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Prevalence of Malnutrition and Associated Factors Among Children Under Five Years Attending Masaka Regional Referral Hospital, Uganda

[1]Ayella Allan, [1]Amanyire Jordan, and [1]Waswa Bright Laban
Affiliations [1]Department Public Health and Biomedical Sciences, Health Sciences, Bishop Stuart University, Mbarara, Uganda
Corresponding Author: Ayella Allan
Email: ayellaallan55@gmail.com

Abstract
Nutritional status is a condition of the body influenced by the diet, the levels of nutrients in the body and ability of those levels to maintain normal metabolic integrity. Normal nutritional status among individuals is managed by the balance of food consumption and normal utilization of nutrients. The purpose of the study was to determine the nutrition status of children under five years of age attending nutrition clinics at Masaka regional hospital in order to inform intervention prioritizing. A cross-sectional survey with a retrospective component that used both qualitative and quantitative research methods was employed. A total number of 505 children were targeted for the study, however, on a sample of 344 children aged under five were selected using Kish and Leslie (1965) and a simple random sampling was done to select children aged under five focusing more of those between 6-59 months Katwe-Butego attending nutrition clinic at Masaka regional hospital. Semi-structured questionnaires and key informant interview guides were used to collect quantitative and qualitative data from mothers/caretakers and key informants respectively. Data was collected with the Epicollect5 software and was downloaded and saved onto the computer. The anthropometric measurements were computed using WHO Anthro plus 2009 software to determine z-scores and percentiles which were compared with WHO (2006) child growth standards to establish nutritional status of children. Thematic analysis was adopted to analyses qualitative data. Factors associated with nutritional status of children were established using multiple Poisson regression. Results showed the prevalence of wasting, stunting and underweight was 11.6%, 32.6% and 16.3% (n=344) respectively. The overall nutritional status of children was 42.73% (n=344). Religion and tribe of mothers/caretakers, stopping period for breastfeeding and child death history in households were significantly associated with the nutritional status of children aged 6-59 months. The IYCF practices were exclusive breast feeding, supplementary, dietary diversification and early weaning. The study recommends that, the religious gatherings and tribal meetings should be used as avenues for giving nutrition education and health education by health workers in order to promote the good nutritional status of children.

Keywords: Prevalence of Malnutrition, Associated Factors, Children Under Five Years, Masaka Regional Referral Hospital, Uganda.

Background to the study
The state of the body that arises from the ratio of the nutrients in the food we eat to our nutritional requirements and from our bodies' capacity to absorb, digest, and utilize those nutrients is known as our nutritional status (FAO, 2019). When a person achieves a balance between food intake and typical nutrient use, they are said to have a normal nutritional status (OMICS, 2014). One of every human being's essential rights is adequate sustenance. Everyone should have access to it, but especially vulnerable populations including elderly people, pregnant women, and children.
However, the body experiences an imbalance when the nutrients in the diet are insufficient or improperly utilized (Gibson and Sidnell, 2014). One of the primary causes of almost half of child fatalities worldwide, among children under five, is inadequate nutrition (UNICEF, 2018). It results in immune malfunction, making children under five more vulnerable to infections. The World Health Organization states that inadequate nutrition can

result in decreased productivity as well as impaired mental and physical development (WHO, 2018a). Malnutrition has a significant influence on nations worldwide and can take many different forms, such as children who do not reach their full potential, individuals who are skin-and-bone or prone to infection, or those who are overweight (GNR, 2016).

In a similar vein, UNICEF statistics indicate that 151 million children under five worldwide suffer from stunting (UNICEF, 2018). Sub-Saharan Africa has the highest prevalence, but almost all children are affected (Black et al., 2013b). In 2017, there were around 51 million wasted children under five in the globe, 16 million of them were severely wasted (UNICEF, 2018).

In 2016, approximately 14.1 million children under the age of five were affected by wasting in the UN African Region (WHO, 2017). Several biological factors influence nutritional status, including age, gender, growth patterns, disease conditions, and genetic composition (Jackson, 2003). Young children under five have weaker immune systems than older individuals, making them more vulnerable to infectious diseases, which in turn impact their nutritional well-being (Rytter et al., 2014).

Gender also plays a role in children's nutritional status. Females generally have lower muscle mass than males, leading to lower caloric requirements and, consequently, lower dietary intake (SFGate, 2018). Additionally, genetic predisposition influences food preferences, which directly affects dietary consumption—an essential factor in determining nutritional status (Scaglioni et al., 2011). Health status is another crucial determinant; for instance, children living with HIV/AIDS are more susceptible to opportunistic infections due to weakened immunity, which significantly compromises their nutritional status (Duggal et al., 2012).

Non-biological factors also contribute to children's nutritional well-being, including climate, healthcare services, socioeconomic conditions, and socio-cultural influences. Climate plays a significant role in food production and availability, which impacts overall food consumption. It also affects the prevalence of infections such as malaria, diarrhea, and dengue fever (WHO, 2016a). Food availability directly influences dietary intake, while opportunistic infections contribute to malnutrition by causing appetite loss, poor nutrient absorption, direct nutrient loss, and metabolic alterations due to infection (Farhadi & Ovchinnikov, 2018).

Nutritional status is largely determined by education. Maternal education has been found to be a strong predictor of children's nutritional health. An investigation into the effect of maternal education on children's nutrition, for instance, in Nairobi's slums, found that children whose mothers had only completed primary school had a higher prevalence of stunting (43%) than children whose mothers had completed at least secondary school (37%).

The root causes of malnutrition in Uganda include limited access to safe drinking water, poor hygiene and sanitation, food insecurity, high fertility rates, gender inequality, and insufficient maternal and child care practices (USAID, 2010). Additional contributing factors include inadequate education, unhealthy lifestyles, and lack of physical activity (Vorster, 2010). Furthermore, limited community awareness, policy shortcomings, governance issues, and challenges in public administration and expenditure also influence an individual's nutritional status (NPA, 2015).

To address malnutrition, international organizations such as USAID have introduced initiatives like the "Feed the Future Strategy," a U.S. government program aimed at combating global hunger and enhancing food security in Uganda. This strategy has been implemented in regions such as Karamoja, Eastern Uganda, the Southwest, and the North. It emphasizes agricultural development and community-based approaches to prevent and treat malnutrition, ultimately improving nutrition among children and the wider population (USAID, 2018).

The Ministry of Health, in collaboration with agencies like USAID, has taken significant steps to reduce the prevalence of infectious diseases such as diarrhea and malaria, which negatively affect children's nutritional status. This has been achieved through health interventions like immunization, deworming, mosquito net distribution, and the provision of nutritional supplements such as vitamin A at health facilities.

In Uganda, high child morbidity and death rates are a result of hunger and poor health, which

continue to be major problems (UNICEF, 2010). According to data from the Uganda Demographic and Health Survey (UDHS), 43.8% of children in the nation suffered from malnutrition, and child mortality was 147 deaths for every 1,000 live births (UDHS, 2014). By 2013, 38% of children suffered from malnutrition, and the child death rate had decreased to 125 per 1,000 live births. Furthermore, 13% of the population had severe stunting, 3% had wasting, 21% had moderate underweight, and 4% had severe underweight (UDHS, 2016). The objective of universal health care, according to the World Health Organization (WHO), is to guarantee that everyone achieves and maintains optimal health (WHO, 2009). However, in regional referral hospitals like those in Gulu, Lira, Arua, and Jinja, undernutrition is still a serious problem, especially for children under five.

With 38% of children suffering from undernutrition, 13% from severe stunting, 3% from wasting, 21% from moderate underweight, and 4% from severe underweight, malnutrition is still a major problem in Uganda, where it contributes significantly to the country's child mortality rate of 112 deaths per 1,000 live births (UDHS, 2017). Children's nutrition is significantly influenced by economic structures, institutional frameworks, both formal and informal and decision-making processes regarding resource allocation for children. Household income levels also play a role in exacerbating malnutrition, which has been identified as a fundamental cause of child malnutrition and mortality in Uganda (UNICEF, 2013).mThe purpose of the study was to determine the nutrition status of children under five years of age attending nutrition clinics at Masaka regional Hospital. The General objective was to assess the nutritional status of children aged under five and to establish those factors among children aged under five attending Masaka regional hospital. This paper assessed factors associated with nutritional status of children under five attending at Masaka Regional Hospital.

Literature Review

Factors associated with nutritional status of children under five years

A study conducted in Lahore found that children from lower socio-economic backgrounds were more likely to experience poor nutritional status compared to those from higher socio-economic groups (Babar et al., 2010). This can be linked to insufficient time for mothers to care for and feed their children, as many mothers spend a significant amount of time working (Galgamuwa et al., 2017a).

The majority of malnourished children in Nepal came from households experiencing food insecurity, according to a cross-sectional study on household food insecurity and the nutritional status of children aged 6 to 23 months (Osei et al., 2010). In a similar vein, a study conducted in South Ethiopia discovered that children from households experiencing food insecurity had a reduced consumption of nutrients and a limited variety of their diet, which resulted in malnutrition. Compared to children from food-secure homes, children from these households had a 3.8-fold higher risk of underweight and a 6.7-fold higher risk of stunting (Betebo et al., 2017). This demonstrates how a major cause of childhood malnutrition is food instability.

Religious and cultural beliefs play a strong role in shaping food habits, particularly through dietary laws such as food taboos. Various holy books, including the Bible, Quran, Bhagavad Gita, and Buddhist scriptures, mention food restrictions (Kwon and Tamang, 2015a). For example, Muslims follow strict dietary laws that prohibit the consumption of pork, blood, carrion, and alcohol. In Uganda’s Baganda culture, individuals are forbidden from eating the totem of their own clan or their mother's clan totem (Semakula, 2019). For instance, a person with the “Nte” (cow/bull) totem cannot eat beef.

Health conditions, including both communicable and non-communicable diseases, significantly impact nutritional status. Children living with HIV/AIDS, for example, face an increased risk of opportunistic infections due to their weakened immune systems, directly affecting their nutritional status (Duggal et al., 2012).

Age is an important factor in determining nutritional status. Children under the age of five

have weaker immune systems, making them more susceptible to infections, which in turn affects their nutritional status (Rytter et al., 2014). Gender can also influence nutritional status, with females typically having lower muscle mass and calorie needs than males, which results in lower dietary intakes (SFGate, 2018). However, a study in Tanzania found no significant association between age and nutritional status (Tufingene, 2010).

Discussion

Factors associated with nutritional status of children aged 6-59 months

The findings for this study reveal that region and tribe of the caretaker, child death history in the household, and stopping period for breasting were significantly associated with the nutritional status of children.

Children whose mothers/caretakers were catholic by religion (P=0.018, CPR=1.67, 95% CI (1.09-2.25)) were 1.67 times more likely to have normal nutritional status than any other religion. By tribe, Banyoro children (P=0.001 adjusted PR=1.57, 95% CI (1.22-2.02)) were 1.57 times more likely to have children with normal nutritional status than those from any other tribe. Culture and religion influence communication flow and rapport between clients and health workers, treatment compliance and follow up among clients or patients (Vorster, 2015). Perhaps Banyoro are more compliant in terms of provision of healthcare services to their children than any other tribe which makes their children more likely to have normal nutritional status. Religion has been considered to empower communities through the consciousness of religious principles, such meaningful roles in the community, but also offers a variety of social and economic support and social networks (Basu-Zharku, 2011). It is an avenue for individual commitment beyond themselves. Mothers/caretakers who are Catholics could be committed to caring for their children most probably through; proper child feeding practices like exclusive breastfeeding and appropriate complementary feeding practices which positively impacts on child's nutritional status.

Families that had experienced any child death history (P=0.000, adjusted PR=0.56, 95% CI (0.41-1.10)) were 0.56 times more likely to be malnourished as compared to those that had never experienced any child death history. Early child death is one of the indicators of poverty but also malnutrition in children (UNDP, 2018, WHO, 2019c). The qualitative arm in the current study described Katwe-Butego as a poor community. According to WHO, poverty deprives families' capabilities of obtaining even the most basic health care for their children. It is has been indicated that poor or delayed healthcare-seeking contributes up to 70% of all under-five child deaths (WHO, 2011). Generally, poverty contributes to the poor nutritional status of children as parents lack enough money to provide quality basic needs like food, health care and shelter to their children. Child death may result due to failure of a child to recover from diseases or adverse conditions of malnutrition.

Children that stopped breastfeeding at 9 months (P=0.015, adjusted PR=0.49, 95% CI (0.28-0.88)) and those that had stopped breastfeeding at more than 12 months (P=0.010, adjusted PR=0.64, 95% CI (0.46-0.90)) were 0.49 and 0.64 times respectively more likely to be malnourished compared to those that stopped breastfeeding in other months. Ugandan policy guidelines on Infant and Young Child Feeding recommends that children should be breastfed for at least two years (MOH, 2011). Breastfeeding minimizes risks of chronic conditions such as childhood asthma, childhood leukaemia, high blood pressure, and diabetes at later stages of child development (UNICEF, 2015). Therefore, failure to breastfeed children as per policy guidelines on Infant and Young Child Feeding predisposed children to diseases and chronic health conditions thus their poor nutritional status.

Though other factors like food variety fed to mothers during pregnancy, their level of education and income, sanitation and hygiene of households, initiation period to complimentary food and prevalence of diseases among children were not significant for this study, they still play a role on child's nutritional status.

Ugandan Ministry of Health emphasizes pregnant women to eat a variety of foods in adequate amounts, basing on local availability and accessibility to meet their nutritional requirements. Extra energy and protein intake during pregnancy should be encouraged to meet

the extra nutrition demands needed for the growth of the fetus, placenta, and other maternal tissues, most especially during second and third trimesters (MOH, 2010a). The Ministry of Health recommends that women should have at least one extra meal (snack) per day on top of the regular three meals to meet the daily energy requirements of pregnancy. However, women which children attending nutrition clinic at Masaka regional hospital do not follow these recommendations. The current study indicates that only 39% and 50.58% of women in the division were given extra food ration and were fed more than 7 variety of foods respectively during their pregnancy. This could be probably due to lack of knowledge by mothers regarding feeding during pregnancy but also inadequate foods in households.

Studies indicate that adverse maternal and birth outcomes like anaemia, premature delivery, low birth weight, and other morbidities are related to maternal nutritional deficiencies (Stake, 2013, Young et al., 2012). Such outcomes lead to poor nutritional status among under-five children. Stunting and wasting of children have been linked to maternal undernutrition (Black et al., 2013a). Therefore, the first 1000 days of life which depend on maternal nutrition also determine the nutritional status of children.

Children who had never suffered from diseases within the two months before the study was conducted were 10% more likely to have normal nutritional status than those who had suffered from diseases. Though this finding was not statistically significant in the current study, findings in a similar study in Ethiopia found it significant (Fekadu et al., 2015).

Though there was no significant association between mothers earning and children's nutritional status, this study indicates that children whose mothers earned highest income per month (UGX. 200,000-300,000) were 1.18 times more likely to have normal nutritional status compared to their counterparts in the reference category. This implies that the level of income of parents indirectly affects nutritional status. This finding conformed to similar studies in India and Rawalpindi (Abuya et al., 2012a, Hagey, 2012, Mahmood et al., 2016). Possession of income by parents gives access of children to basic needs like adequate food, and health care services which positively affect their nutritional status in the long run.

Mothers/caretakers who had attained an advanced secondary level of education were 31% more likely to have children with normal nutritional compared to the rest of mothers/caretakers. The cross-sectional study conducted in Tanzania also pointed out that mothers who were educated had children with low stunting rates than those from uneducated mothers (Makori et al., 2018).

Mothers have been considered as primary care providers as far as child needs are concerned (Bbaale, 2014). However, care depends on the level of education attained by the mothers. Factors like utilization of health knowledge, small family size and increased income among others have been indicated to be associated with maternal education (Anwar et al., 2013). Education of mothers plays a big role in a child's nutritional status in that, it improves health care utilization, child care and feeding practices (Abuya et al., 2012b).

The negative and significant relationship observed between children's age and nutritional status based on stunting and underweight could be explained by the fact that as the child grows older he/she becomes more dependent and access different food than the younger infant who depends on what is provided by the caregiver/mother (Meme, 1996). However, in this study the prevalence of wasting and underweight seem to increase after the 48 months of age. This is probably due to increased physiological activities of the child at this age which may necessitate more nutrient intake to support growth and development. Children at this age are outside homes either in school or playing, failing to feed regularly to replenish their energy.

Lack of relationships between the nutritional status and gender of the household head as well as their education level could be attributed to the fact that the overwhelming majority of the household heads were of the same gender (male) and also similar education level to impact difference in nutritional status.

Although legumes, nuts and seeds were the second most popular food groups after cereals, the benefit from consumption of these food groups was not evident in determining nutritional status in this study probably because other factors like quality of the diet, quantity of food consumed and

utilizations by the body are also determinant factors.

There was no direct significant relationship between nutritional status in terms of W/A, W/H and H/A and energy adequacy. Household adequacy did not translate to individual energy adequacy and hence better nutrition probably because food often may not be distributed equally within the family. Furthermore, energy contribution from food purchased by the household was not determined and it may be a major contributor if high proportion of income spent on food observed is anything to go by.

In comparison to children from healthier families, a greater percentage of malnourished children had mothers who were housewives, had less education, or lacked personal assets, according to a case-control study conducted in Terengganu, Malaysia. Additionally, children with a history of sickness, worm infestations, or low birth weight were more likely to suffer from malnutrition. Furthermore, malnutrition was more common in children from big families, low-income households, and those who had been exposed to recurrent illnesses (Wong et al., 2014). Additionally, children of fathers with lower-paying employment were more likely to be stunted, wasting, and underweight than children of fathers with higher-paying jobs, according to a nutrition and micronutrient survey conducted in Sri Lanka (Dr. Renuka Jayatissa, 2012). This implies that the nutritional status of children is greatly influenced by parental income and that specific interventions are necessary.

The availability of adequate healthcare services is crucial for maintaining good health and optimal nutritional status (FAO, 2019). Disease prevention through immunization, care, and early diagnosis and treatment helps minimize the adverse effects of diseases, which in turn supports healthy nutritional status (FAO, 2019). In Uganda, both public and private health sectors are responsible for providing these services as outlined in the Second National Health Policy of 2010 (MOH, 2010b). Public services include national and regional hospitals as well as health centers, while private services include non-profit and for-profit health providers.

Climate plays a significant role in food production and availability, directly affecting the nutritional status of individuals. It also influences the spread of infections such as malaria, diarrhea, and dengue (WHO, 2016a). Food availability impacts food intake, which in turn affects nutritional status. Additionally, opportunistic infections can reduce the body's ability to absorb and utilize food, further affecting nutritional status

Young children, particularly those under five years old, are more vulnerable to malnutrition due to their high protein and energy requirements as well as their susceptibility to infections, which make them more at risk compared to adults (Ubesie and Ibeziakor, 2012). Malnutrition often has long-term consequences for children, negatively impacting their cognitive development and work capabilities as adults (WHO, 2018a). It is more prevalent in rural areas, especially among immune-compromised children under five (Bechir et al., 2010; Tabatabaei et al., 2015).

Malnutrition refers to conditions in both children and adults caused by poor or insufficient nutrient intake, inadequate absorption, or improper utilization of nutrients. It is categorized into two major types: Protein-energy malnutrition, which results from deficiencies in one or more macronutrients, and Micronutrient deficiency diseases, which stem from a lack of specific vitamins and minerals (Radhakrishnan, 2018).

Micronutrient malnutrition is caused by inadequate consumption of vitamins and minerals, which can result in shortages in iron, iodine, vitamin A, and other nutrients. Additionally detrimental to health, particularly in children, are deficiencies in other vitamins and minerals such as thiamine, niacin, riboflavin, folate, vitamin C, vitamin D, calcium, selenium, and zinc (FAO, 2017). According to Radhakrishnan (2018), there are three types of protein-energy malnutrition in children: acute malnutrition, which is characterized by rapid weight loss or failure to gain weight (wasting); chronic malnutrition, which results in stunting due to long-term inadequate nutrition that causes poor linear growth; and a combination of acute and chronic malnutrition, which results in underweight and can be caused by either stunting, wasting, or both.

According to the 2012 Nutrition and Micronutrient Survey, 15.1% of children aged 6 to 59 months in Sri Lanka were stunted, 27.3% were underweight, and 21.9% were wasting. According to this survey, the prevalence of stunting rose in the second year

of life after being low in the first. In contrast, wasting rose gradually for 36–47 months before falling. In contrast to research conducted in Terengganu, Malaysia, male children were more likely than female children to suffer from stunting and wasting (Dr. Renuka Jayatissa, 2012).

Poor sanitation and hygiene are important underlying contributions to child malnutrition, according to the UNICEF conceptual framework for the causes of child malnutrition (UNICEF, 2019). These elements include access to clean water, food hygiene, personal hygiene, and the cleanliness of food equipment. In underdeveloped nations, poor sanitation and hygiene habits have played a significant role in the development of infectious diseases. Malnutrition and illnesses such intestinal nematode infections, schistosomiasis, and malaria can be avoided with better hygiene practices, proper management of water quality, and sanitation facilities (WHO, 2019f). Hand washing with soap has been demonstrated to reduce the incidence of respiratory infections by 23% and diarrheal disease by 44% (Curtis et al., 2009; UNICEF, 2019). Access to clean water, basic sanitation, and good hygiene are essential for the survival and development of children (UNICEF, 2019).

Food hygiene practices, such as thorough cooking, proper food storage, and handwashing with soap before handling food, play a crucial role in preventing the spread of diarrheal diseases, regardless of the pathogen source (Woldt and Moy, 2015). Curtis and colleagues state that preventing fecal-oral diseases like typhoid and cholera can be achieved by keeping food free from fecal contamination (Curtis et al., 2011). Safe or treated water is also a critical component in food hygiene, as it prevents both food contamination and illnesses in vulnerable groups like children who may ingest contaminated water or liquids (Woldt and Moy, 2015).

Studies show that household water, sanitation, and hygiene practices are linked to children's linear growth (Ngure et al., 2014). Poor WASH practices have been linked to about 50% of child undernutrition (Pattanayak et al., 2009). In rural low-income areas, infants and young children often ingest high levels of fecal bacteria from human and animal sources by mouthing soiled items, soil, or poultry feces (Rah et al., 2015). This leads to intestinal infections, which impair appetite, nutrient absorption, and increase nutrient loss, ultimately compromising the child's nutritional status (Dewey and Mayers, 2011). The source of drinking water also significantly affects children's nutritional health. A study in Iraq found that families who used tap water as their primary drinking source were 2.4 times more likely to have malnourished children (Hasanain et al., 2012).

Methodology

The study adopted a cross-sectional survey design, integrating both quantitative and qualitative approaches. The quantitative component assessed the nutritional status of children using anthropometric measurements, while the qualitative part provided descriptive insights from caregivers and health workers. The research was conducted at Masaka Regional Referral Hospital in Masaka City, a regional facility that admits over 23,000 patients annually, making it an appropriate setting for accessing a diverse child population and obtaining reliable data on malnutrition.

The study population comprised children aged 6–59 months attending the hospital and their mothers or caretakers, as well as health workers who were selected as key informants because of their expertise in child nutrition. Inclusion criteria required that children and their mothers/caretakers lived near the hospital and attended during the study period, while exclusion criteria ruled out critically ill, disabled, grossly deformed children, and those whose caregivers did not consent to participate.

The sample size was determined using the Kish and Leslie (1965) formula, based on a malnutrition prevalence of 28% (UDHS, 2016), with adjustments for non-response, resulting in 344 children. Simple random and systematic random sampling techniques were applied to recruit children from outpatient, neonatal, and pediatric wards, while purposive sampling was used to select key informants.

Data were collected using questionnaires, interview guides, checklists, MUAC tapes, Spring Salter scales, and height/length boards. Anthropometric measurements included weight, height/length, and MUAC, while dietary assessment was conducted using a 24-hour recall method with a food composition table. Semi-structured questionnaires captured socio-

economic and household data, and qualitative interviews with mothers/caretakers and health workers enriched the findings. To ensure validity and reliability, questionnaires were translated into Luganda and back-translated to English, weighing scales were calibrated daily, and standardized procedures minimized measurement errors.

Quantitative data were analyzed using SPSS (versions 16 and 27) for descriptive statistics, Chi-square tests, and regression analyses, with anthropometric indices computed through WHO Anthro Plus (2009) against WHO (2006) growth standards. Qualitative data were analyzed thematically to identify patterns associated with nutritional status. Ethical approval was obtained from Bishop Stuart University Research Ethics Committee and Masaka Regional Referral Hospital. Participation was voluntary, with informed consent obtained from all mothers or caretakers, and confidentiality was assured by avoiding personal identifiers.

Results

Factors associated with child nutritional status at multivariate analysis

After adjusting all variables in the multivariate model, only region and tribe of the caretaker, child death history in the household, and stooping period for breasting maintained a significant association with nutritional status of children as presented in Table 4.5 below:

Table 1: Significant factors at multiple Poisson regression

Variable	Nutritional status				Adjusted PR at 95% Confidence Interval (CI)	*P-values*
	Malnourished		Normal			
	F	%	F	%		
The religion of the caretaker						
Anglican	36	24.49	30	15.23		
Muslims	78	53.06	112	56.85	1.28 (0.84-1.91)	0.256
Catholics	16	10.88	35	17.77	1.67 (1.09-2.25)	***0.018**
Sevenths day Adventists	7	4.76	11	5.58	1.57 (0.94-2.62)	0.084
Born again	10	6.08	9	4.57	0.93 (0.51-1.70)	0.816
Tribe of the caretaker						
Banyoro	100	68.03	129	65.48		
Basoga	19	12.93	16	8.12	0.81 (0.54-1.19)	0.281
Balaalo	2	1.36	2	1.02	1.06 (0.46-2.43)	0.885
Baganda	4	2.72	16	8.12	1.57 (1.22-2.02)	***0.001**
Bakiga	5	3.40	3	1.52	0.28 (0.05-1.54)	0.143
Others	17	11.56	31	15.74	1.07 (0.76-1.49)	0.699
Any child death						
Yes	3	2.04	11	5.58		
No	144	97.96	186	94.42	0.56 (0.41-1.10)	***0.000**
Staple food of the respondents						
Banana (matooke)	82	55.78	106	53.81		
Millet	7	4.76	14	7.11	0.91 (0.41-1.10)	0.809
Posho	17	11.56	20	10.15	1.04 (0.73-1.48)	0.833

Sweet potatoes	41	27.89	55	27.92	1.00 (0.79-1.26)	0.985
Rice	0	0.00	2	2.102	1.52 (0.81-2.86)	0.197
When do you stop breastfeeding						
6 months	3	2.04	13	6.60		
7 months	5	3.40	2	1.02	0.34 (0.10-1.16)	0.084
8 months	9	6.12	8	4.06	0.52 (0.23-1.15)	0.106
9 months	11	7.48	8	4.06	0.49 (0.28-0.88)	***0.015**
10 months	7	4.76	8	4.06	0.63 (0.38-1.05)	0.079
11 months	8	5.44	7	3.55	0.50 (0.24-1.02)	0.055
12 months	17	11.56	32	16.24	0.84 (0.57-1.26)	0.403
More than 12 months	87	59.18	119	60.41	0.64 (0.46-0.90)	***0.010**
Immunizations of mothers during pregnancy						
Yes	147	100	196	99.49		
No	0	0.00	1	0.51	1	

Results show that, children from mothers/caretakers who were catholic by religion (P=0.018, CPR=1.67, 95% CI (1.09-2.25) and those who were Baganda by tribe (P=0.001 adjusted PR=1.57, 95% CI (1.22-2.02) were more likely to have children with normal nutritional status as compare to those from any other religion or tribe.

Families that had experienced any child death history (P=0.000, PR=0.56, 95% CI (0.41-1.10) were less likely to have normal nutritional status as compared to those that had never experienced any child death history.

Children that stopped breastfeeding at 9 months (P=0.015, adjusted PR=0.49, 95% CI (0.28-0.88) and those that had stopped breastfeeding at more than 12 months (P=0.010, adjusted PR=0.64, 95% CI (0.46-0.90) were less likely to have normal nutritional status as compare those that stopped breastfeeding in other months.

Bi-variate analysis on the Socio-demographic factors and nutritional status of the children aged under five attending nutrition at Masaka regional hospital, Masaka City

Bi-variate analysis was performed on various selected variables with nutritional indices of the children to determine possible associations as highlighted in Table 2 below:

Table 2: Pearson correlation coefficients of selected variables and nutrition status

Variables	**WAZ**		**HAZ**		**WHZ**	
	R	**p**	**R**	**P**	**r**	**p**
Age in months	-.296**	.007	.544	.395	-.243*	.046
Sex of the child	.083	.356	.143*	.030	.004	.966
Household heads education level	-.045	.242	.036	.109	-.052	.542
Education level of the mother	.088	.325	.126	.159	.018	.845
Household size	.611	.460	.410*	.047	.402*	.041

Number of good groups consumed	.501	.341	.231	.237	.054	.112
Marital status of household head	-.92	.046	.015	.365	-.014	.101
Gender of the household head	-.91	.056	.013	.399	-.013	.112
Household Kcal adequacy	.030	.737	.010	.910	.049	.582
Morbidity status	.159	.073	.036	.684	.173*	.040
Water treatment	.044	.625	-.193	.321	.182	.421
Exclusively breastfed	-.06	.726	-.100	.330	.236	.132
Introduction to complementary feeding	-.042	.540	-.057	.652	.441	.069

***Correlation significant at 0.01 levels (2 tailed).*

****Correlation significant at 0.05 levels (2 tailed)*

WAZ- weight-for-age z-score, HAZ-height-for-age z-score, WHZ-weight-for-height z-score

Results in Table 2 above indicate that, a significant positive and linear relationship was found to exist between underweight, stunting and wasting among the children under five years after an inter-variable Pearson correlation analysis. Negative and significant correlation was observed between children's age and nutritional status based on wasting and underweight (r= -0.243 and r=-0.296 respectively). Household size was positively and significantly correlated to stunting and wasting (r=0.410, r=0.402 respectively). Household size was also positively and significantly correlated with total land size owned and size of land farmed on by the household ($p<0.05$). However, there was no significant relationship ($p>0.05$) between amount of food produced (kg), protein and energy consumed by the household and size of land farmed on by the household.

There was no significant relationship between the three indicators of nutritional status (HAZ, WAZ and WHZ) and gender, marital status and education level of the household head. Similarly, there were no direct significant associations between household income and nutritional indicators (HAZ, WAZ and WHZ). However, there was a significant association ($p<0.05$) between number of food groups consumed and household income. Household income was also significantly and positive related to proportion of income spent on purchase of food (r=0.492, p=0.000). These are indications that any extra shilling earned is spent on buying food for the household.

Discussion of results

Factors associated with nutritional status of children aged 6-59 months

The findings for this study reveal that region and tribe of the caretaker, child death history in the household, and stopping period for breasting were significantly associated with the nutritional status of children.

Children whose mothers/caretakers were catholic by religion (P=0.018, CPR=1.67, 95% CI (1.09-2.25)) were 1.67 times more likely to have normal nutritional status than any other religion. By tribe, Banyoro children (P=0.001 adjusted PR=1.57, 95% CI (1.22-2.02)) were 1.57 times more likely to have children with normal nutritional status than those from any other tribe. Culture and religion influence communication flow and rapport between clients and health workers, treatment compliance and follow up among clients or patients (Vorster, 2015). Perhaps Banyoro are more compliant in terms of provision of healthcare services to their children than any other tribe which makes their children more likely to have

normal nutritional status. Religion has been considered to empower communities through the consciousness of religious principles, such meaningful roles in the community, but also offers a variety of social and economic support and social networks (Basu-Zharku, 2011). It is an avenue for individual commitment beyond themselves. Mothers/caretakers who are Catholics could be committed to caring for their children most probably through; proper child feeding practices like exclusive breastfeeding and appropriate complementary feeding practices which positively impacts on child's nutritional status.

Families that had experienced any child death history (P=0.000, adjusted PR=0.56, 95% CI (0.41-1.10)) were 0.56 times more likely to be malnourished as compared to those that had never experienced any child death history. Early child death is one of the indicators of poverty but also malnutrition in children (UNDP, 2018, WHO, 2019c). The qualitative arm in the current study described Katwe-Butego as a poor community. According to WHO, poverty deprives families' capabilities of obtaining even the most basic health care for their children. It is has been indicated that poor or delayed healthcare-seeking contributes up to 70% of all under-five child deaths (WHO, 2011). Generally, poverty contributes to the poor nutritional status of children as parents lack enough money to provide quality basic needs like food, health care and shelter to their children. Child death may result due to failure of a child to recover from diseases or adverse conditions of malnutrition.

Children that stopped breastfeeding at 9 months (P=0.015, adjusted PR=0.49, 95% CI (0.28-0.88)) and those that had stopped breastfeeding at more than 12 months (P=0.010, adjusted PR=0.64, 95% CI (0.46-0.90)) were 0.49 and 0.64 times respectively more likely to be malnourished compared to those that stopped breastfeeding in other months. Ugandan policy guidelines on Infant and Young Child Feeding recommends that children should be breastfed for at least two years (MOH, 2011). Breastfeeding minimizes risks of chronic conditions such as childhood asthma, childhood leukaemia, high blood pressure, and diabetes at later stages of child development (UNICEF, 2015). Therefore, failure to breastfeed children as per policy guidelines on Infant and Young Child Feeding predisposed children to diseases and chronic health conditions thus their poor nutritional status.

Though other factors like food variety fed to mothers during pregnancy, their level of education and income, sanitation and hygiene of households, initiation period to complimentary food and prevalence of diseases among children were not significant for this study, they still play a role on child's nutritional status.

In this study, the majority of the mothers (57.9%) initiated their children to complimentary food at the age not recommended by the Ministry of Health. It is recommended that complementary feeding should be initiated at the age of six months (MOH, 2011). Literature indicates that the initiation period to complementary foods is determined by factors like ethnicity, geographical location, the social and economic situation (Muhimbula and Issa-Zacharia, 2010). For the case of this study, initiation of children to complementary food at un-recommended age was probably due to lack of knowledge regarding complementary feeding. Initiation of children to complementary foods at early age interferes with the digestion of breast milk among infants due to limited gastric capacity which results into reduced protective benefits of breast milk which predisposes them to diseases (Tang et al., 2015). On the other hand, late initiation of complementary foods makes children fail to meet their body nutrient demands thus their poor growth and development.

Children who had never suffered from diseases within the two months before the study was conducted were 10% more likely to have normal nutritional status than those who had suffered from diseases. Though this finding was not statistically significant in the current study, findings in a similar study in Ethiopia found it significant (Fekadu et al., 2015).

Though there was no significant association between mothers earning and children's nutritional status, this study indicates that children whose mothers earned highest income per month (UGX. 200,000-300,000) were 1.18 times more likely to have normal nutritional status compared to their counterparts in the reference category. This implies that the level of income of parents indirectly affects nutritional status. This finding

conformed to similar studies in India and Rawalpindi (Abuya et al., 2012a, Hagey, 2012, Mahmood et al., 2016). Possession of income by parents gives access of children to basic needs like adequate food, and health care services which positively affect their nutritional status in the long run.

Mothers/caretakers who had attained an advanced secondary level of education were 31% more likely to have children with normal nutritional compared to the rest of mothers/caretakers. The cross-sectional study conducted in Tanzania also pointed out that mothers who were educated had children with low stunting rates than those from uneducated mothers (Makori et al., 2018).

Mothers have been considered as primary care providers as far as child needs are concerned (Bbaale, 2014). However, care depends on the level of education attained by the mothers. Factors like utilization of health knowledge, small family size and increased income among others have been indicated to be associated with maternal education (Anwar et al., 2013). Education of mothers plays a big role in a child's nutritional status in that, it improves health care utilization, child care and feeding practices (Abuya et al., 2012b).

Sanitation and hygiene within households also affect the nutritional status of children. The sanitation and hygiene at Masaka regional hospital were observed to be poor though it was not statistically significant in the current study. This results in unhygienic food handling and child feeding practices. Literature indicates that poor hygienic practices, predispose complementary foods given to children to contamination by coliform bacteria (Islam et al., 2012). This increases the risk of infant exposure to infections and diarrhoea, which contributes to the poor growth rate (Tang et al., 2015). Therefore, promoting good sanitation and hygiene in households plays a big role in the attainment of normal nutritional status of children.

The negative and significant relationship observed between children's age and nutritional status based on stunting and underweight could be explained by the fact that as the child grows older he/she becomes more dependent and access different food than the younger infant who depends on what is provided by the caregiver/mother (Meme, 1996). However, in this study the prevalence of wasting and underweight seem to increase after the 48 months of age. This is probably due to increased physiological activities of the child at this age which may necessitate more nutrient intake to support growth and development. Children at this age are outside homes either in school or playing, failing to feed regularly to replenish their energy.

Lack of relationships between the nutritional status and gender of the household head as well as their education level could be attributed to the fact that the overwhelming majority of the household heads were of the same gender (male) and also similar education level to impact difference in nutritional status.

The negative significant relationships among household size and stunting and wasting could be explained by the fact that the family meal is distributed among large numbers of household members resulting to inadequate diet for an extended period eventually causing chronic malnutrition (Macharia et al., 2005).

Contrary to other studies (Onyango et al., 1998; Ruel, 2002), this study did not find significant association between nutritional status and dietary diversity. Thus, malnutrition in this area might be caused by other factors other than just having a diversified diet. Additional studies are required to explain cooking method and caloric adequacy of the complementary foods consumed by children in the study area. The high consumption of food items from mainly cereals observed in this study only confirms that the diets of the children were predominantly based on starchy staples. Besides lacking adequate nutrient, it is also possible that the quantity of carbohydrates obtained from these cereals group was still not adequate to meet the macronutrient needs of the children. From personal observations, the diet of children below two years mainly comprised of starchy staple (mashed banana and potatoes). While the intake of energy is important in diet, other nutrient such as vitamins, proteins and minerals are also necessary for healthy living. Moving from a monotonous diet to one containing a more diverse range of foods has been shown to increase intake of energy as well as micronutrients in developing countries (Gina et al, 2007).

Although legumes, nuts and seeds were the second most popular food groups after cereals, the benefit from consumption of these food groups was not

evident in determining nutritional status in this study probably because other factors like quality of the diet, quantity of food consumed and utilizations by the body are also determinant factors.

There was no direct significant relationship between nutritional status in terms of W/A, W/H and H/Aand energy adequacy. Household adequacy did not translate to individual energy adequacy and hence better nutrition probably because food often may not be distributed equally within the family. Furthermore, energy contribution from food purchased by the household was not determined and it may be a major contributor if high proportion of income spent on food observed is anything to go by.

Conclusion

Factors associated with nutritional status of children at multivariate analysis were; region and tribe of the caretaker, child death history in the household, and stopping period for breasting. Therefore, the current findings serve to highlight the critical predisposing factors which may be prioritized for intervention by different actors.

Recommendations

Since religion and tribe of mother/caretakers are associated with nutritional status, the religious gatherings and tribal meetings should be used as avenues for giving nutrition education and health education by health workers in order to promote the good nutritional status of children.

All mothers who are HIV negative who stop breastfeeding their children before the age of two years should be encouraged to breastfeed up to 2 years by health workers to maximize the benefits of breast milk. Mothers who are HIV positive should be encouraged to bottle feed their children after exclusive breastfeeding for at least 1.5 years.

Child death in households should be prevented by health workers through prevention of diseases and malnutrition by health educating and encouraging household members to maintain good household hygiene and sanitation, and giving quick response to child illness through seeking early treatment.

ACRONYMS

MOH	Ministry of Health
UBOS	Uganda Bureau of Statistics
UDHS	Uganda Demographic and Household Survey
UNICEF	United Nations Children's Fund
USAID	United States Aids Urgency for International Development
WHO	World Health Organization

Declarations

Ethics approval and consent to participate

To uphold the ethical considerations during the study, permission was obtained to conduct the study from Bishop Stuart University Research Ethics Committee. An introductory letter from the Directorate of Graduate Studies, Research and Innovations of Bishop Stuart University was given to enable the study to be conducted. Permission was also sought from the administration and leadership of Masaka Regional Referral Hospital to conduct the study at the facility. The local council and village health team were involved in introducing the researcher to the participants.

The study participants' written informed consent was obtained by providing participants aged 18 and above with consent forms. The permission form provided detailed information regarding the study's purpose, voluntary participation, advantages, the ability to withdraw from the study at any time without consequence, dangers, and discomforts. Measures to ensure confidentiality and privacy regarding participants' identity protection and protection of information given were offered on the consent form, allowing participants to make informed decisions.

Consent for publication

Not applicable.

Availability of data and materials

Every piece of information required for this manuscript has been included. The corresponding author can be contacted if any clarifications are required.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

Conceptualization: Ayella Allan (AA), Amanyire Jordan (AJ), and Waswa Bright Laban (WBL)
Supervision: Amanyire Jordan (AJ), and Waswa Bright Laban (WBL)
Writing – original draft: Ayella Allan (AA)
Writing – review & editing: Ayella Allan (AA), Amanyire Jordan (AJ), and Waswa Bright Laban (WBL)

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