Original Article

Determinants of Micronutrient Powder Coverage among Children Aged 6–23 Months in Nyarugenge District, Rwanda

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Abstract

Background
Micronutrient deficiencies continue to affect millions globally, particularly pregnant women and children. This study aims to identify the determinants of Micronutrient Powder (MNP) coverage among children aged 6–23 months in Nyarugenge District, Rwanda.

Methods
A cross-sectional study was conducted on 380 children aged 6–23 months. Data were analyzed using SPSS version 21. Logistic regression was employed to assess the determinants of MNP coverage.

Results
The study found that 71.1% of children received MNP. Children aged 12–17 months (AOR = 1.63, 95% CI: 1.005–2.483, p = 0.046); 18–23 months (AOR = 2.14, 95% CI: 1.061–4.335, p = 0.034); Attendance at postnatal care (PNC) (AOR = 2.62, 95% CI: 1.346–5.097, p = 0.004), participation in supplementary feeding programs (AOR = 2.94, 95% CI: 1.214–7.109, p = 0.017), and having married mothers (AOR = 1.85, 95% CI: 1.033–3.306, p = 0.037) were positively associated with MNP coverage. Conversely, mothers aged 30–40 years (AOR = 0.14, 95% CI: 0.026–0.771, p = 0.024), UBUDEHE-2 (AOR = 0.40, 95% CI: 0.162–0.906, p = 0.031) were negatively associated with MNP coverage.

Conclusion
Integrating MNP distribution with maternal and child health services could enhance MNP coverage and adherence.

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Keywords: Micronutrient powder; child nutrition; MNP coverage; determinants; Rwanda

Introduction

Micronutrient deficiencies have become a public health problem on the health and nutrition agenda, particularly in low- and middle-income countries. Micronutrients contain vitamins and minerals the body needs to produce enzymes, hormones, and other substances essential for healthy growth. Micronutrient-related malnutrition, which refers to a lack of adequate quantities of vitamins and minerals needed, is responsible for morbidity, life-threatening conditions, and deaths for billions of people worldwide.[1] Globally, an estimated 2 billion people suffer from micronutrient deficiency, as indicated by WHO,[2] pregnant women and children suffer the most. Vitamin A deficiency is the leading cause of preventable blindness in children, while less than 1% of children suffer from night blindness. Zinc deficiency affects the central nervous, immune, reproductive, and skeletal systems.[3] Childhood development demands the availability of essential and specific vitamins and minerals, the insufficiency of which can lead to anemia, which is prevalent among 42% of children under 5 years of age and 40% of pregnant women globally.[4]

Deficiencies in vitamins and minerals are common around the world, however, people from low- and middle-income countries disproportionally suffer from micronutrient deficiency. While 282 million people in Africa are undernourished, between 60% and 70% of children in sub-Saharan Africa suffer from vitamin A deficiency, while nearly 50% suffer from zinc deficiency, and 60% of pregnant women are anaemic as a result of a lack of essential vitamins and minerals.[5]

According to the Rwanda demographic and health survey, [6] iron, vitamin A, and iodine are the most common nutrient deficiencies among children; consequently, 37% of children are anaemic, which is inversely correlated with their age and family wealth quantile. The micronutrient deficiency influences the nutritional profile, whereby among children under five years, 33% are stunted, 8% are underweight, and 1.1% are wasted (low weight-for-height, indicating acute malnutrition due to insufficient dietary intake or illness).

Micronutrient powder (MNP) has been recommended by the World Health organization for infants aged six to twenty-three months to improve nutritional status and reduce anemia.[7] WHO recommends three boxes (90 sachets) of micronutrient powder over a six-month's period. MNP is mixed with semi-solid foods to increase the vitamins and minerals in diet. The research conducted in Nepal has shown that MNP consumption reduces the risk for anaemia by approximately 25% and iron deficiency by 50%.[8]

Micronutrient powder in Rwanda locally known as "Ongera intungamubiri" is one of the services provided to every child aged 6–23 months to increase the availability of vitamins and minerals in children's diet. The powder is served by the community health workers from door to door; this is in line with the government target of reducing stunting (low height-for-age, indicating chronic malnutrition that impairs growth and development) from 33% to 18% by 2024.[9]

Then government of Rwanda established the supplementary food program that addresses the undernutrition in the first 1000 days of child's life, through this program, children aged 6–23 months receive free micronutrient powder to improve the quality and ensure their diet is rich is necessary micronutrients of the body with "Ongera intungamubiri" that emphasize sustainable dietary improvements and behavioral changes. However, RHDS 2019–2020 has shown that 18% of children aged 6–23 months received MNP,[6]and the City of Kigali city has lower MNP coverage (8.8%) than other provinces. Nyarugenge district of Kigali city has the lowest MNP coverage (6.4%) among other districts. Comparing to 6.5% in Gasabo district and 15.6% of Kicukiro district.[6] The reasons for the low MNP

coverage in the City of Kigali and Nyarugenge District remain unclear.

The objective of this study was to evaluate the determinants of MNP coverage in Nyarugenge district in order to provide evidence on the availability and accessibility of micronutrient powder, to enable the policymakers to make informed decision on how to improve the MNP supply chain. Such approach will enhance the timely delivery of the MNP to the distribution points and addressing any issues related to stockouts or distribution gaps.

Methods

Study design

A cross-sectional study design was employed to collect quantitative data from children aged 6–23 months in Nyarugenge District, Rwanda. This design was chosen as it allows for the efficient collection of data on MNP coverage and its determinants at a single point in time, providing a snapshot of the current situation.

Setting

The study was conducted in Nyarugenge District, one of the three districts of Kigali City, Rwanda. Nyarugenge is composed of ten sectors. According to the 2022 Rwanda Population and Housing Census,[10] Nyarugenge District has a population of 374,319 residing in an area of 134 square kilometers. The district is diverse, with both urban and rural populations, and is served by Nyarugenge District Hospital, which provides healthcare services, including maternal and child health interventions.

Study population and sample

The study population included children aged 6–23 months residing in Nyarugenge District. According to the May 2022 Maternal and Child Health week report, there were 7,809 children in this age group in the district. The sample size was calculated using the Yamane Taro formula, resulting in a required sample of 380 children.

A stratified random sampling technique was employed to ensure representation from both urban and rural populations. Nyarugenge District was stratified into its ten sectors, and two sectors, Gitega and Kanyinya, were selected using simple random sampling since they have both rural and urban parts. Within each selected sector, households with eligible children were identified, and participants were randomly selected for inclusion in the study.[11]

Data collection instrument and procedures

Data were collected through a structured questionnaire, which was based on literature and designed to assess MNP coverage. The coverage is defined as the percentage of the children who had received and consumed MNP within a month prior to the study.
Caregivers were interviewed at their homes, with community health workers assisting in household visits. Data collection was completed within three weeks, with approximately 20 households visited per day. The data were collected in September 2023, capturing socio-demographic, reproductive, and healthcare-related variables.

Data analysis

Data were entered, cleaned, and analyzed using IBM SPSS Statistics for Windows version 21.0 (IBM Corp, Armonk, NY, USA). This software was chosen due to its user-friendly interface, robustness in handling large datasets, and wide applicability in public health research. SPSS provides advanced statistical tools, including logistic regression, which were critical for identifying the determinants of MNP coverage in this study. Descriptive statistics were used to summarize participant characteristics. Binary logistic regression was employed to assess the association between socio-demographic variables and MNP coverage. Results were presented as adjusted odds ratios (AORs) with 95% confidence intervals (CIs). A significance level of $p < 0.05$ was used to identify statistically significant associations.

Ethical consideration

Ethical approval was obtained from the Mount Kenya University School of Public Health (MKU04/PGS&R/1050/2023) and the Nyarugenge District Health Office Ref No: 9030.07/01/01/03/23. Written informed consent was obtained from caregivers after explaining the purpose of the study, procedures, potential risks, and their right to withdraw at any time without consequence. The study was conducted in a manner that observed ethical requirements. Confidentiality was ensured by anonymizing data and securely storing it in password-protected files. Hard copies of questionnaires were securely stored and were to be destroyed after six months. While no monetary compensation was provided, caregivers were informed of the study's potential benefits for improving MNP coverage and child nutrition.

Results

The characteristics of participants

The distribution of children's gender is nearly balanced, with 49.7% being male and 50.3% female, spanning various age categories, with the largest proportion falling within the 12–17 age group (38.9%). Mothers in the study exhibited diverse educational backgrounds, with 49.5% having completed primary education. The range of maternal occupations is varied, with a notable percentage not currently employed (49.7%). Additionally, the majority of mothers fell within the 25–29 age category (34.7%), and the household heads were predominantly male (75.8%). Notably, a high percentage of respondents had health insurance (91.3%), while the majority (65%) resided within a proximity of 0–3 km to a health centre. These detailed demographic insights lay the foundation for the subsequent data analysis, enabling a nuanced exploration of the determinants of micronutrient powder coverage among children aged 6–23 months in Nyarugenge district (Table 1).

Table 1. The characteristics of Participants (N=380)

Characteristics	Frequency (n)	Percent (%)
Child's Gender		
Male	189	49.7
Female	191	50.3
Age category of child		
6–8	51	13.4
9–11	65	17.1
12–17	148	38.9
18–23	116	30.5
Mother's highest education level		
No formal education	109	28.8
Primary education	187	49.5
Secondary education	68	18.0
College/University	8	2.1
TVET /VTC	6	1.6
Mother's current occupation		
Farmer	102	26.8
Casual	27	7.1
Public employee	10	2.6
Private employee	10	2.6
Self-employed	28	7.4
Student	6	1.6
Not employed	189	49.7
Other	8	2.1
Mother's age category		
15–19	10	2.6
20–24	87	22.9
25–29	132	34.7
30–34	73	19.2
35–39	53	13.9
40–44	25	6.6
UBUDEHE category		
1	32	8.4
2	280	73.7
3	68	17.9
Mother's marital status		
Single	62	16.3
Married	206	54.2
Separated	105	27.6
Divorced	6	1.8
Household head gender		
Male	288	75.8
Female	92	24.2
Health insurance		
Yes	347	91.3
No	33	8.7
Far from health centre		
Nearly (0–3 km)	247	65
Far (3–5 km)	73	19
Very far (More than 5 km)	60	15

Source: Primary data, 2023

Maternal characteristics of caregivers

The results (Table 2) A significant majority of households consisted of 1–2 children (59.5%), followed by 3–4 children (31.1%), and 5–6 children (9.5%). Maternal healthcare utilization was notable, with 97.1% of women delivering their children at a health facility, and a similarly high percentage receiving postnatal care (PNC) at a health facility (96.6%). Maternal age at the time of the first birth varied, with the highest proportion falling within the 20–24 age category (53.7%).

Table 2. Maternal characteristics of caregivers (N=380)

Characteristics	Frequency (n)	Percent (%)
Number of children in the household		
1–2	226	59.5
3–4	118	31.1
5–6	36	9.5
Woman delivered at health facility		
Yes	369	97.1
No	11	2.9
Mother received PNC at health facility		
Yes	367	96.6
No	13	3.4
Number of ANC Visits during pregnancy		
1–4	364	95.8
4+	16	4.2
Mother's age at First Birth		
15–19	104	27.4
20–24	204	53.7
25–29	57	15.0
30–34	15	3.9

Source: Primary data, 2023

The coverage of micronutrient powder among children aged 6–23 months in Nyarugenge district

The data indicates that a substantial portion of the respondents, 71.1%, had reported receiving MNP in the last month, while 28.9% had not (Figure 1). This information is pivotal in understanding the current coverage of MNP distribution within the study population, setting the stage for further analysis to explore the determinants and factors associated with MNP coverage among children aged 6–23 months in Nyarugenge district.

Figure 1.The prevalence of Micronutrient powder among children aged 6–23 months in Nyarugenge district

The determinants of micronutrients powder coverage among children aged 6–23 months in Nyarugenge district

Bivariate Analysis using chi-square test of independence

The chi-square test was employed to test for association between each independent variable and outcome variable (MNP Coverage).

The analysis (Table 3) revealed that considering the child's characteristics, the gender of the child did not exhibit a statistically significant association with MNP receipt ($x^2 = 0.268$, $p = 0.604$). However, a significant association was observed between the age category of the child and MNP receipt ($x^2 = 36.69$, $p < 0.001$).

Concerning maternal characteristics, the age category of the mother demonstrated a statistically significant association with MNP receipt ($x^2 = 16.539$, $p = 0.005$). Mothers in the 25–29 age group show higher MNP receipt rates compared to other age categories. Furthermore, the UBUDEHE category (socio-economic classification system in Rwanda) is significantly associated with MNP receipt ($x^2 = 7.565$, $p = 0.023$), indicating variations in MNP receipt across different socio-economic strata. Examining socio-economic and health-related factors, marital status ($x^2 = 13.953$, $p = 0.003$), health insurance coverage ($x^2 = 14.4$, $p < 0.001$) revealed statistically significant associations with MNP receipt. Notably, MNP receipt was higher among married mothers. However, there was no significant association with distance from the health centre ($x^2 = 0.685$, $p = 0.710$).

Additionally, the number of children in the household was significantly associated with MNP receipt ($x^2 = 7.583$, $p = 0.023$). Considering maternal reproductive health factors, maternal age at first birth shows a significance ($x^2 = 6.288$, $p = 0.098$), with mothers aged 20–24 exhibiting higher MNP receipt rates.

Delivery at a health facility ($x^2 = 15.395$, $p < 0.001$) and postnatal care receipt at a health facility ($x^2 = 4.057$, $p = 0.044$) both exhibit significant associations with MNP receipt. The number of antenatal care (ANC) visits during pregnancy did not show a statistically significant association with MNP receipt ($x^2 = 1.779$, $p = 0.257$).

Table 3. Bivariate analysis: Determinants of micronutrients powder coverage among children aged 6–23 months in Nyarugenge district

Characteristics	Received MNP		Chi-Square	P Value
	Yes, n (%)	No, n (%)		
Child's Gender				
Male	132 (48.9)	57 (51.8)	0.268	0.604
Female	138 (51.1)	53 (48.2)		
Age category of child				
6–8	24 (8.9)	27 (24.5)	36.69	**<0.001**
9–11	35 (13)	30 (27.3)		
12–17	112 (41.5)	36 (32.7)		
18–23	99 (36.7)	17 (15.5)		
Mother's highest education level				
No formal education	85 (31.5)	24 (21.8)	5.839	0.322
Primary education	127 (47)	60 (54.5)		
Secondary education	48 (17.8)	20 (18.2)		
College/University	5 (1.9)	3 (2.7)		
TVET /VTC	3 (1.1)	3 (2.7)		
Mother's current occupation				
Farmer	71 (26.3)	31 (28.2)	7.846	0.346
Casual	22 (8.1)	5 (4.5)		
Public employee	5 (1.9)	5 (4.5)		
Private employee	7 (2.6)	3 (2.7)		
Self-employed	23 (8.5)	5 (4.5)		
Student	3 (1.1)	3 (2.7)		
Not employed	132 (48.9)	57 (51.8)		
Other	7 (2.6)	1 (0.9)		
Mother's age category				
15–19	5 (1.9)	5 (4.5)	16.539	**0.005**
20–24	50 (18.5)	37 (33.6)		
25–29	101 (37.4)	31 (28.2)		
30–34	60 (22.2)	13 (11.8)		
35–39	36 (13.3)	17 (15.5)		
40–44	18 (6.7)	7 (6.4)		

Source: Primary data, 2023

Tabele 3. Continued

Characteristics	Received MNP		Chi-Square	P Value
	Yes, n (%)	No, n (%)		
UBUDEHE category				
1	16 (5.9)	16 (14.5)		
2	205 (75.9)	75 (68.2)	7.565	**0.023**
3	49 (18.1)	19 (17.3)		
Mother's marital status				
Single	48 (17.8)	14 (12.7)		
Married	157 (58.1)	49 (44.5)	13.953	**0.003**
Separated	62 (23)	43 (39.1)		
Divorced	3 (1.1)	4 (3.6)		
Household head gender				
Male	208 (77)	80 (72.7)	0.791	0.374
Female	62 (23)	30 (27.3)		
Health insurance				
Yes	256 (94.8)	91 (82.7)	14.4	<0.001
No	14 (5.2)	19 (17.3)		
Far from health centre				
Nearly (0–3 km)	178 (65.9)	69 (62.7)		
Far (3–5 km)	52 (19.3)	21 (19.1)	0.685	0.71
Very far (More than 5 km)	40 (14.8)	20 (18.2)		
Number of children in the household				
1–2	150 (55.6)	76 (69.1)		
3–4	95 (35.2)	23 (20.9)	7.583	**0.023**
5–6	25 (9.3)	11 (10)		
Woman delivered at health facility				
Yes	268 (99.3)	101 (91.8)	15.395	**<0.001**
No	2 (0.7)	9 (8.2)		
Mother received PNC at health facility				
Yes	264 (97.8)	103 (93.6)	4.057	**0.044**
No	6 (2.2)	7 (6.4)		
Mother's age at First Birth				
15–19	71 (26.3)	33 (30)		
20–24	142 (52.6)	62 (56.4)	6.288	0.098
25–29	48 (17.8)	9 (8.2)		
30–34	9 (3.3)	6 (5.5)		
Number of ANC Visits during pregnancy				
1–4	261 (96.7)	103 (93.6)	1.779	0.257
4+	9 (3.3)	7 (6.4)		

Source: Primary data, 2023

The results from the bivariate analysis identified several significant variables ($p < 0.05$) associated with Micronutrient Powder (MNP) coverage, including the child's age, mother's age, UBUDEHE category, marital status, health insurance coverage, number of children in the household, delivery at health facility, and attendance at postnatal care (PNC) services.

These variables were subsequently included in the multivariable logistic regression model to assess the magnitude and direction of their associations with MNP coverage, while controlling for potential confounders. Variables that did not demonstrate statistical significance in the bivariate analysis, such as the child's gender, mother's highest education level, mother's occupation, and number of antenatal care (ANC) visits during pregnancy, were excluded from the multivariable model.

Multivariable analysis using logistic regression analysis

A logistic regression analysis was conducted to delve into the determinants of MNP receipt among children aged 6–23 months in Nyarugenge district. This analytical approach allows for a nuanced exploration of the statistical associations between various demographic, socio-economic, and health-related factors and the likelihood of children receiving micronutrient supplementation (Table 4).

Table 4. Multivariable analysis: Determinants of micronutrients powder coverage among children aged 6–23 months in Nyarugenge district

Characteristics	AOR	95% CI (AOR)		P-Value
	Lower	Upper		
Age category of child				
6–8	1*			
9–11	0.70	0.307	1.6	0.399
12–17	1.63	1.005	2.483	**<0.001**
18–23	2.14	1.061	4.335	**<0.001**
Mother's age category				
15–19	1*			
20–24	0.44	0.092	2.146	0.312
25–29	0.22	0.044	1.078	0.062
30–34	0.14	0.026	0.771	**0.024**
35–39	0.46	0.076	2.786	0.398
40–44	0.37	0.050	2.754	0.333
UBUDEHE category				
1	1*			
2	0.40	0.162	0.906	**0.032**
3	0.50	0.170	1.455	0.202
Mother's marital status				
Single	1*			
Married	2.36	1.077	5.691	**0.047**
Separated	4.82	1.952	11.912	0.081
Divorced	12.80	1.693	96.722	0.014
Health insurance				
Yes	3.36	1.374	8.232	0.080
No	1*			
Number of children in the household				
1–2				
3–4	0.552	0.266	1.145	0.111
5–6	0.979	0.302	3.175	0.972
Woman delivered at health facility				
Yes	11.362	0.871	148.17	0.064
No				
Mother received PNC at health facility				
Yes	1*			
No	0.471	0.047	0.898	**0.021**

Source: Primary data, 2023: 1* Reference category

The results in Table 4 indicate that children aged 12–17 months had 1.63 times the odds of receiving MNP compared to those aged 6–8 months (AOR = 1.63, 95% CI: 1.005–2.483). Similarly, children aged 18–23 months had 2.14 times the odds of receiving MNP compared to the same reference group (AOR = 2.14, 95% CI: 1.061–4.335).

In contrast, mothers aged 25–29 years had 0.22 times the odds of their children receiving MNP compared to mothers aged 15–19 years (AOR = 0.22, 95% CI: 0.044–1.078). Mothers aged 30–34 years and 40–44 years exhibited even lower odds, with 0.14 times (AOR = 0.14, 95% CI: 0.026–0.771) and 0.37 times the odds (AOR = 0.37, 95% CI: 0.050–2.754) of MNP receipt, respectively.

Considering socio-economic factors, households in UBUDEHE category 2 had significantly lower odds of MNP receipt (AOR = 0.40, 95% CI: 0.162–0.906), indicating that these households were 60% less likely to receive MNP compared to those in UBUDEHE category 1. Similarly, households in UBUDEHE category 3 also exhibited reduced odds (AOR = 0.50, 95% CI: 0.170–1.455), meaning they were 50% less likely to receive MNP compared to the reference group.

Marital status emerged as a significant determinant, with married mothers having 2.36 times the odds (136% higher likelihood) of MNP receipt compared to single mothers (AOR = 2.36, 95% CI: 1.077–5.691). In contrast, health insurance coverage did not significantly influence MNP receipt.

Attendance at postnatal care (PNC) services at a health facility was significantly associated with higher odds of MNP receipt. Mothers who attended PNC services had 53% higher odds of their children receiving MNP compared to those who did not attend (AOR = 0.471, 95% CI: 0.047–0.898).

Discussion

The objective of this study was to assess the determinants micronutrient powder coverage among children aged 6 to 23 months old in Nyarugenge district, Rwanda. This study found that 71.1% of children received MNP in the last month prior to the study, whereas in the Nairobi County study, only 18.5% of caregivers had ever received MNP for their children, and effective coverage was 5.8%. While both studies highlight the importance of effective program design and context-specific interventions to improve MNP coverage, they also emphasize the need to address socio-economic disparities to ensure equitable access for all children aged 6–23 months.[12]

The MNP coverage among children aged 6–23 months in Nyarugenge district, Rwanda, is slightly lower at 71.1% than the MNP reception rates observed in northern Nigeria, where 76.7% of households were found using MNP.[13] Another study in Eastern Uganda found that 59% of children had MNP sachet coverage.[14] Similarly, the coverage rate in Nyarugenge is higher than the MNP coverage observed in Nepal (61.3%).[8] The difference may be attributed to social-cultural and organizational factors in different study settings. Strengthening health system support, including uninterrupted MNP supply and integration within existing maternal and child health programs, emerged as a critical factor for optimizing MNP program effectiveness in both contexts. These findings underscore the importance of tailored, context-specific interventions to maximize the impact of MNP programs on child nutrition outcomes in low-resource settings.

This study reported the common factors positively associated with MNP utilization, such as the age of a child, social class, attendance to postnatal care services, and having a married mother, moreover, the study in Ethiopia found that ease of use and support from the community.

Challenges such as distance to health posts and knowledge gaps were specific barriers to coverage in Ethiopia.[15] Both findings suggest the need for tailored interventions addressing context-specific barriers to optimize MNP program effectiveness in respective settings. [16]

Another study in northern Nigeria found that, although 90.0% of caregivers indicated that MNP was easy to use, specific barriers to MNP compliance were identified, such as difficulty opening sachets and challenges related to child feeding practices, which were also observed as potential barriers in Rwanda. These findings suggest the need for tailored interventions addressing context-specific barriers to optimize MNP program effectiveness in respective settings, while also highlighting the importance of factors influencing MNP utilization across different geographic regions.[13]

The study in Uganda identified predictors such as MNP ration cards, organoleptic changes to foods, knowledge of correct MNP preparation, and current breastfeeding status that were associated with MNP reception and use. Fortunately, both studies found that older child age was associated with MNP coverage. These findings suggest the importance of tailored interventions addressing specific predictors to optimize MNP program effectiveness across different contexts.[14]

Determinants played a crucial role in MNP coverage across all studies because they directly influence access, awareness, and utilization of MNP by addressing socio-economic, cultural, and healthcare-related barriers.[17] Highlighting the need to address disparities for equitable access. Context-specific interventions, such as tailored program designs and health system support, emerged as critical factors for optimizing MNP program effectiveness. Furthermore, various predictors of MNP coverage were identified, including maternal age, participation in supplementary food programs, and having a married mother, underscoring the importance of understanding local contexts to develop targeted interventions.

Conclusion

This study identifies critical determinants of MNP coverage among children aged 6–23 months in Nyarugenge District. To improve distribution and adherence, health programs should focus on increasing awareness and access, particularly among socioeconomically disadvantaged families. Integrating MNP distribution with maternal and child health services, such as routine immunization visits and antenatal or postnatal care, could enhance coverage. Training community health workers and linking MNP distribution to health promotion activities at health facilities are practical strategies to strengthen access and improve equity in nutrition interventions.

Study limitation

The study was conducted in Nyarugenge District, which may limit the generalizability of the findings to other regions of Rwanda. Additionally, the reliance on self-reported data may introduce bias.

Strength of the study

The cross-sectional study's strength is that it was possible to analyze the variables at the same time, making it possible to assess the relationships between the variables.

Authors' contribution

AU conceptualized the study, collected data, and drafted the manuscript. CN and MM provided critical supervision and revisions, and TK assisted in Data analysis and manuscript writing. All authors reviewed and approved the final manuscript.

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Data Availability Statement

The data supporting the findings of this study are available from the corresponding author, [AU], upon reasonable request via email: ufiline05@gmail.com.

Conflict of interest declaration

The authors declare that they have no competing interests.

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