Journal of Medicine, Nursing & Public Health

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ISSN: 2706-6606

Stratford Peer Reviewed Journals and Book Publishing
Journal of Medicine, Nursing & Public Health
Volume 7||Issue 1 ||Page 117-126||June|2024|
Email: info@stratfordjournals.org ISSN: 2706-6606

Assessing Factors Hindering Effectiveness of Family MUAC Program on Nutrition Surveillance and Early Detection of Malnutrition Cases Among Children Aged 6-59 Months in Banisa Sub County

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How to cite this article: **Saida, R. H., Masinde, L. & Mugambi, L. (2024). Assessing Factors Hindering Effectiveness of Family MUAC Program on Nutrition Surveillance and Early Detection of Malnutrition Cases Among Children Aged 6-59 Months in Banisa Sub County.** ***Journal of Medicine, Nursing & Public Health*****, 7(1), 117-126. https://doi.org/10.53819/81018102t30153**

Abstract

The Family MUAC Program, which trains mothers and caregivers to use a Mid-Upper Arm Circumference (MUAC) tape to detect malnutrition in children, has improved nutrition surveillance and early detection of malnourished children. This study assessed the factors hindering the effectiveness of family MUAC programs on nutrition surveillance and detection of malnutrition among children aged 6-59 months in Banisa Sub-County, Mandera County. The study objectives were to assess the influence of mothers' characteristics and socio-economic factors on nutrition surveillance and early detection of malnutrition cases. The study was guided by Cognitive Behavioral Theory (CBT) and adopted a descriptive correlation research design. The target population was 293 mothers from Banisa Sub-County, and the sample size was determined through the census method. Primary data was collected using questionnaires and interview guides and analyzed using SPSS version 26. The response rate was 89% (209 out of 236). The findings showed a positive relationship between socioeconomic factors and the effectiveness of family MUAC programs ($r(204) = .232$, $p = .001$). On the contrary, there was no significant influence between mothers' characteristics factors and MUAC programs ($r(204) = .030$, $p = .489$). The study recommendations and conclusion aimed at exploring the feasibility and accuracy of incorporating MUAC measurements into family-based programs for detecting and addressing malnutrition, providing valuable insights into the implementation and efficacy of MUAC-based screening initiatives in community settings.

Keywords: *Mid-Upper Arm Circumference (MUAC), Mandera County, nutrition surveillance, nutrition, family-based programs*

Stratford Peer Reviewed Journals and Book Publishing
Journal of Medicine, Nursing & Public Health
Volume 7||Issue 1 ||Page 117-126||June|2024|
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1.0 Introduction

Nutrition plays a vital role in human growth and development, yet malnutrition remains a global challenge, with one in every three people experiencing some form of malnutrition (UNICEF, 2020). The triple burden of malnutrition, which includes undernutrition, micronutrient deficiencies, and over-nutrition, affects millions of children worldwide. According to the Global Nutrition Report (2022), 150.8 million children under the age of five (22.2%) are stunted, while 50.5 million children (7.4%) are wasted. Malnutrition is associated with 45% of deaths among children under five years of age, and its medical, economic, and social impacts are detrimental and lasting for individuals, families, and communities (Guldan, 2020). In sub-Saharan Africa, morbidity and mortality rates associated with malnutrition are increasing compared to other parts of the world, with an estimated 26%-38% of children under five years of age suffering from malnutrition, resulting in about 3.5 deaths per 1,000 children (Kayembe, 2022). Kenya faces a similar situation, with about a quarter of children aged five years and below being stunted (26%), 4% wasted, and 11% underweight (Mulama, 2023). In Mandera County, the rates of children at risk of malnutrition have increased to about 19.7%, with a global acute malnutrition rate of 20.4%, moderate acute malnutrition at 16.4%, and severe acute malnutrition at 4% (NDMA, 2022).

To address the persistent cases of severe acute malnutrition (SAM) and coverage gaps, despite the implementation of community-based management of acute malnutrition (CMAM) programs, the public health community has recognized the need for strategies to increase access to healthcare and scale up these strategies. One such approach is the use of Mid-Upper Arm Circumference (MUAC) for early detection of malnutrition cases (Khan, Sharmin & Ahasan, 2022). MUAC has been successfully used by healthcare providers at facility and community levels for screening and early detection of SAM, and its simplicity, accuracy, affordability, and acceptability have contributed to the initial success of CMAM (Bliss et al., 2018). The family MUAC program was introduced to further decentralize SAM care and tap into the potential of community health workers and caregivers in addressing the burden of undernutrition (Perry, 2014). This approach involves teaching mothers to measure MUAC and test for edema to detect acute malnutrition in their children (Barcus, Papathakis, Schaffner & Chimera, 2021). By participating in nutrition screening activities, mothers are acknowledged as being best positioned to detect early indicators of malnutrition and are empowered to preserve and improve their children's health. The main goal of the family MUAC program is to increase the coverage and frequency of creating awareness, screening for early detection, and treatment of acute malnutrition among children.

Despite the adoption of the family MUAC approach in various countries and its popularity in communities, especially during the COVID-19 pandemic (Zhu et al., 2022), there was a need to evaluate the factors that hindered the effectiveness of the family MUAC program in early detection of malnutrition cases. This study aimed to assess the factors hindering nutrition surveillance and early detection of malnutrition cases among children aged 6-59 months in Banisa Sub-County, Mandera County, focusing on the influence of mothers' characteristics and socioeconomic factors on the effectiveness of family MUAC programs.

1.1 Statement of the Problem

The rates of malnutrition in Mandera County remain alarming. The Coping Strategy Index (CSI) for January 2021 in Mandera is 17.45, up from 16.8 in December 2020 (NDMA, 2022). In addition, between December 2020 and January 2021, the percentage of children under the age of five who were at risk of malnutrition (MUAC) increased from 21.7% to 23.4% (Nutrition Health, 2023). As

a result, children under the age of five have a higher morbidity and mortality rate. One way to avoid this scenario is to implement early detection of malnutrition at the family level, which will aid in the provision of additional management. The most efficient and applicable method of early detection of malnutrition at the family level is the use of family MUAC. The information about factors that impede the effectiveness of family MUAC is not well understood. As a result, there is a need to assess factors limiting the effectiveness of Family MUAC as an appropriate technique in detecting malnutrition earlier to reduce the number of child mortality and morbidity. The rates of malnutrition in Mandera County are still alarming. The Coping Strategy Index (CSI) for the month of January 2021 in Mandera is 17.45, which is an increase from the value of 16.8 in the month of December 2020 (NDMA., 2022). In addition, from December 2020 to January 2021, the percentage of children under the age of five who were at risk of malnutrition (MUAC) increased from 21.7% to 23.4 % (NDMA., 2022). Consequently, there is an increase in the morbidity rate and mortality rates of children below 5 years. One way to avert this scenario is application of early detection of malnutrition at family level which will help in provision of further management. The most efficient and applicable way of early detection of malnutrition at family level is the use of family MUAC. The information regarding factors hindering the effectiveness of family MUAC are not well elucidated. Therefore, there is need to assess factors hindering the effectiveness of Family MUAC as an appropriate technique in detecting malnutrition earlier to reduce the number of child mortality and morbidity.

2.0 Literature Review

Mothers' characteristics and socioeconomic factors play a crucial role in the effectiveness and uptake of family MUAC programs for nutrition surveillance and early detection of malnutrition in children. Shahid et al. (2022) found that in a marginalized district of Punjab, Pakistan, malnutrition was high, with 91.84% of malnourished children belonging to the low maternal nutritional and health awareness (MNHA) category. The study emphasized the need for well-resourced, targeted, and coordinated health and nutritional education and awareness programs to tackle malnutrition. Similarly, Andersen et al. (2024) evaluated the Indian Integrated Child Development Services scheme and found that receipt of the scheme's activities was associated with improved nutrition knowledge and practices among beneficiary women, with improvements in practices being statistically mediated by improvements in knowledge. In a regional hospital in northeast Namibia, Albanus and Ashipala (2023) found that while most mothers had appropriate nutritional knowledge, only a minority had appropriate practices regarding feeding their children, indicating a knowledge/practice mismatch. The findings suggested the need for strategies and targeted interventions to create awareness among mothers regarding effective breastfeeding practices. In Kenya, Ndemwa et al. (2017) found that the prevalence of stunting, underweight, and global acute malnutrition rates was high among children aged 1 day to 24 months in Kwale County, with male children being associated with a significantly higher prevalence of stunting than females, and the prevalence of underweight and stunting increasing with age.

Socioeconomic factors also play a significant role in the effectiveness of family MUAC programs. Mohamed et al. (2022) found that maternal factors such as high pre-pregnancy body mass index (BMI), excess gestational weight gain (GWG), and high blood glucose levels were associated with fetal macrosomia, while low pre-pregnancy BMI, inadequate GWG, intake of confectioneries and condiments, and high blood pressure were associated with low birth weight. Chitekwe et al. (2018) found that long distances between home and treatment centers, lower MUAC at admission, or having diarrhea, vomiting, fever, or cough during the treatment episode were factors associated

with negative outcomes in a large-scale community-based management of acute malnutrition (CMAM) program in Nigeria. The study recommended providing CMAM services closer to the community, using mobile and/or satellite clinics, counseling mothers to encourage early treatment-seeking behavior, and screening patients for early detection and treatment of comorbidities. Morris et al. (2017) also found that the prevalence of stunting, underweight, and global acute malnutrition rates was high among children in Kwale County, Kenya, with male children being associated with a significantly higher prevalence of stunting than females, and the prevalence of underweight and stunting increasing with age.

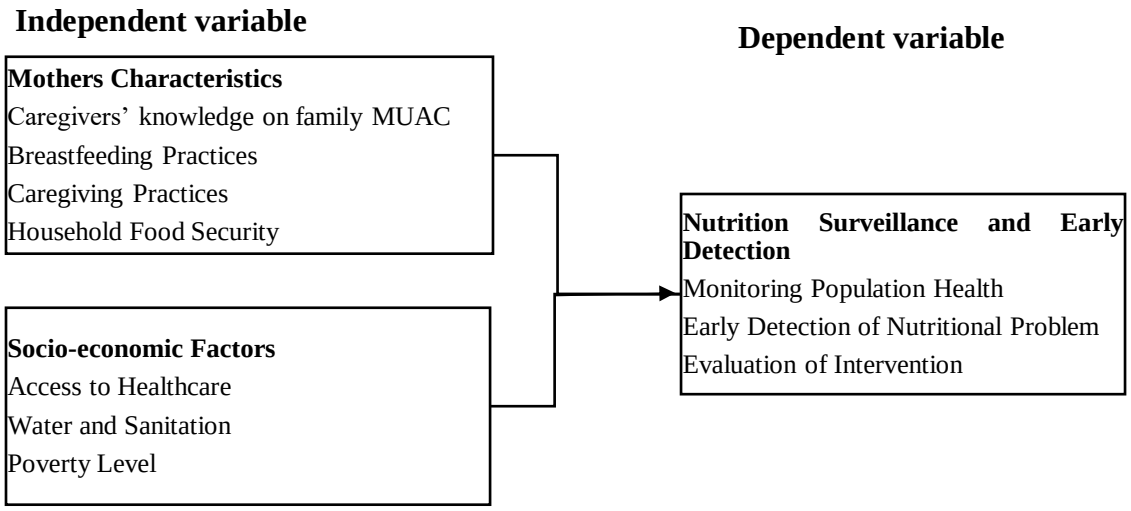

Figure 1: Conceptual framework

3.0 Methodology

The study employed a quantitative and descriptive correlational research design, targeting mothers with children aged 6-59 months in Banisa Sub-County, Mandera County, Kenya. The accessible population consisted of mothers with children aged 6-59 months who were recruited in the family MUAC program. Using a census method and stratified sampling based on age brackets, a sample size of 169 mothers was determined from a target population of 293. Data was collected through questionnaires and interviews, and a pilot study was conducted to assess the clarity, validity, and reliability of the instruments. The collected data was analyzed using descriptive statistics (means, frequencies, and percentages) and inferential statistics (Pearson chi-square coefficients and linear regression) to establish correlations and determine the significance of the independent variables' effect on the dependent variable.

4.0 Results

The study had a high response rate of 89%, with 209 of 236 questionnaires completed and returned for analysis. The majority of respondents (70.3%) were between 21 and 30 years old, with 42% married. The majority of respondents (59.3%) reported having one to three children. In terms of education, 34% had never attended school, 15% had preschool education, 20% had primary education, 24% had secondary education, and 7% had tertiary education. The study also discovered that men owned 91% of the households, with women owning only 9%.

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Journal of Medicine, Nursing & Public Health
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4.1 Influence of Mother Characteristics on Family MUAC Programs

The study looked at the influence of mother characteristics on the effectiveness of family MUAC programs for surveillance and early detection of malnutrition. The following table presents the respondents' level of agreement with various statements related to the influence of social demographic factors on the effectiveness of these programs.

Table 1: Influence of Mother Characteristics on Family MUAC Programs

Social Demographic Factors	Agree N (%)	Neither N (%)	Disagree N (%)	Mean	Std Dev
How confident are your ability to identify signs of malnutrition in your child aged 6-59 months?	184(88%)	17(8%)	9(4%)	3.83	.533
To what extent do you believe that regular monitoring of your child's growth is important for detecting malnutrition	69(33%)	37(18%)	103(49%)	2.78	.969
I promptly seek medical advice when I notice any changes in my child's eating habits	53(25%)	51(24%)	105(51%)	2.72	.883
I am knowledgeable about the signs and symptoms of malnutrition in children	156(75%)	26(12%)	27(13%)	4.12	1.182
I communicate effectively with health provides regarding my child's nutritional needs	58(28%)	27(13%)	124(59%)	2.50	1.097
Average				**3.19**	**0.9328**

The study looked into how mother characteristics affected the efficacy of family MUAC programs for malnutrition surveillance and early detection. The composite means of 3.19 indicates that most participants agree that mother characteristics influence the effectiveness of these programs. The majority of respondents (88%) were confident in their ability to recognize signs of malnutrition in their children aged 6-59 months, and 75% were familiar with the signs and symptoms of malnutrition. However, only 33% thought that regular monitoring of their child's growth was important for detecting malnutrition, and only 25% sought medical advice right away when they noticed changes in their child's eating habits. Moreover, only 28% of respondents believed they had effectively communicated with health providers about their child's nutritional needs.

4.2 Hypothesis Testing

Hypothesis H_{01}: There is no statistically significant relationship between mothers' characteristics on nutrition surveillance and early detection of malnutrition cases among children aged 6-59 months in Banisa Sub-County, Mandera County. To test the first hypothesis, the study conducted a correlation analysis to determine the strength of the linear relationship between mothers' characteristics and the effectiveness of family MUAC programs for surveillance and early detection of malnutrition.

Table 2: Correlation Results for Mother Characteristics

Variables		Family MUAC Programs Surveillance
Mothers Characteristics	Pearson correlation	.048
	Sig. (2-tailed)	.489
	N	209

https://doi.org/10.53819/81018102t30153

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Volume 7||Issue 1 ||Page 117-126||June|2024|
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The correlation results in Table 2 show a Pearson correlation coefficient of .048 between mothers' characteristics and the effectiveness of family MUAC programs for surveillance. The significance value (2-tailed) is .489, and the sample size (N) is 209. From the bivariate correlation, the Pearson coefficient (0.048) is a weak correlation which is not significant, hence showing that mothers characteristics were not correlated with efficient family MUAC nutrition surveillance and early detection of malnutrition cases among children aged 6-59 months in Banisa Sub-County.

Table 3: Regression Analysis Results

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	2.163	.141		15.335	.000
Mothers' characteristics	.030	.043	.048	.693	.489

In Table 3, the regression analysis results indicate that the unstandardized coefficient (B) for mothers' characteristics is .030, with a standard error of .043. The standardized coefficient (Beta) is .048. The t-value for mothers' characteristics is .693, with a significance level of .489. From this finding, it is confirmed that mothers' characteristics were not significant predictors of effectiveness of family MUAC programs for nutrition surveillance and early detection of malnutrition among children aged 6-59 months in Banisa sub-county in Mandera County.

4.3 Influence of Socio-economic Factors on Effectiveness of Family MUAC Program

The second objective of the study determined respondents' level of agreement with various statements related to the influence of socio-economic on effectiveness of family MUAC program surveillance and early detection. Likert scale results like agree, neither and disagree together with means and standard deviation for all the socio-economic factors variables ranges between 2.47 to 393 and from 0.921 to 1.325 respectively.

Table 4: Socio-Economic of Family MUAC Program Surveillance

Socio-Economics Factors	Agree N (%)	Neutral N (%)	Disagree N (%)	Mean	Std Dev
I believe that access to nutritious food is sufficient for children in Banisa Sub-County	194(93%)	12(6%)	3(2%)	3.93	.353
Adequate healthcare facilities are available in Banisa Sub-County to address malnutrition	63(10%)	34(16%)	112(54%)	2.72	.952
Community awareness programs effectively educate parents and caregivers about proper nutrition for children	122(58%)	11(5%)	76(37%)	3.34	1.325
Economic opportunities in Banisa Sub-County contribute positively to family's ability to provide nutrition needs for their children.	48(23%)	12(6%)	149(71%)	2.47	.925
There is sufficient access to clean water and sanitation facilities in Banisa Sub-County, which positively impacts child nutrition	98(45%)	76(36%)	40(19%)	3.15	1.003
The overall economic status of families in Banisa Sub-County influences the prevalence of malnutrition among children.	54(26%)	75(36%)	80(38%)	3.93	.353
I believe that access to nutritious food is sufficient for children in Banisa Sub-County	194(93%)	12(6%)	3(2%)	2.72	0.961
Composite Mean/SD				**3.18**	**0.839**

https://doi.org/10.53819/81018102t30153

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The composite means of 3.18 suggests that respondents slightly disagree that socio-economic factors have had a significant positive impact on the effectiveness of family MUAC programs. The majority of respondents (93%) believe that access to nutritious food is sufficient for children in Banisa Sub-County. However, only 10% agree that adequate healthcare facilities are available to address malnutrition, and 71% disagree that economic opportunities contribute positively to families' ability to provide for their children's nutritional needs. While 58% agree that community awareness programs effectively educate parents and caregivers about proper nutrition, only 45% believe there is sufficient access to clean water and sanitation facilities, which positively impacts child nutrition. The results suggest that socio-economic factors have a limited positive influence on the effectiveness of family MUAC programs in Banisa Sub-County.

4.4 Hypothesis Testing

Hypothesis H02: There is no statistically significant relationship between socio-economic factors of family MUAC program on nutrition surveillance and early detection of malnutrition cases among children aged 6-59 months in Banisa Sub-County, Mandera County. To test the second hypothesis, the study conducted a correlation analysis to determine the strength of the linear relationship between socio-economic factors and the effectiveness of family MUAC programs for surveillance and early detection of malnutrition.

Table 5: Correlation Results for Socio-Economic Factors

Variables		**Effectiveness of family MUAC Program**
Socio-Economic Factors	Pearson correlation	.232**
	Sig. (2-tailed)	.001
	N	209

The results in Table 5 show a significant and positive moderate correlation between socio-economic factors and the effectiveness of family MUAC programs for nutrition surveillance and early detection ($r(209) = .232$, $p = .001$). The findings show a weak but positive linear correlation between socio-economic factors and the effectiveness of family MUAC programs. The findings also show that access to healthcare facility, availability of sanitation facility and poverty levels positively influenced the effectiveness of family MUAC programs in detecting malnutrition among children in Banisa, Mandera County.

Table 6: Regression Results for Socio-Economic Factors effect on MUAC Programs

Model	**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
	B	**Std. Error**	**Beta**		
1 (Constant)	1.684	.170		9.921	.000
Socio-Economic Factors	.180	.053	.232	3.425	.001

The regression coefficient results demonstrate a significant and positive influence of socio-economic factors on the effectiveness of family MUAC programs ($B = .180$, $p = .001$). Based on

these findings, the study rejected the null hypothesis and concluded that there is a significant and positive influence of socio-economic factors on the effectiveness of family MUAC programs for nutrition surveillance and early detection of malnutrition in Banisa Sub-County, Mandera County.

5.0 Conclusion

The study concluded that the effectiveness of nutrition surveillance and early detection of malnutrition among children aged 6-59 months in Banisa Sub-County, Mandera County, is affected by various factors, mostly notably the socio-economic factors. Low levels of maternal education, associated with poor knowledge about nutrition and health practices, limit mothers' understanding of the importance of proper nutrition, vaccination, and timely healthcare seeking. While those were found from the descriptive statistics, inferential statistics show that socioeconomic factors were not predictors of effective family MUAC program in nutrition surveillance and detecting malnutrition among children aged 6-59 months. On the contrary, socioeconomic factors had significant positive influence on the effectiveness of family MUAC programs. Additionally, high levels of poverty restrict access to nutritious food, healthcare services, and clean water, making it challenging for families with limited financial resources to provide balanced diets for their children. These findings indicate that only socioeconomic factors are strongly linked to the positive implementation and effectiveness of family-MUAC programs in Banisa Sub-County, Mandera County.

6.0 Recommendations

The study recommended that continuous training of mothers and other caregivers should be conducted to help them identify early signs of malnutrition in their children using simple techniques such as the Mid-Upper Arm Circumference (MUAC) tape. This approach was developed with the objective of improving coverage of treatment services, detecting cases earlier, and raising awareness about malnutrition. The study also recommended the use of additional techniques, such as the "Mama Aweza" randomized controlled trial, which found that Family MUAC supported by a two-way SMS mHealth platform was associated with a one-third reduction in wasting. Furthermore, the study emphasized the importance of implementing a blanket supplementary feeding program (BSFP) for children aged 6 to 59 months to address the micro-nutrient and malnutrition issues in the area, as highlighted in the Mandera West Nutrition Survey. Lastly, the study recommended increasing the number of health facilities in the district, as the majority of the population currently lives more than 5km from the nearest facility.

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