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Descriptive and bivariate statistical analysis of socio-demographic and cultural factors associated with protein deficiency malnutrion in under 5 children admitted to Pediatric Teaching Hospital, Gezira State, Sudan (2019)

Nazik Abayazeed [1] *Ahmed Mohammed Hamad Alnory*[2]

Abstract

Protein deficiency malnutrition (PDM) is the most common disease that affect children between 1 to 5 years old. As a general term it refers to a condition that results from taking a diet in which nutrient protein are too little or too much that it causes health problems including a number of diseases. It is often manifested by two notorious diseases known as marasmus and kwashiorkor which have almost similar symptoms. This study aims to strength research methodology through estimating the level and socioeconomic and cultural correlates of the disease in a sample of 800 malnourished children admitted to Wad Medani Pediatric Teaching Hospital suffering from marasmus and kwashiorkor. The data collected by structured questionnaire, coded and analyzed in SPSS program. Descriptive statistic using frequency tables and graphs was used to describe the level and pattern and factor analysis and bivariate analyses are used to determine socioeconomic and cultural factors associated with the disease. The study determined 11 pathological and socioeconomic and cultural factors that associated with PDM including Weight at birth, Current weight of the child, body mass index of the child, educational level for mother, family income. The time period between any pregnancy and the next and others. The study recommended that attention should be focused on the importance of creating a solid comprehensive data file of PDM status at the national level with a view to implement a national strategic plan for the control of malnutrition in general ad PDM in particular" and enhance the existing weak road map (RM) to address the above variables.

[1] *Economic and social research bureau, Ministry of higher education & Scientific research.*

[2] *Professor- Applied Statistic and Demography – Faculty of Economic and Rural Development - University of Gezira*

1. Background:

Protein deficiency malnutrition (PDM) as a general term refers to a condition that results from eating a diet in which nutrient proteins are too little or too much that it causes health problems including a number of diseases, each with a specific cause related to one or more nutrients and each characterized by a cellular imbalance between the supply of nutrient and energy and the body's demand for them to ensure growth, maintenance and specific functions (WHO, 2006). This may lead to either under nutrition or over-nutrition.

Worldwide there are about 60 million children with moderate acute malnutrition and 13 million with severe acute malnutrition. Malnutrition is consequently the most important risk factor for the burden of disease in developing countries. It is associated with increased morbidity and mortality from malaria, diarrheal diseases, measles and respiratory disease2.s among other diseases.

Protein deficiency malnutrition in particular has long-term detrimental consequences of which include impaired cognitive development, growth impairment, greater behavioral problems, deficient social skills and inability to fulfill one’s potential. In its classical form is manifested by marasmus and kwashiorkor.

It is estimated that 150 million children under 5years are under weight and more than 20 million are infected or expected to develop marasmus and kwashiorkor About 47 million children under 5 years are stunted in the sub-Saharan Africa, where as in the Eastern and Southern Africa 24 million are stunted (UNICEF. 2008)

In Sudan, 31.0% of children under 5 years are moderately or severely underweight, 32.5% suffer from moderate or severe chronic deficiency and 14.8% suffer from global acute PDM (SMDG, 2010). In Khartoum state the prevalence of PDM among 6–59 months old children was 11.8% had acute PDM and 7.3% had severe PDM. The problems of increased prevalence of PDM were related to poor sanitary conditions and inadequate food intake. Mother's education was found to be the strongest factor associated with malnutrition among the children under 5 years of age. Hence, growth failure is associated with lowered immunity. Indeed, it seems that even mild degrees of malnutrition begin to adversely affect immune competence, hence morbidity and mortality, which shifts attention to mild−moderate as well as severe protein−energy malnutrition. Looked at the other way round, the mechanisms whereby infections lead to growth failure and clinical malnutrition are becoming better understood. They operate through anorexia, changes in metabolism, malabsorption, as well as behavioral changes affecting feeding practices; and lead to malnutrition in the context of limited nutritional reserves. The interactions of nutrition and infection with regard to individual infections and defined nutrients are now better known. For example, we know that PEM increases the duration of episodes of diarrhea.

Malnutrition affects all groups with the general population but the problem is particularly significant among infants and young children worldwide. This is so because young children have increased nutritional needs for growth and development (Torun, 2006). Children under the age of five years are the most vulnerable and majority of those who are affected with malnutrition are in the developing world (Ashworth, 2004).

2. Problem Statement:

When nutrition falls short, damage is done to individuals and to society. When pregnant women are not adequately nourished; their babies are born at low weights, putting their survival at risk. When girls are undernourished, their future ability to bear healthy children is threatened. Under-nutrition and micronutrient deficiencies can lead to developmental delays throughout childhood and adolescence, making individuals less productive as adults. The global community promised to cut the proportion of underweight children by half between 1990 and 2015, but we are still not on track to reach that target (UNICEF, 2006).

3. Objectives

1-To estimate the prevalence and association of different independent variables of protein deficiency malnutrition in udder 5 children admitted to Wad Mandeni Pediatric Teaching Hospital.

2- To analyze mothers' attitudes towards protein deficiency malnutrition in udder 5 children admitted to Wad Mandeni Pediatric Teaching Hospital.

4. Research significance

The study results are hoped to provide updated data which will help policy makers in formulating a road map to control protein deficiency malnutrition in children under 5 years. Ministry of Health towards Malnutrion diseases.

- Ethical Code

The Population Studies Center (PSC) at the faculty of Economic and Rural Development of Gezira University granted the ethical clearance certificate to conduct the research. An ethical approval obtained from (PSC). For retrospective side of this research, official letter addressed to the Ministry of Health in the Gezira State to assist the researcher to obtain the appropriate data.

The respondent's personal information is guarded from all people other than the n researcher. Privacy is maintained by not obliged the respondent to answer any question in the survey instrument which he chooses not to answer.

5. Methods and Materials:

- Data collection:

The data was collected through a longitudinal sample of 800 mothers of children admitted to the pediatric hospital in Wad Medani by the field data collection team, which consisted of the principal researcher and students from students of the department of statistics and demography at the faculty of economic and rural development, Gezira University.

- Data analysis:

Data were coded and entered into a computer using two of the latest versions of prepared packages of statistical analysis namely Statistical Package for Social Sciences (SPSS) version 24. Descriptive statistics initially was undertaken to analyze the composition of the sample. Quantitative analysis of the question responses obtained from the questionnaire was summarized, portrayed and analyzed on a statistical basis in order to offer the researcher the opportunity to analyze the responses.

Both bivariate and multivariate analyses were employed to identify the determinants of Protein deficiency malnutrition. Bivariate analysis was conducted using chi-square test of independence or Fisher's exact test. Multivariate analyses were performed using factor analysis

6. Results:

(1) Descriptive analysis

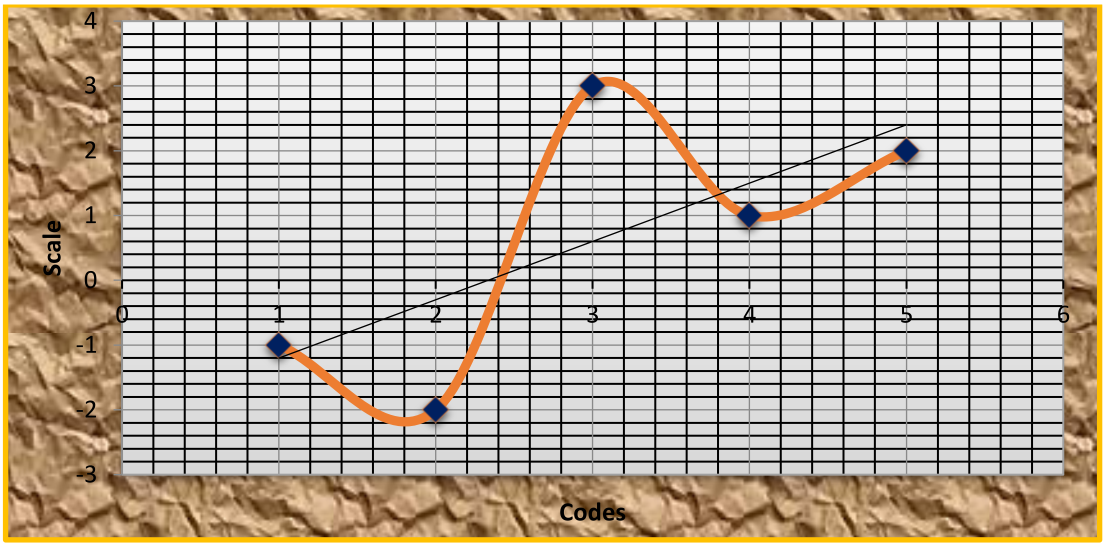
1. The mode of living of the majority of respondents is rural. 78.8% of them live in villages while 10.6% live in cities or small towns and 8.0% live in Campos.
2. The majority of mothers were in the broad age range of (25-34yrs.),(50%) with mean age interval (29.2 years ± 0.178).

3. The level of the education of the majority of the mothers is general education primary or secondary (69.9%) The mean years of the education for mothers was (10.83 ±5.36) with range of 18 years. Only 5 % are illiterate.
4. 81% of the mothers are not working, the majority are housewives 72%. The remaining 19% who are working are employed in the public center.
5. The majority of women reported that their family income is adequate (90%).
6. Average family size is 5.8 members with probability limits (SE= ±2.167). The majority have between 1 and 4 children under age 14 with mean of 3.3 and children.60% have children under 5 years.
7. 89% of the families have their homes built from bricks, 7% bricks cement and 4% mud. Average number of rooms per house is (2.33 ±2.167).
8. 84.9% of the family utilizes the national water network for drinking and cooking and the rest utilize river or canal water and water is treated by gas as the main source of fuel.
9. For sanitation, 88.5%} of the respondents reported that have normal dig, {11.5%} reported they have no sanitation facility. The most common used facility is pit latrine (38%) and septic Tank. 31% of the households share toilet facilities with neighbors.
10. {78%} of the respondents have access to a garbage collection system.
11. Most of the sample {n=494, 61.8%} indicated that Charcoal as the main fuel for cooking. {31.3% } Firewood and only {7.0%} Gaz.
12. The majority of the households (59.7%, n=478) had no animals inside homes, while there were 322 (40.3%) of them keep some animals inside homes

(2) Mother Attitudinal Scale Analysis

Respondents were asked to assign a value between one and five for each statement. The replies are then distributed according to Likert quninical scale giving 1 for never and 5 to always. (see fig. (1). According to the figure, Likert quninical scale codes mothers' attitudes "Never as 1, Rarely as two, sometimes as 3, Often as 4 and Always as 5" and the following standard is normally used to evaluate each code response.

- **Range** = Largest value – smallest value in the scale graduation.
- **Class interval**= Range over number of classes.
- If the arithmetic mean is between 1 to less than 1.8, the response will be classified as Never.
- If the arithmetic mean is between 1.8 to less than 2.6, the response will be classified as rarely.
- If the arithmetic mean is between 2.6 to less than 3.4, the response will be classified as Sometimes.
- If the arithmetic mean is between 3.4 to less than 4.8, the response will be classified often.
- If the arithmetic mean is between 4.2 to 5.0,, the response will be classified as Always.



Source: Alnory 2002

Fig. (1): Isomatic representation of Likert quninical scale

-The Likert Scale Classification on Mother Attitude on child nutrition

- Relative sore (RS)

- Relative score is defined as:

$$RS = \frac{\text{Maximum Likert Scale Point– Minus Minimum Likert Scale}}{\text{Number of Likert Scales Points}}$$

RS= ((5 – 1)/3) = 1.33

Attitudinal Index is then computed as:

AI= Mean/RS (Newsroom, 2007, pp.: 177,347), cited in (Al Harahsheh, 2014).

The criteria for decision on score level are:

- If MI is less than 2.0, Attitude positivity is week.
- If MI is between 2.0 and 3.0, Attitude positivity is medium.
- If MI is higher 3.0, Attitude positivity is high.

Table (1) below indicates that data on mothers' sense of child nutrition is statistically unbiased. All results are highly significant at 1% level of significance. (All P values are typically zeros), suggesting that the research instrument is valid. The mean of the women attitude ranges between 1.77 and 4.07 with an overall mean of 3.1, judged from the relative MI yardstick discussed above, with a standard error of 0.11 giving a probability limit of 2.92 – 3.00, entailing Meduim sense of child nutrition among mothers in Gezira state.

Table (1): The Likert Scale Classification on Mother Attitude on child nutrition

Attitudinal variable	Mean	Attitude Index (AI)	t	df	sig	Oral expression of attitude positivity
Clean supplementary food	4.05	3.0	510.7	799	.000	Medium
Breastfeeding should be exclusive in first 6 months	4.07	3.1	576.8	799	.000	High
Breastfeeding immediately after delivery	4.05	3.0	156.7	799	.000	Medium
Breastfeeding in the first hour after birth	4.06	3.1	540.3	799	.000	High
Special meals for the baby	3.05	2.3	571.8	799	.000	Medium
Number of breastfeeding per day	3.23	2.4	592.8	799	.000	Medium
Giving the child bottle milk	2.19	1.6	703.5	799	.000	Week
Child spacing	3.00	2.3	92.6	799	.000	Medium
Consulting the Doctor	1.89	1.4	632.3	799	.000	Week
Sterilization of household utensils	4.05	3.0	623.2	799	.000	Medium
Sterilization protects the child	2.83	2.1	507.4	799	.000	Medium
Polluted water is harmful to the child health	4.08	3.2	486.2	799	.000	High
Vaccination against tetanus is essential	1.98	1.5	451.7	799	.000	Week
child health condition must monitored	2.55	1.9	557.6	799	.000	Medium
A healthy culture of child care is important	3.00	2.3	587.3	799	.000	Medium
Mother must always seek medical help for baby	4.09	3.2	540.3	799	.000	High
Mother must protect her child from diarrhea	1.77	1.3	571.8	799	.000	Week
Overall (N=800)	**3.11**	**2.4**	**511.9**	**16**	**.000**	Medium

Source: SPSS Output Based on Researcher own Survey, of Malnutrion, Wad Mandeni Pediatric Teaching Hospital in 2022

(3) Bivariate Analysis:

The cross-tab procedure

The Crosstabs procedure forms two-way and multiday tables and provides a variety of tests and measures of association for two-way tables. The structure of the table and whether categories are ordered determine what test or measure to use.

Crosstabs' statistics and measures of association are computed for two-way tables only. If you specify a row, a column, and a layer factor (control variable), the Crosstabs procedure forms one panel of associated statistics and measures for each value of the layer factor (or a combination of values for two or more control variables). For example, if *malnutrion is* a layer factor for a table of *educated women* (Ordinal), the results for a two-way table for the females are computed separately from those for the males and printed as panels following one another. For education of mother as a layer variable, the following cross tab is obtained:

Table (2): Is the Child Malnourished * Education Level of Mother Crossabulation

Count

		Education Level of Mother						Total
		Illiterate	Khalwa	Primary	Secondary	University	Postgraduate	
Is the Child Malnourished	Yes	351	205	165	65	5	0	791
	No	2	1	2	15	175	14	209
Total		353	206	167	80	180	14	1000

Source: SPSS Output Based on Researcher own Survey, of Malnutrion, Wad Mandeni Pediatric Teaching Hospital in 2022

In table (2) above the frequency of each response category whether the child is malnourished (Yes) or not malnourished (No) at each educational level is shown. If each category provides a similar level of education i.e., if the null hypothesis is true that each level is independent, then the pattern of response should be similar across malnutrition categories.

The result indicates that at each malnutrion layer, the majority of respondents except for university category which means that the null hypothesis that the two variables are not independent. However, from the cross tabulation alone it is difficult to tell whether these differences are real or due to chance variation for this reason we perform a chi-square test to be sure.

The chi-square Test

The chi-square test measures the discrepancy between the observed cell counts and what you would expect if the rows and columns are unrelated i.e., if the null hypothesis is true. The two- sided asymptotic significance of the chi-square statistics is zero, so it is safe to say that the differences are due to chance and variation and that level of education is significantly associated with malnutrion at the level of significance 1%, table (3).

Table (3): Chi-Square Tests			
Chi-square test	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	866.873[a]	5	.000
Likelihood Ratio	843.342	5	.000
Linear-by-Linear Association	655.825	1	.000
N of Valid Cases	1000		
a. 1 cells (8.3%) have expected count less than 5. The minimum expected count is 2.93.			

Source: SPSS Output Based on Researcher own Survey, of Malnutrion, Wad Mandeni Pediatric Teaching Hospital in 2022

This result is in agreement with other results of chi-square versions directional or symmetric, see table (4). They all show significant association at 1% level of significance.

Table (4): Directional Measures						
Chi-square test			**Value**	**Asymp. Std. Error[a]**	**Approx. T[b]**	**Approx. Sig.**
Nominal by Nominal	Lambda	Symmetric	.417	.022	14.653	.000
		Is the Child Malnourished Dependent	.880	.023	14.540	.000
		Education Level of Mother Dependent	.267	.018	14.265	.000
	Goodman and Kruskal tau	Is the Child Malnourished Dependent	.867	.022		.000[c]
		Education Level of Mother Dependent	.213	.010		.000[c]
	Uncertainty Coefficient	Symmetric	.406	.017	20.570	.000[d]
		Is the Child Malnourished Dependent	.823	.029	20.570	.000[d]
		Education Level of Mother Dependent	.270	.013	20.570	.000[d]
a. Not assuming the null hypothesis.						
b. Using the asymptotic standard error assuming the null hypothesis.						
c. Based on chi-square approximation						
d. Likelihood ratio chi-square probability.						

Symmetric Measures			
		Value	Approx. Sig.
Nominal by Nominal	Phi	.931	.000
	Cramer's V	.931	.000
	Contingency Coefficient	.681	.000
N of Valid Cases		1000	

Source: SPSS Output Based on Researcher own Survey, of Malnutrion, Wad Mandeni Pediatric Teaching Hospital in 2022

Using the same procedure associations are examined for all descriptive variables. All the variables in the study file were refined by their confidence interval probability level (CI). Variables with narrower interval were selected for the chi-square test, The See table (5). The bivariate analysis using Fisher exact test determined 10 variables associated with child malnutrition significantly at 1% level of significance. These are:

Weight at birth
Current weight of the child
Body mass index of the child
Educational level for mother
Family income
The time period between any pregnancy and the next
Vaccination status
Number of Newborn
Duration of exclusive breastfeeding

It also specified two variables associated with child malnutrition significantly at 5% level of significance. These are;

1- Early weaning
2- Start of supplementary food.

Table (5): Factors associated with protein deficiency malnutrition: Socio- demographic variables

SER	Characteristic (N = 800)	Dependent variable: Proportion of Diarrhea in children under five		
		Chi-square	DF	p value
1	Weight at birth	866.8	5	0.000**
2	Current weight of the child	384.3	4	0.000**
3	Body mass index of the child	404.9	16	0.000**
4	Educational level for mother	866.0	5	0.000**
5	Family income	404.5	5	0.000**
6	Mother occupation	12.1	5	0.234
7	Father educational level	17.3	6	0.065
8	Resident	7.98	2	0.063
9	Suitable Kitchen in the house	1.43	3	0.514
10	Number of rooms	0.718	3	0.399
11	The time period between any pregnancy and the next	2.48	3	0.000**
12	Vaccination status	418.06	5	0.000**
13	Number of Newborn	316.12	3	0.000**
14	The duration of breastfeeding	21.7	4	0.061
15	The importance of breastfeeding	6.12	1	0.431
16	Bottle usage	17.34	1	0.220
17	Did the child receive a dose of vitamin A	12.76	1	0.055
18	Does the Child have vaccination card?	11.67	1	0.059
19	Usage of contraception	10.76	1	0.0611
20	Start of supplementary food	115.9	3	0.011*
21	Number of Children Born	12.65	5	0.051
22	Duration of exclusive breastfeeding	455.5	4	0.000**
23	Early weaning	166.1	1	0.033*
24	Raising animals at the Home	8.45	3	0.132
25	Nutrient foods	15.67	1	0.051

Source: SPSS Output Based on Researcher own Survey, of Malnutrion, Wad Mandeni Pediatric Teaching Hospital in 2022.

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According to the direct and symmetric versions of the chi-square tests, five variables are strongly associated with protein deficiency malnutrion. They are presented here according to their order of strength of association:

1 Educational level for mother

2 Body mass index of the child

3 Duration of exclusive breastfeeding

4 Vaccination status

5 Number of Newborn

Conclusion and Discussion:

A sample of 800 children admitted to Wad Medani pediatric Hospital suffering from protein deficiency symptoms was investigated. 47.6% of them were diagnosed with marasmus, 12.2% Kawashkor, 19.9% both marasmus and Kawashkor and 20% of them were either wasted or stunted. Data was collected through qua longitudinal questionnaire and coded and analyzed by SPSS program. This paper gave a summarized picture of the sample data using frequency distribution together with measures of location and dispersion. 12 variable representing the three axioms of the data file were described including respondents and child characteristics, Health and Hygiene and women altitudes on protein energy malnutrition. The study revealed that 11 variables are distinguished as being associated with PDM but notably 5 variables had the highest degree of association with PDM. These are education of mothers, body mass index of the child, duration of exclusive breastfeeding, vaccination status and number of newborns. The study recommends that female Education should be universal and that mothers must be given solid health education to be able to raise their attitudes towards child health issues including breastfeeding, vaccination, family planning and monitoring of child growth.

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