IJAAR PUBLISHING®

Open Access Journal of Science Research | ISSN: 3027-1185
Vol. 3, Issue 1 (2025) | www.ijaar.org

PREDICTIVE RISK FACTORS FOR MALNUTRITION AMONG CHILDREN AGED 6 TO 60 MONTHS AT FEDERAL TEACHING HOSPITAL LOKOJA NIGERIA

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ABSTRACT

Background: Malnutrition remains one of the most common causes of morbidity and mortality among children worldwide. Adequate nutrition during the first five years of life is crucial for physical, cognitive, and emotional development. This study was carried out to determine the prevalence, and risk factors associated with malnutrition in children aged 6 - 60 months presenting at Federal Teaching Hospital Lokoja.

Methods: This descriptive cross-sectional study was conducted among 412 children who met the inclusion criteria.Socio-economic data of participants were obtained using a structured questionnaireand anthropometric parameters were measuredusing World Health Organization (WHO) standard methods. Data were analyzed using SPSS statistical package (version 26.0) with level of significance set at $p < 0.05$.

Results: The prevalence of malnutrition among the studied children was 36.7%, of which 34.5% were undernourished and 2.2% were overnourished. Significant risk factors for undernutrition include lack of exclusive breastfeeding, ($p = < 0.001$), presence of infections ($p = < 0.001$), unfortified complementary feeds ($p = < 0.001$), poor hygiene/sanitation ($p = < 0.001$), lower socioeconomic class $p = < 0.001$, maternal orphan ($p = < 0.001$), inadequate immunization ($p= 0.022$). There are no correlations between these factors and overnutrition.

In conclusion: Identified significant risk factors for undernutrition include non-exclusive breastfeeding, use of unfortified complementary feeds, poor hygiene and inadequate immunization. It is recommended that effort should be geared towards mitigating the observed significant risk factors by creating awareness during antenatal and post-natal visits to the clinic.

Keywords: Children, Lokoja, Malnutrition, Risk Factor, Prediction

Ajetomobi, A., Abioye, T., Oladipe, T., Olanrewaju, O., Adegbegi, A., Feyi, O. and Ojuawo, A. (2025). Predictive Risk Factors for Malnutrition among Children Aged 6 to 60 Months at Federal Teaching Hospital Lokoja Nigeria. *Open Access Journal of Science Research. 3*(1), 87-96. DOI: https://doi.org/10.5281/zenodo.15691605

INTRODUCTION

The burden of malnutrition in Nigeria is high amongst children under the age of five years and a contributory cause of morbidity and mortality as stated by the United Nations Children's Fund (UNICEF) in 2018 (UNICEF, 2018). It has been stated by the World Health Organization (WHO) that about 45% of deaths among children under five years of age in low- and middle-income countries such as Nigeria are linked to undernutrition (WHO, 2020). In addition anaemia, hypoproteinaemia, hypoalbuminaemia, and hypoglycaemia has been associated with undernutrition in children (Ajetomobi *et al*., 2024), concurrently, in these countries, a new trend of childhood overweight and obesity has also been reported. Several studies (Abidoye, 1999; Nahor, 2010; Ubesie, 2012; Chowdhury, 2018) have all shown associations between risk factors such as illiteracy,poverty, inadequate duration of breastfeeding amongst others, and malnutrition. Knowing the risk factors of malnutrition will be a step forward in the prevention of malnutrition by tackling the risk factors as much as possible. Risk factors such as ignorance and poverty can be approached through interventions such as advocacy, health education, women empowerment through skills acquisition programme, or learning a trade (Ashworth, 2016).

This study sought to assess the nutritional status of children between the ages of 6 – 60 months at the Federal Medical Centre Lokoja and to determine the risk factors associated with both undernutrition and overnutrition among them.

MATERIALS AND METHODS

The cross-sectional study was a hospital-based descriptive study carried out at the Pediatric Unit of the Federal Teaching Hospital Lokoja, Kogi State, Nigeria. The sample size (412) was calculated using Cochran's formula (Abidoye, 2001). Children aged between 6 months to 60 months who attended the clinic within six months whose parents gave their consent, were included in the study. However, Children with chronic disease conditions such as chronic kidney diseases, cerebral palsy, gastrointestinal abnormalities, chronic inflammatory conditions with fever greater than three weeks, and sickle cell anemia, as well as those whose parent/caregiver declined to give consent, were also excluded from the study. A well-structured, pretested, and validated questionnaire was used to collect general information on the biodata, and history. The questionnaire was self-administered to literate parents and an interviewer administered it to parents who were illiterate in a language they could understand (Chowdhury, 2008). Relevant clinicalinformation was obtained from the child's case note.

Anthropometric measurements such as weight, was taken using the buerer® digital baby scale for children younger than two years old. The RGZ-160 mechanical weighing scale was used for children above two years. The expected weight for age for each child was obtained using a standard WHO growth chart (WHO, 2006) and they were classified into normal, mild, moderate, or severe malnutrition based on WHO classification (Rodriquez, 2011). The height/length of each child was measured using the Seca® 210 mobile infantometer for children younger than two years old and the RGZ-160 mechanical height scale was used for children above two years. The height for age was charted using standard WHO growth charts (WHO, 2006). They were classified into normal, mild, moderate, or severe stunting. Body mass index (BMI), was calculated from the weight and height measurements using the formula BMI= weight (Kg) / height^2 (m^2). Z scores and percentiles were obtained using the WHO standard growth charts and recorded (WHO, 2006).

Data were analyzed using the IBM Statistical Package for Social Sciences (IBM SPSS) statistics version 26.0. The student's t-test was used to compare the means of two normally

distributed continuous variables. Analysis of variance (ANOVA) was used to compare the means of the anthropometric parameters. The prevalence of malnutrition was calculated by dividing the number of children with malnutrition by the minimum sample size multiplied by 100. A *p*-value of less than 0.05 indicated statistical significance.

Ethical approval for this study was obtained from the Ethical Research Committee of the Federal Medical Centre, Lokoja. (FTHL) (FMCL/HREC/Vol.1/2021/131). Informed consent to participate or withdraw from the study was obtained from the parents of the participants. The patients' confidentiality and anonymity were ensured (Ogunlesi, 2015). Participants were given both written and verbal information about the background and aim of the study.

RESULTS

Nutritional status and prevalence of the various grades of malnutrition in the study participants.

Table 1 shows the prevalence of malnutrion among the 412 participants. The results show that 118 (28.7%) children are wasted with the most prevalent grade of wasting being moderate wasting accounting for 43 (10.4%) of children. Children with severe wasting without edema accounted for 28 (6.8%) and six (1.5%) with edema. Stunting was observed in 24 (5.8%) of the children with moderate stunting accounting for 14 (3.4%). The prevalence of overnutrition was nine (2.2%), and all were overweight. None of the children was obese.

Table 1: Nutritional status and the prevalence of various grades of malnutrition in the study participantsbased on WHO classification.

Nutritional Status	Frequency n=412	Percentage (%)
Normal	261	63.3
Malnutrition	151	36.7
Undernutrition	142	34.5
Wasting (Weight-for-length/height)	118	28.7
Mild (< -1 to ≥-2 Z score)	41	10.0
Moderate (< -2 to ≥-3 Z score)	43	10.4
Severe without edema (<-3Z score)	28	6.8
Severe with edema	6	1.5
Stunting (Height/length-for-age)	24	5.8
Mild (< -1 to ≥-2 Z score)	3	0.7
Moderate (< -2 to ≥-3Z score)	14	3.4
Severe (<-3Z score)	7	1.7
Overnutrition	9	2.2
Overweight (BMI-for-age >2 to ≤ 3Z score)	9	2.2
Obese (BMI-for-age >3 Z score)	0	0

Comparison of general characteristics between the well-nourished and malnourished subjects.

There was a significant p = <0.001 difference between malnurished children who were exclusively breastfed 49 (17.1%) and those who were not exclusively breastfed 102 (81.0%). Fifty-five per cent of children who were not immunized were malnourished compared to 34.8% of immunised children who were malnourished, p = 0.022. children who are fed unfortified complementary feeding are significantly p = <0.001. malnurished compared with those who had fortified complemetary feeding.

Table 2: Comparison of general characteristics between the well-nourished and malnourished subjects

Variables	Total N=412	Well-nourished N =261 n(%)	Malnourished N=151 n(%)	χ^2	p-value
Exclusively breastfed					
Yes	286(100.0)	237(82.9)	49(17.1)	150.70	**<0.001**
No	126(100.0)	24(19.0)	102(81.0)		
Duration of exclusive breastfeeding					
Less than 6 months	167(100.0)	69(41.3)	98(58.7)	57.13	**<0.001**
6 months	245(100.0)	192(78.3)	53(21.6)		
Unfortified complementary feeding					
Yes	55(100.0)	10(18.2)	45(81.8)	53.56	**<0.001**
No	357(100.0)	251(70.3)	106(29.7)		
Total duration of breastfeeding					
< 1 year	158(100.0)	116(73.4)	42(26.6)	10.50	**0.001**
> 1 year	254(100.0)	145(57.1)	109(42.9)		
Immunization status					
Fully immunized	376(100.0)	245(65.2)	131(34.8)	5.21	**0.022**
Not immunized	36(100.0)	16(44.4)	20(55.6)		

FE = Fisher's Exact Test

Risk factors for undernutrition in the study population

Table **3** shows that undernutrition was significantly higher in children in the lower socioeconomic class (45.2%) compared to those in the upper socioeconomic class (14.3%), p =<0.001. Similarly, children who were not exclusively breastfed (80.0%), were significantly undernourished compared to those exclusively breastfed (16.3%), p =<0.001. Also, undernutrition was significantly more in children who had an infection (69.7%) than those who did not have an infection (6.0%), p = <0.001. The proportion of children with undernutrition was significantly higher in children who were maternal orphans (91.7%) than those who were not maternal orphans (33.5%), p = <0.001. Children who had unfortified complementary feeds (80.8%) were significantly more undernourished compared to those who did not have unfortified complementary feeds (28.5%), p =<0.001**.** In addition, children

who had poor sanitation/hygiene (86.0%) were significantly more associated with undernutrition compared to those who did not have poor sanitation and hygiene (9.4%) p =<0.001.

Table 3: Risk factors for undernutrition in the study population

Risk factors	Total N=403 n(%)	Normal N=261 n(%)	Undernutrition N=142 n(%)	χ^2	p-value
Socioeconomic class					
Upper	70(100.0)	60(85.7)	10(14.3)	16.95	**<0.001**
Middle	291(100.0)	178(61.2)	113(38.8)		
Lower	42(100.0)	23(54.8)	19(45.2)		
Exclusive breastfeeding					
Yes	283(100.0)	237(83.7)	46(16.3)	147.27	**<0.001**
No	120(100.0)	24(20.0)	96(80.0)		
Presence of infection					
Yes	185(100.0)	56(30.3)	129(69.7)	175.53	**<0.001**
No	218(100.0)	205(94.0)	13(6.0)		
Parental literacy					
Literate	379(100.0)	249(65.7)	130(34.3)	1.80	**0.180**
Illiterate	24(100.0)	12(50.0)	12(50.0)		
Maternal orphan					
Yes	12(100.0)	1(8.3)	11(91.7)	FE	**<0.001**
No	391(100.0)	260(66.5)	131(33.5)		
Unfortified complementary feeds					
Yes	52(100.0)	10(19.2)	42(80.8)	51.98	**<0.001**
No	351(100.0)	251(71.5)	100(28.5)		
Poor sanitation/hygiene					
Yes	136(100.0)	19(14.0)	117(86.0)	228.73	**<0.001**
No	267(100.0)	242(90.6)	25(9.4)		

FE = Fisher's Exact Test

Risk factors for overnutrition in the study population

There was no statistically significant association between exclusive breastfeeding (p= 1.000), socioeconomic class (p = 0.074), screen time per day (p = 0.378), and overnutrition. This is shown in **Table 4**.

Table 4: Risk factors for overnutrition in the study population

Risk factors	Total N=270 n(%)	Normal N=261 n(%)	Overnutrition N=9 n(%)	χ^2	*p*-value
Socioeconomic class					
Upper	63(100.0)	60(95.2)	3(4.8)	FE	0.074
Middle	184(100.0)	178(96.7)	6(3.3)		
Lower	23(100.0)	23(100.0)	0(0.0)		
Exclusive breastfeeding					
Yes	240(100.0)	234(97.5)	6(2.5)	FE	0.066
No	30(100.0)	27(90.0)	3(30.0)		
Presence of infection					
Yes	58(100.0)	56(96.6)	2(3.4)	FE	1.000
No	212(100.0)	205(96.7)	7(3.3)		
Parental literacy					
Literate	258(100.0)	249(96.5)	9(3.5)	FE	1.000
Illiterate	12(100.0)	12(100.0)	0(0.0)		
Maternal orphan					
Yes	1(100.0)	1(100.0)	0(0.0)	FE	1.000
No	269(100.0)	260(96.7)	9(3.3)		
Unfortified complementary feeds					
Yes	10(100.0)	10(100.0)	0(0.0)	FE	1.000
No	260(100.0)	251(96.5)	9(3.5)		
Poor sanitation/hygiene					
Yes	21(100.0)	19(86.4)	2(13.6)	FE	0.149
No	249(100.0)	242(97.2)	7(2.8)		
Screen time per day					
>1 Hour	51(100.0)	48(94.1)	3(5.9)	FE	0.378
≤ 1 Hour	219(100.0)	213(97.3)	6(2.7)		

FE= Fisher's Exact Test

Logistic regression analysis of risk factorspredictive of undernutrition

Table 5 shows that not being exclusively breastfed (p =<0.001), belonging to the lower and middle socioeconomic class (p = 0.001, p =<0.001), presence of infection (p =< 0.001), being a maternal orphan (p = 0.003), being fed with unfortified complementary feeds (p =< 0.001), and poor sanitation/hygiene (p =< 0.001) are significantly associated with undernutrition.

Table 5: Logistic regression analysis of risk factors predictive of undernutrition

Model	B	SE	β	*p*-value
Socioeconomic class				
Upper*				
Middle	1.337	0.362	3.809	**<0.001**
Lower	1.601	0.461	4.957	**0.001**
Exclusive breastfeeding				
Yes*				
No	3.026	0.279	20.609	**<0.001**
Presence of Infection				
Yes	3.593	0.328	36.326	**<0.001**
No*				
Parental literacy				
Literate*				
Illiterate	-0.650	0.422	0.522	0.124
Maternal orphan				
Yes	3.083	1.050	21.832	**0.003**
No*				
Unfortified complementary feeds				
Yes	2.355	0.371	10.542	**<0.001**
No*				
Poor sanitation/hygiene				
Yes	4.088	0.325	59.608	**<0.001**
No*				

*Reference category, **B** = log of odd ratio, **SE**= standard error, β = odd ratio

DISCUSSION

Nutritional status assessment of children can be carried out using direct methods such as; dietary history and assessment of dietary intake, clinical examination, and anthropometry, biochemical estimation, morphologic studies on body tissues (Ulasi & Ebenebe 2016). The diagnosis of malnutrition is mainly clinical with anthropometric assessment being the most commonly used direct method of nutritional assessment employed in clinical practice (Ulasi & Ebenebe, 2016). Anthropometric indicators such as height-for-age, weight-for-height, and weight-for-age describe the nutritional status of children. The height-for-age index is an indicator of chronic illness, while the weight-for-height index is an indicator of acute illness. Weight-for-age is a composite index, and it takes into account both acute and chronic malnutrition (Man, 2013). Stunting is defined as low height-for-age while wasting is low weight-for-height (WHO, 2020). Body Mass Index (BMI) > 3 SD for the age and sex is obesity, while BMI > 2 SD for age and sex is overweight (Ezeudu, 2016; Gahagan, 2019).

The prevalence of malnutrition (undernutrition and overnutrition) in this studywas 36.7% with 34.5% for undernutrition and 2.2% for overnutrition. Wasting and stunting accounted for 28.7%and 5.8% respectively. Mild wasting was observed in 10.0%, moderate wasting in 10.4%, severe wasting without oedema in 6.8%, and severe wasting with oedema in 1.5%. Previous studies across Nigeria have reported a prevalence of undernutrition in children aged 0-5 years (Abidoye, 1999; Manyike, 2014; Ocheke, 2015). These studies reported prevalence of moderate wasting, severe wasting and stunting in the studied children. The World Health Organization in 2020, found that 45 million children under the age of five years were wasted, 14.3 million were severely wasted, 149 million were stunted and 38.9 million were overweight or obese worldwide (WHO, 2020).

Malnutrition is a preventable condition and many measures can be taken to prevent it. These measures include identifying the risk factors associated with malnutriotn and prevention of malnutrition by tackling these risk factors as much as possible. As shown in Table 3, not being exclusively breastfed significanlty (p =<0.001) correlates with undernutrition. Similarly, a study done in Benue identified length of breastfeeding less than six months as a significant risk factor for malnutrition (Abidoye, 1999). Similar to the finding in this present study. In India, an association between exclusive breastfeeding and stunting was documented, as children who were exclusively breastfed are less likely to be undernourished than those who were not exclusively breastfed (Sharma, 2015).

As shown in Table 3, being fed with unfortified complementary feeds significanlty (p =< 0.001) correlate with undernutrition. This may have resulted from micronutrients malnutrition. Food supplementation using food supplements such as vitamins, minerals, amino acids, fatty acids, and other substances delivered in the form of pills, tablets, capsules, or liquid given to the children can also help prevent malnutrition. Food fortification (Ashworth, 2016) which entails adding micronutrients to food such as iodization of salt has also been used to prevent malnutrition. In this study poor sanitation/hygiene (p =< 0.001) are significantly associated with undernutrition. Poor hygiene increased the level of exposure to pathogenic agents which inturns increase the incidence of diseases such as diarrhoea, measles, and pneumonia (WHO, 2018). Environmental sanitation, personal hygiene, and immunization against preventable childhood diseases are also key as this will prevent the transmission of infectious diseases within the environment and homes.

Although Parental literacy does not significantly (p=0.180) correlate with undernutrion. However, female education, health education, and women empowerment (Ashworth, 2016), will help the mother to process, understand, and utilize health informations on how to prevent malnutrion and improve on food fortification, environmental hygiene. It will also enlighten the mothers/caregivers in addition to financial empowerment. In this study there is a significant correlation between socioeconomic class and malnutrition. Belonging to the lower and middle socioeconomic class significantly (p = 0.001, p =<0.001), correlates with undernutrition. The explanation for this finding is that children in the upper socioeconomic class were likely to afford better quality food than those in the lower socioeconomic class.

CONCLUSION

This study shows that not being exclusively breastfed, belonging to the lower and middle socioeconomic class , presence of infection, being a maternal orphan, being fed with unfortified complementary feed, and poor sanitation/hygiene are significantly associated with undernutrition in children. Preventive measures are to be taken to reduce the prevalence of malnutrition, these measures include growth monitoring, encouraging exclusive breastfeeding

for six months, fortified complementary feeding, female education, health education, and women empowerment, food supplementation, family planning, environmental sanitation, personal hygiene, and immunization against preventable childhood diseases In addition to the above measures, early diagnosis and prompt treatment as well as ensuring the availability of essential drugs such as antibiotics, and vitamin A, should be made available for prompt treatment of infections. Furthermore, feeding with an appropriate nutritional diet (nutritional rehabilitation) is very important.

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