seeds flour supplementation can positively impact your overall health and immune system.	19.6	12.2	64.4	0.7	3.0	2.55	0.91
<i>Moringa oleifera</i> seeds flour supplementation is associated with potential risks or side effects.	5.6	17.8	9.6	67.0	-	3.38	0.96
PLWHIV are willing to use <i>Moringa oleifera</i> seeds flour should they be effective in suppressing HIV viral load.	68.1	21.9	-	3.7	6.3	1.58	1.11
There is adequate information available about <i>Moringa oleifera</i> seeds flour supplementation for HIV-positive individuals.	6.3	34.4	45.9	7.8	5.6	2.72	0.91
Healthcare provider's recommendations on the use of <i>Moringa oleifera</i> seeds flour supplementation will increase willingness to consume <i>Moringa oleifera</i>	27.0	50.7	16.7	3.3	2.2	2.03	0.88
The taste of <i>Moringa oleifera</i> seeds flour, when consumed alone or added to food, is good.	5.6	52.6	33.7	8.1	-	2.44	0.72
It is easy to integrate <i>Moringa oleifera</i> seeds flour into a daily diet.	7.0	65.2	23.3	4.4	-	2.25	0.65
General acceptability	-	-	-	-	-	2.57	Agree

Discussion

The study revealed a significant gap in awareness of the existence of *Moringa oleifera*, with approximately 70.8 per cent of participants unfamiliar with *Moringa oleifera* seed flour supplementation. This lack of familiarity highlights a potential knowledge deficit among HIV-positive individuals regarding alternative or

complementary treatments for managing HIV. The results align with previous research indicating limited awareness and understanding of complementary and alternative medicine (CAM) among individuals living with HIV/AIDS (Bahall, 2017; Syed et al., 2016). Such findings emphasise the need for education and awareness campaigns to bridge this knowledge gap, particularly in resource-constrained settings where access to information and healthcare services may be limited. Despite this, a minority of participants were knowledgeable about *Moringa oleifera*, suggesting that further exploration into the characteristics of these individuals could provide insights into factors influencing awareness and utilisation of complementary therapies.

The study also assessed participants' perceptions of the health benefits of *Moringa oleifera* seed flour supplementation. Approximately 48.5 per cent of participants were uncertain about its benefits, with 31.8 per cent somewhat believing in its positive impact on the immune system. This uncertainty may stem from limited access to reliable information, conflicting narratives about the effectiveness of herbal supplements, and individual variations in beliefs and experiences. Previous studies have found various results regarding the perception of CAM among people living with HIV (PLWHIV), with some studies reporting positive attitudes towards herbal remedies (Gopalakrishnan et al., 2016; Shiferaw et al., 2020), while others have highlighted scepticism due to concerns about safety and efficacy (Namuddu et al., 2011). These findings underscore the need for tailored education and counselling efforts to provide accurate information and support informed decision-making regarding the use of complementary therapies in HIV management.

Regarding safety, the study found that a significant majority of participants (78.1%) considered *Moringa oleifera* seeds flour to be a safe option for HIV-positive individuals. This positive perception may be influenced by personal experiences with the supplement. However, previous research has shown mixed results, with some studies reporting positive attitudes towards the safety of herbal remedies, while others have emphasised caution because of potential side effects and interactions with anti-retroviral medications (Bishop et al., 2008; Rafhi et al., 2024). The discrepancy in perceptions of safety across different studies highlights the complexity of PLWHIV's perspectives on complementary treatments and underscores the need for further research to explore the factors influencing these attitudes.

The study also explored the potential impact of *Moringa oleifera* seeds flour supplementation on the immune system. Participants somewhat believed that *Moringa oleifera* seeds flour positively impact the immune system, which aligns with existing research demonstrating that *Moringa oleifera* seeds flour supplementation can lead to significant increases in CD4 cell counts, indicating a strengthened immune system (Dhakad et al., 2019; Mbikay, 2012; Ramamurthy et al., 2021; Vergara-Jimenez et al., 2017). However, the study also acknowledged potential risks or side effects associated with *Moringa oleifera* seeds flour supplementation, such as gastrointestinal discomfort and allergic reactions, particularly when consumed in large quantities (Gopalakrishnan et al., 2016; Pareek et al., 2023). The general lack of concern among participants about potential risks contrasts with scientific findings that emphasise caution, particularly with high doses (Verma et al., 2009). This difference highlights a potential gap in knowledge or communication about the safe use of *Moringa oleifera* seeds flour, suggesting that educational interventions could help align public perception with scientific findings.

Participants' willingness to use *Moringa oleifera* seeds flour if proven effective in suppressing HIV viral load was notably high, with 90 per cent expressing readiness to integrate it into their treatment regimen. This openness reflects a broader trend among PLWHIV to explore complementary and alternative therapies alongside conventional anti-retroviral therapy (ART) (Bahall, 2017; Mosavat et al., 2023). However, the efficacy and safety of *Moringa oleifera* in suppressing HIV viral load remain under-researched, underscoring the need for comprehensive clinical trials to validate its therapeutic benefits in the context of HIV (Dhakad et al., 2019).

The study also found that nearly half of the participants (45.9%) were neutral regarding the amount of information they had about *Moringa oleifera* seeds flour supplementation, suggesting a general lack of awareness or uncertainty about its use among PLWHIV. This is consistent with existing literature that has documented limited research on the specific application of *Moringa oleifera* for HIV-positive individuals, resulting in less dissemination of information to the public and healthcare providers (Dhakad et al., 2019; Leone et al., 2016). The study further revealed that a significant majority of participants (77.7%) would be willing to try *Moringa oleifera* seed flour supplementation if recommended by their healthcare providers, highlighting the trust that patients place in their healthcare professionals' advice (Aprioku et al., 2022; Lorenc & Robinson, 2013). This suggests that healthcare providers play a crucial role in facilitating the adoption of new treatments or supplements, including CAM therapies.

The acceptability of *Moringa oleifera* seeds flour based on taste was also evaluated, with more than half of the participants (58.2%) finding it palatable. This level of acceptability is crucial for its integration into the diet of PLWHIV, as taste preferences can significantly influence the adoption of dietary supplements (Gopalakrishnan et al., 2016; Saini et al., 2016). The study also found that 72.2 per cent of participants found it easy to incorporate *Moringa oleifera* seeds flour into their daily diet, suggesting its convenience and adaptability in enhancing the nutritional profile of everyday meals (Islam et al., 2021; Padayachee & Bajinath, 2020).

5.0 CONCLUSION AND RECOMMENDATION

Conclusion: The study demonstrated a high level of acceptance of *Moringa oleifera* seeds flour supplementation among HIV-positive women in Marigat Sub-County despite a general lack of familiarity and information about its use for HIV management.

Recommendation: The findings highlight the need for greater awareness, targeted education, and further research to validate the therapeutic benefits and safety of *Moringa oleifera* in HIV management.

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