

**NEWPORT INTERNATIONAL JOURNAL OF RESEARCH
IN MEDICAL SCIENCES (NIJRMS)**
Volume 3 Issue 3 2023

Assessment of risk factors for severe acute malnutrition in children below the age of five admitted in malnutrition unit at Mubende regional referral hospital, Uganda

Mugyema David

Department of Medicine and Surgery, Kampala International University, Uganda

ABSTRACT

The study assessed the risk factors for severe acute malnutrition in children below the age of 5 admitted in Malnutrition Unit at Mubende Regional Referral Hospital. The specific objectives of the study were; to assess the parental risk factors for severe acute malnutrition in children below the age of 5 admitted in Malnutrition Unit at Mubende Regional Referral Hospital and to assess the child risk factors for severe acute malnutrition in children below the age of 5 admitted in Malnutrition Unit at Mubende Regional Referral Hospital. A descriptive facility-based cross-sectional study design was used which was applied to both qualitative and quantitative approaches. The study population was all patients with severe acute malnutrition below the age of 5 admitted in Malnutrition Unit at Mubende Regional Referral Hospital. 261 respondents were a representative sample to take part in this study. Data was collected chiefly through a researcher-administered questionnaire specifically tailored to meet the objectives of the study and supported by anthropometric measurements and clinical evaluation and diagnoses. Data analysis was done as per objective; descriptive statistics in form of percentages, charts, tables or graphs with univariate, bivariate or multivariate analytical method. According to the findings, household was factors for severe acute malnutrition in children below the age of 5 admitted in Malnutrition Unit at Mubende Regional Referral Hospital. Majority of respondents lived in semi-permanent house constituting (49.8%), 19.2% lived in temporary house, while 31.0% was within permanent house. The findings implied that majority of respondents were considered in the middle income as they lived in a semi-permanent house. The study concluded that illiteracy and poverty were the major factors contributing to malnutrition in children while recurrent diarrhea and nonexclusive breast feeding were directly responsible for it. The study recommended that Health workers should do village outreaches to sensitize parents on prevention of malnutrition and advocate for early seeking of health services in case. The government should provide income generating activities for those in the informal sector, so that they can make extra income to feed their children and prevent malnutrition.

Keywords: Assessment, risk factors, acute malnutrition and children

INTRODUCTION

Malnutrition is the condition where by an individual can have over nutrition (excess nutrients) or under nutrition (nutrient deficiency). Under nutrition is categorized as: **acute** (recent) or **chronic** (long-term). It is caused by inadequate intake or poor absorption of nutrients in body. Under nutrition has four (4) forms; acute malnutrition, Stunting, underweight and micronutrient deficiencies. The 4 forms can be categorized moderate or severe [1]. This research will focus on severe acute malnutrition (SAM) and SAM is characterized by bilateral pitting edema or severe wasting. Several indicators can be used to measure acute malnutrition [2]. These include: height for age, weight for height, weight for age, mid upper arm circumference, body mass index and Z scores.

Height for Age: This is a measure of linear growth, and deficit represents the cumulative impact of adverse events, that ultimately results in stunting or chronic malnutrition.

Height / Age: (Height of child / Height of normal child of same age) $\times 100$.

Weight for Height: Low weight for height indicates Acute Malnutrition.

Weight / Height: (Weight of child / Weight of normal child of same height) $\times 100$

Weight for Age: Weight / Age: (Weight of child / Weight of normal child of same age) $\times 100$

Mid Upper Arm Circumference (MUAC): Used for screening wasted children.

Body mass Index (BMI): It is a screening tool for thinness, overweight and obesity.

BMI = Weight in Kg/square of height in meters.

Z score: It is the child's height minus the median height for the age and sex of the child divided by relevant standard deviation. Development of SAM is associated with several factors. Among these are: Socio-economic status, biological factors, environmental factors, role of free radicals, age of the host etc. Some of the socio-economic, biological and environmental factors are: lack of breast feeding and giving diluted formula, improper complementary feeding, overcrowding and poor child-spacing in family, ignorance, illiteracy, lack of health education (awareness), poverty, concomitant infections, familial disharmony among others [3]. Two new theories associated with SAM (specifically in the pathogenesis of Kwashiorkor) have emerged lately viz the role of free radicals and the age of the host [4]. The free radical theory postulates that free radical damage to hepatocytes give rise to Kwashiorkor whereas the age of the host theory applies frequently in infants and young children whose rapid growth increases their nutritional requirements hence predisposing to Kwashiorkor [4].

Malnutrition is a special public health problem, especially in developing countries. About 95% of all malnourished people live in the tropics and subtropics of Africa and Asia. More than 70% of children with SAM live in Asia and 26% in Africa, and 4% in Latin America and the Caribbean [5]. Malnutrition is by far the biggest contributor to child mortality: 49% of the 10.4 million deaths occurring in the under-fives in developing countries are associated with SAM. 6 million children die of hunger every year [1, 5]. When the nutritional status of a child deteriorates in a relatively short period of time, the child can be said to have acute malnutrition. If a child's weight for height measurement is less than 70% of the normal range for his age (weight for height Z score $< -3SD$), then the child would be diagnosed as having severe acute malnutrition. Another criterion is when the child's MUAC is less than 11 cm [6]. Acute malnutrition is a devastating public health problem of epidemic proportions. Worldwide, about 55 million under five children suffer from acute malnutrition and an estimated 26 million of them had severely acute malnourished, most of who live in sub-Saharan Africa and South Asia. Every year, 3.5 million children die of malnutrition related causes. Among this, severe acute malnutrition contributes to 1 million deaths of children annually [7]. SAM is a deadly condition. It kills children by increasing the case fatality of common childhood infections, and therefore it is an immediate or direct cause of child death. Malnourished children, who are ill, die because they are malnourished. Mortality rates in SAM children are 9 times higher than those in well-nourished children. According to the Maternal and Child Under nutrition Study Group, 3.5 million child deaths, 35% of the disease burden in children younger than 5 years, and 11% of total global disability-adjusted life-years (DALY) are attributable to maternal and child under nutrition [8]. It was estimated by the same group that stunting, severe wasting, and intrauterine growth restriction together were responsible for 2.2 million deaths and 21% of DALYs for children below five years of age [7].

Karamoja sub-region which is a semi-arid area of northern Uganda that borders Kenya and South Sudan has the highest burden of malnutrition compared with the rest of the country (Uganda Bureau of Statistics [9]. About 3.8% (95% CI; 3.2- 4.5) of the children younger than five years are severely wasted in Karamoja Region. Stunting and underweight rates amongst children under 5 years stand at 39.5% and 31% respectively [10]. Majority (80%) of Karamojong live below the poverty line [11]. and nearly half of all households (46%) in Karamoja are said to be food insecure [10]. About 79% of the poor households are less likely to have at least two meals a day than those living above the poverty line [12]. Less than half of Karamoja's children receive a minimum frequency of meals for their age [10]. Only 3% of children are fed adequately in terms of diet diversity and meal frequency recommended by WHO [10]. The SAM children are more vulnerable to infections because of the effect of SAM on their body metabolism and require high quality of care to catch up with growth and development [13]. A discussion with UNICEF revealed that cases of children exiting the treatment program after being successfully cured and discharged reappear for re-admission after relapsing to SAM [14]. The Ugandan Government rolled out Integrated Management of Acute Malnutrition (IMAM) Guidelines for treating children with SAM to facilitate integration of treatment of SAM in the existing health system [15]. Over 103 SAM treatment centres have been established in Karamoja Region. It is reported that 10,000- 11,500 SAM cases are treated annually in the Karamoja Region [16]. It has also been reported that only half of SAM children (49.7%) receive treatment in the Karamoja Region [16]. Globally, approximately 52 million (8%) children under the age of five years in 2011 were wasted and more than 70% were from Sub-Saharan Africa and Asia [18]. In Uganda, the national prevalence of acute malnutrition (wasting) among children 6-59 months of age is 4% and it is 10% for West Nile sub-region [19-23]. In South Sudan where most of the refugees in Uganda originate from, there is critical food shortage and famine is looming with prevalence of acute malnutrition in some areas estimated at 26.1% [24-29]. Despite the overall improvement in lowering of chronic malnutrition over the past five years, the proportion of children who are wasted has remained almost unchanged (6% in 2006 to 5% in 2011) in Uganda, there are significant disparities in malnutrition between the regions of the country [30-31].

Because of this reason this study sought to assess the **risk factors for severe acute** malnutrition in children below the age of 5 admitted in Malnutrition Unit at Mubende Regional Referral Hospital. Specific objectives is to assess the parental risk factors for severe acute malnutrition in children below the age of 5 admitted in Malnutrition Unit at Mubende Regional Referral Hospital, and also to assess the child risk factors for severe acute malnutrition in children below the age of 5 admitted in Malnutrition Unit at Mubende Regional Referral Hospital.

METHODOLOGY

STUDY DESIGN

A descriptive facility-based cross-sectional study design was used which was applied to both qualitative and quantitative approaches.

STUDY AREA

The study was conducted at Mubende Regional Referral Hospital.

STUDY POPULATION

The study population was all patients with severe acute malnutrition below the age of 5 admitted in Malnutrition Unit at Mubende Regional Referral Hospital

INCLUSION CRITERIA

All patients with severe acute malnutrition below the age of 5 admitted in Malnutrition Unit at Mubende Regional Referral Hospital within the time scope of the study and whose caretakers consented were included in the study.

EXCLUSION CRITERIA

All patients without severe acute malnutrition below the age of 5 admitted in Malnutrition Unit at Mubende Regional Referral Hospital, patients with severe acute malnutrition above the age of 5 admitted in Malnutrition Unit at Mubende Regional Referral Hospital and those whose caretakers refuse to offer consent was excluded.

SAMPLE SIZE DETERMINATION

Sample size was calculated using [21].
formula,

$$N = \frac{Z^2 PQ}{D^2}$$

Where N is the desired sample size

Z is the standard normal deviation taken as 1.96 at a confidence interval of 95%. P is the prevalence = 21.7% (Buena, 2005, Mulago hospital Kampala).

D is the degree of accuracy = 0.05.

Q = (1-P) which is the population without the desired characteristics = (1-0.217) = 0.783

$$N = \frac{1.96^2 \times 0.217 \times 0.783}{0.05^2} \approx 261.09$$

Therefore 261 respondents were a representative sample to take part in this study.

SAMPLING PROCEDURES

Simple random sampling technique was used whereby study subjects were recruited as they come and meet the inclusion criteria.

DATA COLLECTION METHODS AND MANAGEMENT

Data was collected chiefly through a researcher-administered questionnaire specifically tailored to meet the objectives of the study and supported by anthropometric measurements and clinical evaluation and diagnoses. Data collected was tallied, tabulated and charted in away that reflected the study objectives.

DATA ANALYSIS

Data was entered into Microsoft excel 2010 professional spreadsheets and analyzed using SPSS version 17.0. Data analysis was done as per objective; descriptive statistics in form of percentages, charts, tables or graphs with univariate, bivariate or multivariate analytical method.

QUALITY CONTROL

A minimum of 20 questionnaires that were not in part of the study were pretested for accuracy and ability to meet the set objectives. Corrections will be done where necessary.

ETHICAL CONSIDERATIONS

Clearance was obtained from Kampala International University-Western Campus faculty of clinical medicine &

dentistry through IREC and an introductory letter which was presented to the administration of MRRH. The researcher affirmed the use of the information obtained for research purposes only and it was not to reveal to any unauthorized parties.

LIMITATIONS / DE-LIMITATIONS OF THE STUDY

Language barrier can be the outstanding barrier to this research as the researcher cannot speak the language of the research participants, and the interpreter may not be able to translate the exact words of the participant to the researcher. Also the questionnaires were designed in English which may be hard for some research participants that cannot speak English to respond correctly.

RESULTS

The study was ‘To assess the risk factors for severe acute malnutrition in children below the age of 5 admitted in Malnutrition Unit at Mubende Regional Referral Hospital’. It was a cross-sectional study that saw 261 participants recruited. Results were then analyzed using statistical methods and presented in form of tables and pie charts.

Response Rates

A total of 261 questionnaires were given to all patients with severe acute malnutrition below the age of 5 admitted in Malnutrition Unit at Mubende Regional Referral Hospital all 261 questionnaires were fully returned complete.

Socio-demographics of the respondents

Table 1: Socio-demographics of the respondents

AGE	FREQUENCY	PERCENTAGE
15-25	60	22.9%
26-35	100	38.3%
36-45	81	30.1%
46 and above	20	7.6%
Total	261	100
Marital status		
Single	61	23.4%
Married	200	76.6%
Total	261	100
RELIGION		
Christian	160	61.3%
Muslim	60	22.9%
Other Religion	41	15.7%
Total	261	100
LEVEL OF EDUCATION		
Primary	100	38.3%
Secondary	148	56.7
College	10	13.9
Others	3	1.1
Total	261	100

Most of the participants were between the age of 26-35 (38.3%) followed by those of 36-45 (30.1%), 46 and above (7.6%). Most of the participants were married (76.6%) while (23.4%) were single

Most of the respondents were of the Christian denomination (61.3%) followed Muslims with 22.9% unlike 15.7% were other religions. The findings indicated that majority of respondents who involved in the study were Christians. For the case of education level, most of the respondents were secondary holders (56.7%), 38.3 had primary level, 13.9% had attained college level unlike (1.1%) had other qualifications.

Socio-economic factors
Table 2. Socio-economic factors

Socio- economic factors	Frequency	Percentage
House hold		
Temporally house	50	19.2
Semi-permanent	130	49.8
Permanent house	81	31.0
Total	261	100
Occupation		
House wife	115	44
Farmer	91	34.9
Business	30	11.5
Civil servant	15	5.7
Others	10	3.8
Total	261	100
Money earned per month		
Below 100,000 UgX	88	33.8
100,000 – 500,000 UgX	120	45.9
Above 500,000 Ugx	53	20.3
Total	261	100
Number of times food bought in a week?		
Once	60	22.9%
Twice	100	38.3%
Thrice	81	30.1%
Daily	20	7.6%
TOTAL	261	100
Amount of money spent on food in a month?		
Below 50,000 UgX	88	33.8
50,000 – 100,000 UgX	120	45.9
Above 100,000 UgX	53	20.3
Ownership of the following		
Radio	169	64.8
Bicycle	22	8.4
T.V set	60	23
Motorbike	10	3.8
TOTAL	261	100
Type of the roof for the main house		
grass thatched	60	22.9%
Tins	100	38.3%
Iron sheets	81	30.1%
Tiles	20	7.6%
	261	100

According to the findings, household was factors for severe acute malnutrition in children below the age of 5

admitted in Malnutrition Unit at Mubende Regional Referral Hospital. Majority of respondents lived in semi-permanent house constituting (49.8%), 19.2% lived in temporary house, while 31.0% was within permanent house. The findings implied that majority of respondents were considered in the middle income as they lived in a semi-permanent house.

On occupation, majority of respondents were housewives constituting 44%, 34.9% were farmers, 21.4% were housewives, 11.5% were business holders, 5.7% were civil servants unlike 3.8% were none of the above mentioned occupations. On the money earned per month, 33.85 earned below 100,000 UgX, 45.9% earned 100,000 – 500,000 UgX while 20.3% earned above 100,000 UgX. The findings implied that respondents had some money to cater for their children though could not be enough for. Also respondents were asked the number of times food bought in a week, it is revealed that the food is bought once in a week (22.9%), (38.3%) bought twice in a week, (30.1%) bought thrice in a week unlike 7.6% revealed that the food is bought daily in a week. The findings showed that few of respondents buy foods regularly in a week. Thus their children could not get enough food as concerned. Respondents were also asked whether they own the following; majority 64.8% of respondents had radios, 8.4% had bi-cycle, 23% had TV set, while 3.8% had motorbike. Respondents were also asked the type of the roof for the main house. This was intended to know the status of the respondents as they lived. 22.9% lived in grass thatched house, 38.3% had tins, and 30.1% had iron sheets while 7.6% had their house tiled. Majority of respondents lived in the middle income status as they live in iron sheet houses. Respondents were also asked about birth maturity. From the study findings majority of children 65% were delivered by preterm birth while 35% were delivered by term birth. The findings showed that majority of respondents produced children before their maturity thus they are easily affected by malnutrition.

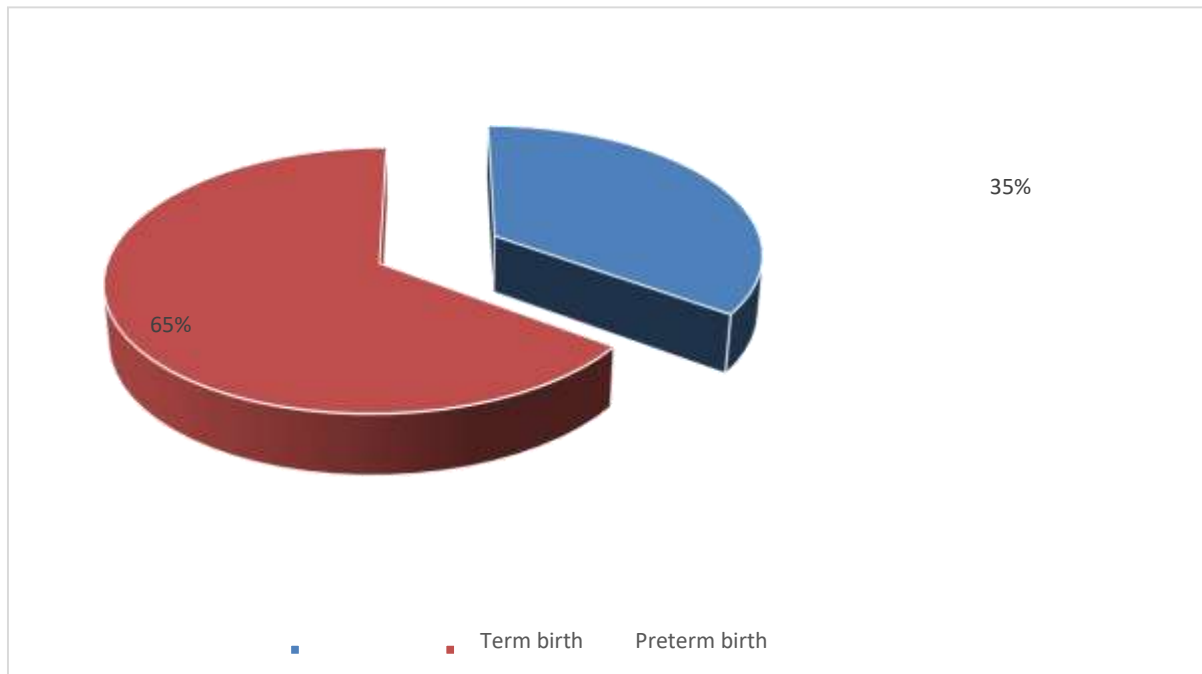


Figure 1: Children birth maturity

Majority 48% of children had normal weight, 13% had extremely low birth weight, 22% had low birth weight while 17% had very low birth weight

Respondents were also asked about birth order the results were summarized in the figure below

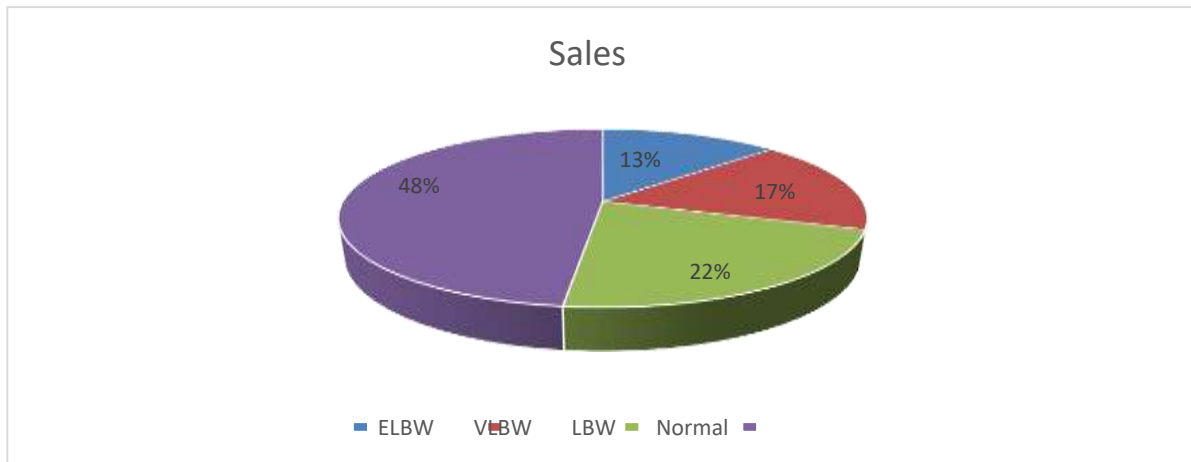


Figure 2: children's birth order

On the information about breast feed and feeding patterns, respondents were asked whether they breastfeed their children for six months. The results are summarized below in the table

Table 3: response on breast feeding and feeding patterns

Do you breastfeed your children for six months	Frequency	Percentage
YES	100	38.3
NO	161	61.7
TOTAL	261	100

Majority 61.7% of respondents do not breast their children for six months while 38.3% breastfed their children for six months. The findings implied that children were likely to have malnutrition since they are not breastfed properly.

Table 4 Child breastfeeding and feeding habits

Number of times the child is breastfed	Frequency	Percentage
1-2 times	115	44
3-4 times	91	34.9
5-6 times	30	11.5
7-8 times	15	5.7
8 and above times	10	3.8
Total	261	100
If stopped breastfeeding before 24 months, what were the reasons		
Mother became pregnant	80	30.3
Mother became sick	100	35.7
Child refused	81	31
Total	261	100
Has this child been introduced to other foods other than breast milk		

YES	188	72.1
NO	73	27.9
Total	261	100

Also on children's breastfeeding, mothers were asked the number of times the child is breastfed, majority of 44% of mothers revealed that a child is breastfed 1-2 times daily while the least 3.8% showed that the child is breastfed 8 and above times. The findings implied that mothers fear to breastfeed their more times daily because they don't want their breasts to lose. This was commonly found on mothers who were between 18- 35 years.

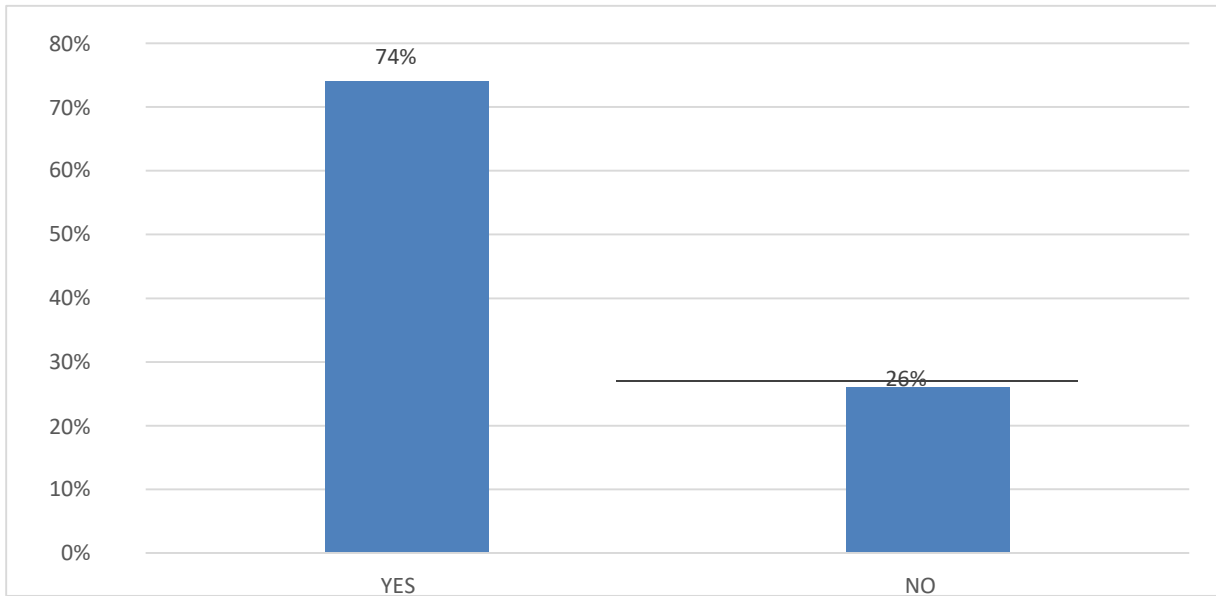
Mothers who stopped breastfeeding their children before 24 months were asked the reason and majority 35.7% revealed that most of mothers became sick unlike few of 30.3% mothers showed that mothers were pregnant. Further findings also showed that 72.1% of mothers have introduced their children to other foods other than milk unlike few of 28.9% did not introduce their children to other foods. From the study findings, those who revealed that their children were introduced to other foods other than breast milk. The results were summarized below;

Table 5: Introducing the child to other foods

N=188

Why did you decide to introduce these foods?	Frequency	Percentage
Advised at the clinic	68	36.2
Child was old enough	110	58.5
I felt that breast milk was no longer adequate	10	5.3
TOTAL		
Which food did you first introduce to the child?		
Cow milk	120	63.9
Porridge (millet)	11	5.8
Meat	36	19.1
Eggs	21	11.2
Total	188	

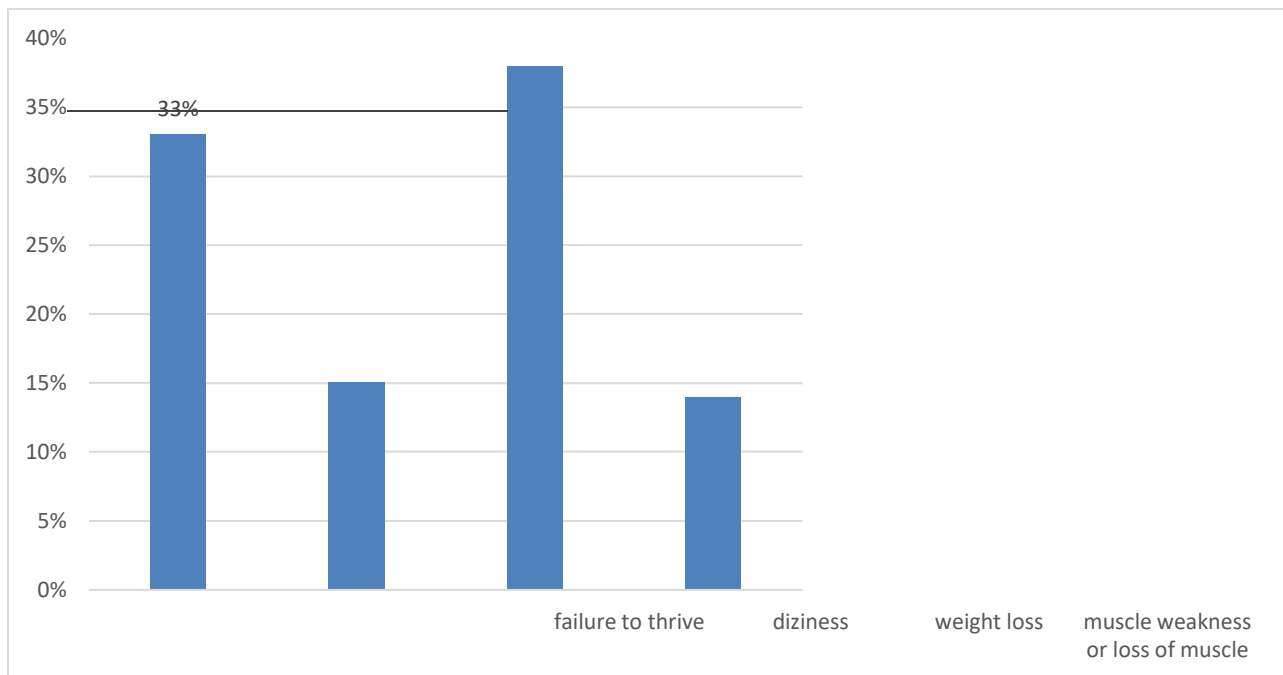
According to the table above, those who introduced their children to other foods the reason was that they got advice from the medical officers or at the health Centre like clinics among others (36.2%), also 58.5% revealed that the child was old enough to breastfeed while few of 5.3% showed that they felt that breast milk was no longer adequate. Also majority of 63.9% showed that the first food that was first introduced to the child was cow milk while 5.8% cited on porridge (millet). Respondents were asked whether the child has been unwell in the past month. The graph below shows the results;



Graph 1: Whether the child has been unwell in the past month

From the graph, majority of respondents showed that their children were unwell in the past month unlike 26% their children were well. Thus they had good health. The findings implied the children were affected by malnutrition since their mothers stopped breastfeeding them in an earlier stage.

Mothers were asked to state the child illness. The results are summarized in the graph below.



Graph 2: The state the child illness

Majority 35% of mothers revealed that their children experienced weight loss, 33% agreed that their children failed to thrive, 15% their children experienced dizziness unlike 14% showed that their children experienced muscle weakness or loss of muscles. These findings shows the signs and symptoms of malnutrition. On other hand mothers were asked signs and symptoms of a child suffering from kwashiorkor or marasmus

Table 6 Signs and symptoms of Kwashiorkor and marasmus

Disease	SYMPTOMS	Frequency	Percentage
KWASHIORKOR	Delayed growth in children	115	44
	A swollen stomach	91	34.9
	Frequent infections	30	11.5
	Skin rash	15	5.7
	diarrhea	10	3.8
	TOTAL	261	100
MARASMUS	Dry skin eyes	60	22.9%
	Low immunity	100	38.3%
	Respiratory infections	81	30.1%
	Weight loss	20	7.6%
TOTAL		261	100

On kwashiorkor, majority of 34.9% revealed that the child experience a swollen stomach unlike few of 3.8% showed that the child experience massive diarrhea. Also on a child suffering marasmus, majority of mothers 38.3% agreed that the child is usually have low immunity unlike 7.6% cited on weight loss. Also mothers were asked who cares their children when they are away. The results are tabulated below.

Table 7: The care of a child

The child is left cared by others		
YES	261	100%
Total	261	100
Who takes care of this child when you are away?		
Older siblings	100	38.3%
maid	148	56.7%
Grandmother	10	13.9%
Neighbors	3	1.1%
TOTAL	261	100
The physical appearance of the child		
Clothes unclean	60	22.9%
Nose unwiped	100	38.3%
Face unwashed	81	30.1%
Body dirty	20	7.6%
Total	261	100

All respondents 100% revealed that the child is left cared by others. However 56.75% showed that the children is looked after by the maid, 38.3% cited on older siblings, 13.95 cited on grandmother unlike few of 1.1% cited on neighbors. On the physical appearance of the child, majority of children 38.3% their children, nose were unwiped, 30.1% faces were unwashed, 22.9% clothes were unclean unlike 7.6% the body were dirty. The findings implied that mothers were careless about their children as they were in bad conditions.

CONCLUSION

In the present study illiteracy and poverty were the major factors contributing to malnutrition in children while recurrent diarrhea and non-exclusive breast feeding were directly responsible for it. High prevalence of undernutrition was observed in our setting and the majority of severely malnourished children were marasmic.

Children with single parents, who were fed on unbalanced diet, unvaccinated or who were partially vaccinated and those whose parents had lower level of education were more likely to be severely malnourished.

RECOMMENDATIONS

Health workers should do village outreaches to sensitize parents on prevention of malnutrition and advocate for early seeking of health services in case. The government should provide income generating activities for those in the informal sector, so that they can make extra income to feed their children and prevent malnutrition. Parents should be sensitized and briefed in their local language to prevent re admissions; it is possible that the children re admitted have not followed the feeding program suggested at the unit either their parents are not in position to sustain the feeding programs. We recommend routine screening for malnutrition to be done in every child who attends the hospital and nutritional counseling be done to their parents in order to prevent their children from severe malnutrition. The government should consider increasing the staff at the hospital nutritional unit to ensure that as these children are admitted they are promptly attended to, and discharged. The government should provide the required medicines for managing acute severe malnutrition and also support the unit with children feeds so that children don't lack medicines and end up staying long on hospital admission.

REFERENCES

1. Black RE, Victora CG, Walker SP, Bhutta ZA, Christian P, et al. Maternal and child undernutrition and overweight in low-income and middle-income countries. *Lancet*. 2013;382(9890):427–51.
2. Bell, C. L., Lee, A. S. W., & Tamura, B. K. (2015). Malnutrition in the nursing home. *Current Opinion in Clinical Nutrition and Metabolic Care*, Vol. 18, pp. 17–23. <https://doi.org/10.1097/MCO.000000000000130>
3. Abdel Wahed, W. Y., Hassan, S. K., & Eldessouki, R. (2017). Malnutrition and Its Associated Factors among Rural School Children in Fayoum Governorate, Egypt. *Journal of Environmental and Public Health*, 2017, 1–9. <https://doi.org/10.1155/2017/4783791>
4. Beer, S. S., Juarez, M. D., Vega, M. W., & Canada, N. L. (2015). Pediatric Malnutrition: Putting the New Definition and Standards Into Practice. *Nutrition in Clinical Practice*, Vol. 30, pp. 609–624. <https://doi.org/10.1177/0884533615600423>
5. Ahmed, M. M., Hokororo, A., Kidenya, B. R., Kabyemera, R., & Kamugisha, E. (2016). Prevalence of undernutrition and risk factors of severe undernutrition among children admitted to Bugando Medical Centre in Mwanza, Tanzania. *BMC Nutrition*, (August), 1–6. <https://doi.org/10.1186/s40795-016-0090-6>
6. United Nations International Children's Education Fund. (2016). UNICEF Data: Monitoring the situation of Children and women. Retrieved from Malnutrition website: <http://data.unicef.org/nutrition/malnutrition.html>
7. UNICEF. (2008). Anthropometric criteria for defining severe and moderate acute malnutrition, Nutrition HEAT Module. *Journal of Nutrition & Food Sciences*, 1–8.
8. SAM Expert Group, I. (2006). Management of Children with Severe Acute. *Ind Medica.*, 1–9.
9. Garenne M, W. D. (2009). Incidence and duration of severe wasting in two African populations. *Public Health Nutr*, 3–9.
10. UBOS and ICF. (2016). *Uganda Demographic and Health Survey: Key Indicators Report*. Maryland, USA.: Kampala, Uganda: UBOS.
11. UNICEF. (2013). *Global SAM Management Update Summary of Findings September*. New York: UNICEF.
12. Finance Ministry Uganda. (2014). *Poverty Status report; Structural Change and Poverty Reduction in Uganda*. Kampala: Planning and Economic Development Policy and Research Department.
13. Akombi, B. J., Agho, K. E., Merom, D., Renzaho, A. M., & Hall, J. J. (2017a). Child malnutrition in sub-Saharan Africa: A meta-analysis of demographic and health surveys (2006–2016). *PloS One*, 12(5), e0177338. <https://doi.org/10.1371/journal.pone.0177338>
14. Bizouerne, C. (2012). Conceptual models of child malnutrition: The ACF approach in mental health and care practices, 2nd ed. *ACF International France*, 2–8.
15. Black, R. A. (2008). *Maternal and child undernutrition: global and regional exposures and health consequences*. Kampala: Lancet 371:243–60.
16. Ministry of Health Uganda and UNICEF. (2016). *Guidelines for Integrated Management of Acute Malnutrition in Uganda*. Kampala: Ministry of Finance and Economic Planning, Uganda.
17. Kouam, C. D. (2014). Perspectives for integration into the local health system of community-based ty-based. *nutr J*, 1–5.
18. UNICEF/WHO- World United Nations Children's Fund, W. H. (2012). *Joint Child Malnutrition Estimates*. Washington, DC: UNICEF, New York; WHO, Geneva Arvidsson, D., Slinde, F., Larsson, S., & Hulthén, L. (2009). Energy cost in children assessed by multisensor activity monitors. *Medicine and Science in Sports and Exercise*. <https://doi.org/10.1249/MSS.0b013e31818896f4>
19. UNICEF/WHO/WBG. (2014). Levels and trends in child malnutrition. In *Joining child malnutrition estimates*. [https://doi.org/10.1016/S0266-6138\(96\)90067-4](https://doi.org/10.1016/S0266-6138(96)90067-4)
20. Uganda Bureau of Statistics (UBOS) & ICF International Inc. (2012). *Uganda Demographic and Health Survey*. Kampala: UBOS Kampala, Uganda.
21. UNICEF Joint press release. (2017.). *South Sudan famine ebbs, but situation still desperate as hunger spreads*. ROME/JUBA: South Sudan.

21. Ayana, A. B., Hailemariam, T. W., & Melke, A. S. (2015). Determinants of acute malnutrition among children aged 6–59 months in Public Hospitals, Oromia region, West Ethiopia: a case–control study. *BMC Nutrition*, 1(1), 34. <https://doi.org/10.1186/s40795-015-0031-9>.
22. Francis Teko. (2023). Factors Related to Malnutrition among Children Below Five Years in Rengen Health Center III, Kotido District. *INOSR Experimental Sciences*. 11(1).112-124.
23. Tumuheki Darius. (2023). Factors that Contribute to Occurrence of Malnutrition among Children below Five Years in Pediatric Ward Itojo Hospital, Ntungamo District Uganda. *NEWPORT INTERNATIONAL JOURNAL OF RESEARCH IN MEDICAL SCIENCES*. 3(1), 80-93.
24. Frank Abagye. (2023). Evaluation of the factors that Contributes to Malnutrition, its significances and avoidance in children admitted at Kampala International University Teaching Hospital, Bushenyi ... *INOSR Experimental Sciences*. 11(2), 89-107.
25. Sharon Awino. (2023). Factors Associated with under Nutrition in Children under Five Years in Bangladesh Parish, Namasale sub-County, Amolatar District. *INOSR Scientific Research*. 9(1), 59-68.
26. Yusuf S. Enechi, O.C., Ugwu, Kenneth K., Ugwu Okechukwu P.C. and Omeh (2013). EVALUATION OF THE ANTINUTRIENT LEVELS OF CEIBA PENTANDRA LEAVES. *IJRRPAS*, 3(3): 394-400.
27. OU Orji, UA Ibiam, PM Aja, P Ugwu, AJ Uraku, C Aloke, OD Obasi, BU Nwali (2016). Evaluation of the phytochemical and nutritional profiles of *Cnidioscolus aconitifolius* leaf collected in Abakaliki South East Nigeria. *World Journal of Medical Sciences*, 13(3): 213-217.
28. BU Nwali, GI Egesimba, PCO Ugwu, ME Ogbanshi (2015). Assessment of the nutritional value of wild and farmed *Clarias gariepinus*. *Int. J. Curr. Microbiol. App. Sci*, 4(1): 179-182.
29. CE Offor, PC Ugwu Okechukwu, U Alum Esther (2015). Determination of ascorbic acid contents of fruits and vegetables. *Int. J. Pharm. Med. Sci*, 5: 1-3.
30. E. C. Afiukwa, C. A., Ogah, O., Ugwu, O. P. C., Oguguo, J. O., Ali, F. U., & Ossai (2013). Nutritional and Antinutritional characterization of two wild Yam species from Abakaliki, Southeast Nigeria. *Research Journal of Pharmaceutical, Biological and Chemical Sciences*, RJPBCS, 4(2): 840-848.
31. FC Asogwa, PC Ugwu Okechukwu, U Alum Esther, O Egwu Chinedu, Edwin Nzubechukwu (2015). Hygienic and sanitary assessment of street food vendors in selected towns of Enugu North District of Nigeria. *American-Eurasian Journal of Scientific Research* 10(1) 22-26.

Mugyema David (2023). Assessment of risk factors for severe acute malnutrition in children below the age of five admitted in malnutrition unit at Mubende regional referral hospital, Uganda. NEWPORT INTERNATIONAL JOURNAL OF RESEARCH IN MEDICAL SCIENCES (NIJRMS) 3(3):91-103.