1. PREVALENCE AND ASSOCIATED FACTORS FOR PROTEIN ENERGY

2. MALNUTRITION AMONG CHILDREN BELOW 5 YEARS ADMITTED AT JINJA REGIONAL REFERRAL HOSPITAL, UGANDA.

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16. ABSTRACT

17. Background

18. Undernutrition immensely contribute to the death of almost half of the children under 5 years, translating into the loss of about 3 million young lives a year. In developing countries, penultimate to hunger that constitute to the death of most children, Protein Energy Malnutrition (PEM) amongst other factors account for the death of 49% of children below the age of five. Due to incessant increase in poverty level in Uganda, Jinja District five-year development plan of 2011 was designed to curb menace posed by malnutrition not only on children but also adults in this district. The objective of this study is to assess the prevalence and factors associated with PEM among under-fives admitted in the paediatric wards of Jinja Regional Referral Hospital (JRRH).

19. Methods

20. To carry out this study, a descriptive questionnaire-based and facility-based cross-sectional study design was used which will apply both qualitative and quantitative approaches. The study involved a sample size of 364 with the study population being under-fives admitted in the paediatric wards of JRRH between March and August 2019.

21. Results

22. Results of this study shows that 52 out of 364 admissions were due to PEM giving a prevalence of 14.29%, males being affected more than females, with suboptimal immunization history. Children aged between 12 – 24 months contributed the highest (34.62%) cases of PEM and most are living in rural areas with low family socio-economic status and poor breastfeeding and feeding practices. The under-five PEM case-fatality rate was 2% (1 out of 52).
39. Conclusion

40. In conclusion, both the prevalence and case fatality rates of under-five PEM were high,
41. calling for appropriate interventions based on the associated factors.

42. Keywords: Protein-energy malnutrition; Case-fatality rate; Under-fives

43. BACKGROUND

44. The World Health Organization (WHO) defines Malnutrition as “the cellular imbalance
45. between the supply of nutrients and energy and the body's demand for them to ensure
46. growth, maintenance, and specific functions” [1]. Malnutrition is the condition that
47. develops when the body does not get the right amount of the vitamins, minerals, and other
48. nutrients it needs to maintain healthy tissues and organ function. Malnutrition remains a
49. major global public health challenge, especially among children under five years of age
50. [2]. One form of malnutrition that affects children is Protein Energy Malnutrition (PEM).
51. The term protein-energy malnutrition applies to a group of related disorders that include
52. marasmus, kwashiorkor, and intermediate states of marasmic-kwashiorkor which arise
53. primarily as a result of a “food gap” between the intake and requirement [3]. PEM is
54. considered the primary nutritional problem and is also known as the First National
55. Nutritional Disorder. Therefore, it is important for the health system to detect Protein
56. Energy Malnutrition at an early stage for planning and implementing timely interventions
57. at all the effective levels.
58. Protein energy malnutrition (PEM) is a major public health problem in Uganda and other
59. developing countries especially in Sub – Saharan Africa. Sub –Saharan Africa has a
60. prevalence of under-nourished children second only to India [4]. Every year, approximately
61. 2.3 million deaths among under 59 months aged children in developing countries are
62. associated with malnutrition, which is about 41% of the total deaths in this age group [5].

63. Undernutrition puts children at greater risk of dying from common infections, increases the frequency and severity of such infections, and contributes to delayed recovery [6]. The interaction between undernutrition and infection can create a potentially lethal cycle of worsening illness and deteriorating nutritional status [7]. Poor nutrition in the first 1,000 days of a child’s life can also lead to stunted growth, which is associated with impaired cognitive ability and reduced school and work performance [8]. Approximately 45% of all deaths in children under five years were associated with malnutrition. This further underpins the impact of malnutrition on child survival [9].

70. Development of PEM is associated with several risk factors, among which 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 includes, 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 [10]. PEM can also develop in pregnant and lactating mothers which can in turn affect the growth, nutritional status and survival rates of their foetuses, new-borns and infants [11].

79. The number of malnourished children in Busoga is on the increase; records at Jinja referral hospital has shown four (4) out of the ten (10) children admitted at the hospital are severely malnourished [12]. To combat the problem of protein-energy malnutrition in this community, risk factors associated with it must be identified. However, there is dearth of information on the risk factors associated with the cases reported at the Jinja regional referral hospital, Uganda.
Therefore, the aim of this study is to determining the case fatality rate and the various predisposing factors to development of PEM among children under five years of age admitted in the paediatric wards of Jinja Regional Referral Hospital. This will provide the necessary information on the prevalence of PEM within the study area and help channel towards finding the lasting solution to this problem.

**90. METHODOLOGY**

**91. Study design**

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

**94. Study area**

The study was conducted at Jinja Regional Referral Hospital. Jinja Hospital is one of the thirteen (13) Regional Referral Hospitals in Uganda. It is also one of the fifteen (15) hospitals designated as Internship Hospitals, where graduates of Ugandan medical schools may undergo a year of internship under the supervision of consultants and specialists in the designated medical and surgical disciplines.

**100. Study Population**

The study population were all children below the age of five years admitted in the paediatric wards of JRRH between March-August, 2019.

**103. Inclusion and Exclusion criteria**

All under-fives admitted in the Paediatric wards of JRRH within the time scope of the study and whose caretakers offered consent were included in the study.

Meanwhile, all under-fives admitted in the Paediatric wards of JRRH within the time scope of the study whose caretakers refused to offer consent were excluded.
108. **Sampling Procedures**

Consecutive sampling technique was used whereby study subjects were recruited as they came and met the inclusion criteria.

111. **Data Analysis**

Data was entered into Microsoft excel 2016 professional spreadsheets and analysed using SPSS version 17.0. Data analysis was done as per objective; descriptive statistics in form of percentages, charts, tables and graphs with univariate, bivariate and multivariate analytical methods being employed.

116. **RESULTS**

117. **Demographic characteristics of study population**

As shown in Table 1, The demographic feature of participants included female (58.24%) and male (41.76%). 37.91% of the under-fives admitted to the paediatric ward at JRRH were aged between 25 and 36 months, followed by those above 36 months (28.57%), 12-24 months (23.08%) and the least is <12 months old (10.44%). Most (58.79%) of the admitted under-fives were under the care of their mothers followed by those under the care of their aunt (28.02%), sister (11.54%) or grandmother (1.65%).

125. **PREVALENCE OF PROTEIN ENERGY MALNUTRITION AMONG UNDER-FIVES**

As shown in Table 2, 52 (14.29%) of the total admissions were due to protein energy malnutrition while 312 (85.71%) were well nourished. It is evident that children aged between 12 – 24 months contributed the highest cases of PEM (34.62%), followed by those aged 25 – 36 months (26.92%) and then those above
36 months (23.08%). The least number of PEM cases was seen in those aged below 12 months (15.39%).

FACTORS ASSOCIATED WITH UNDER-FIVE PEM AT JRRH

Immunization history and under-five PEM

The Children not being fully immunized were found associated with increased cases of PEM as shown in Table 3. Child’s immunization status was found to be of great importance as high number (271) of children that did not suffer from PEM were fully immunized.

Breastfeeding and Feeding practices in association to under-five PEM at JRRH

As shown in Table 4, exclusive breastfeeding (RR: 0.2151), breastfeeding on demand (RR: 0.6114), feeding on specially prepared feeds (RR: 03249) and separately from the other siblings (RR: 0.6487) were found to be associated with a reduction in PEM cases. However, Age at weaning (P-value: 0.9317), total breastfeeding duration (P-value: 0.4152) and number of daily feeds (P-value: 0.6474) were found to be of no statistical significance in as far as under-five PEM was concerned. Though, those having only two feeds per day were found to be more affected by PEM (44.23%) than those with more meals per day. Cow milk, beans, vegetable soup, porridge, banana and matoke mash were the common feeds at weaning.

Family-social characteristics and under-five PEM at JRRH

As shown in table 5, most families had between 2 to 4 siblings in a household (58.79%), under the care of their married parents (78.85%), peasant (76.65%), aged
between 25 and 29 years (34.07%), and who lived in a rural area (82.42%), on an average monthly income of between 100,000 – 500,000 UGX (67.31%) and monthly food expenditure of 50,000UGX or more (93.68%).

However, Urban residence (RR: 0.7952) and Caregiver’s occupation (P-value: 0.0394) were found to be statistically significant in as far as association with under-five PEM was concerned whereas number of siblings (P-value: 0.8083), caregiver’s age (P-value: 0.8840), caregiver’s marital status (P-value: 0.43231), family monthly income (P-value: 0.9366) and monthly food expenditure (P-value: 0.7474) showed no statistical significance.

**CASE FATALITY OF UNDER-FIVE PEM CHILDREN**

Over the study period, only a single fatality attributable to PEM and/or its complications was recorded as shown in Figure 1. This gave a PEM case-fatality rate of 2%.

**DISCUSSIONS**

Prevalence of Protein Energy Malnutrition in under five children showed 52 out of the 364 study participants had PEM (14.29%). These findings support earlier reports that malnutrition is still a big problem in sub of Saharan countries [13]. The study also agreed with the findings of [14] and [15]. However, the result got from this research is slightly lower than prevalence level of 30% reported by [16]. The result may be attributed to the effectiveness of measures put in place to combat malnutrition in the recent past [17]. Otherwise, it may also vary as a result of regional variation in economy, agricultural practice or food security within Uganda [18].
The relationship between child sex of PEM in under-five children showed that males (7.70%) under-five children suffer from PEM compared to females (6.59%). This sex difference was also reported by [19], they observed that Tanzanian under-five males were more affected by PEM than their female counterparts. Similarly, [20] reported that males were worse hit by PEM in Egypt than females. This male predilection could be due to the fact that male children take part in playful activities that demand and expend more energy compared to female children [21].

Poor immunization history was also found to be associated with increased rates of PEM. This was similar to the findings of [22] in Bugando Medical Centre in Mwanza Tanzania. Studies have shown infections to not only be consequences of malnutrition, but can also be a major cause [6].

This study also showed that poor breastfeeding / feeding practices are significantly associated with under-five PEM as observed in the children that were not exclusively breast fed (RR = 0.2151) and not fed on demand (RR = 0.6114). The result was in agreement with the findings of [23] that reported PEM to be a result of suboptimal breastfeeding and feeding practices. It goes without saying that reduced supply is the direct cause of PEM in this case.

Residence was also shown to hold statistical significance [RR = 0.7952] in PEM with rural residence being associated with increased PEM rates. This result agreed with the findings of [24] that observed that better nutritional status of urban children is probably due to the cumulative effect of a series of more favourable socioeconomic conditions, which, in turn, seems to lead to better caring practices for children and their mothers. Despite not statistically significant (P-Value =
0.936552) low monthly income (less than 100,000 UGX) and low monthly expenditure on food (less than 50,000 UGX) was associated with higher rates of PEM. Fatality attributable to PEM or its complications was reported during the study period. This gave an under-five PEM fatality rate of 2%. The fatality record of 2% noticed in this study may be as a result of unforeseen constraints attributed to malnutrition such as diseases. Single fatality recorded might also be indicative of good and improved care provision by the health facility that curtailed more deaths.

CONCLUSIONS

The prevalence of Protein Energy Malnutrition among under-five children admitted at JRRH was high, which warrants immediate mitigating measures with associated factors being suboptimal breastfeeding and feeding practices, age and sex of child, poor immunization status, urban residence, caregiver occupation and financial challenges. However, single case-fatality recorded in the course of this study calls for proper intervention to completely eradicate PEM among under-five children.

RECOMMENDATIONS

The caregivers of under-five children should strictly adhere to exclusive breastfeeding for at least 6 months since its benefits have been scientifically proven beyond doubt. Also, the administration and staff of Jinja Regional Referral Hospital should improve and/or scale-up existing community outreaches to educate the community on the importance of exclusive breastfeeding, optimal child feeding practices and childhood immunization in the fight against childhood malnutrition,
infections and deaths accompanied by intensive community childhood immunization as per EPI stipulations and guidelines. Lastly, the Government of Uganda through the Ministry of Health must intensify community awareness-creation concerning childhood malnutrition, breastfeeding and feeding practices as well as childhood immunization through available avenues such as audio-visual and print media and continue support of these efforts both materially, financially and staff empowerment.

DECLARATIONS

Ethical considerations

Compliance with ethical standards

Consent for publication

Consent to use and publish the data from this work was obtained from the authorities of Jinja Regional Referral Hospital. Also, all authors have read and approved the final manuscript.

Availability of supporting data

If requested by the publisher, data for this work is going to be provided

Competing interests

The authors declare that they do not have competing interests

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Authors’ Contributions

LAM and SAS originated the work, LAM conceptualised the work while SAS supervised the design, methods and writes the manuscript. SAA and YOF helped with the critical review of the manuscript.

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REFERENCES

https://doi.org/10.1016/B0-12-226694-3/00198-8


http://www.who.int/maternal_child_adolescent/topics/child/malnutrition/en/


https://ugandaradionetwork.com/story/cases-of-malnutrition-on-the-rise-in-jinja


https://doi.org/10.1371/journal.pone.012994


[15] AT. Malnutrition in Sub-Saharan Africa: Burden, causes and prospects. *Pan African Medical Journal*. 2013; [https://doi.org/10.11604/pamj.2013.15.120.2535](https://doi.org/10.11604/pamj.2013.15.120.2535)


**Figure legend**

- Blue: Number of Deaths
- Orange: Survivors