Prevalence of Undernutrition in Assiut University Children's Hospital

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Abstract

Introduction: Malnutrition is a pathological state characterized by an imbalance between the intake of energy, protein, and other essential nutrients and the body's requirements, leading to adverse effects on growth and overall health. Malnourished children were divided into three categories: micronutrient malnutrition, chronic malnutrition, and acute malnutrition (wasting). Poor diet, starvation, eating disorders, problems with digestion or absorption, or chronic diseases are the causes of malnutrition. Malnourished children have many complications, such as infections after surgery, which result in a longer hospital stay and a delay in both physical and mental development.

Objectives: To investigate the incidence of malnutrition in infants and children admitted to Assiut University Children's Hospital. Additionally, the study seeks to ascertain whether there is a correlation between nutritional status and the duration of hospitalization.

Methods: This is a descriptive cross-sectional study of children admitted to the Assiut University Children's Hospital from the beginning of January 2020 to the end of December 2020. Personal data were collected; patients were evaluated on admission and discharge by anthropometric measurements and a few laboratory tests, including serum albumin level and complete blood count. All infants and children were categorized into three categories of malnutrition: Underweight, Wasting, and Stunting, based on whether malnutrition occurred before or at the time of admission.

Results: The investigation included 300 participants, 196 males and 104 females. Underweight was substantially associated with older age (> 2 years), rural residence, The number of offspring produced by a single mother surpassing four, low birth weight, illiterate parents, low socioeconomic status (SES), and diarrheal morbidity. Being older than 4 to 6 years old, living in a rural area, and having illiterate parents were all significantly associated with stunting. Parents who were illiterate and those with a history of low birth weight were substantially associated with wasting.

Keywords: Underweight; Atrophy; Stunting.

Introduction:

Malnutrition is defined as a condition in which insufficiency or excess of energy, protein, and other nutrients has detrimental effects on the body and growth in children and may influence clinical outcomes [1]. In a recent study, the prevalence of malnutrition among hospitalized children in developed countries was estimated to range from 12 to 24 percent [2].

Child malnutrition poses a significant global risk to child morbidity and mortality, accounting for over 50% of child deaths worldwide. Developing countries experienced a 54% association between child malnutrition and child deaths in 2001, with varying national levels of malnutrition ranging from 0% in Australia to 49% in Afghanistan. Notably, the prevalence of underweight children decreased from 27% to 22%. Between 1990 and 2000, Asia experienced the most significant decrease in

child malnutrition, with underweight levels decreasing by half [3].

Protein-energy malnutrition (PEM), which was first identified in the 1920s, is most prevalent in developing nations and among hospitalized and chronically ailing children in the United States [4]. The percentage of hospitalized children with protein-energy malnutrition ranged between 21% and 80%, depending on the country's level of development [5]. According to the form of malnutrition, malnourished children were categorized as micronutrient malnutrition, chronic malnutrition, and acute malnutrition (wasting). These are the causes of malnutrition: poor diet, starvation due to a lack of food, eating disorders, difficulties digesting or absorbing nutrients from food, and certain medical conditions that render a person unable to consume [6].

Children who suffer from malnourishment are at a higher risk of experiencing complications, such as post-surgical infections, compared to their well-nourished counterparts. This may lead to an extended duration of hospitalization. Infants who experience early malnutrition exhibit delayed physical and mental development, as evidenced by previous research [7].

Patients and Methods:

Clinical Trial Registration Number: NCT03484572.

Patients:

This descriptive cross-sectional study describes the prevalence of malnutrition among neonates and children admitted to the Assiut University Children's Hospital between January and December 2020.

- Inclusion Criteria

1. Gender: boys and girls.
2. Age: from two months up to six years.
3. Agree to participate in the research.

- Exclusion Criteria:

1. Infants less than 2 months (newborn)
2. Children older than six years old.
3. Children or parents who refused to participate in this study.

- Methods:

Eligible children were subjected to the preliminary evaluation outlined below, which included two Checklist lists (on admission and discharge):

1. Personal data (Name, age, sex, telephone number, physical address, and socioeconomic status).
2. Anthropometric measurements (height in centimeters, weight in kilograms, body mass index in kilograms per square meter, mid-upper arm circumference in centimeters, and triceps skin fold thickness in centimeters).
3. Laboratory tests (serum albumin level and complete blood count).

The two checklists (on admission and discharge) were compared, and all infants and children were classified into three categories of undernutrition: Underweight, Wasting, and Stunting. It was determined if undernutrition occurs at or before the time of admission and whether nutritional status affects the length of hospitalization.

Data Collection:

- The clinical interpretation of the patients at presentation and their most recent medical records were used to collect data.
- Computer software: SPSS Program, version 20 was used.

Ethical Considerations:

- The Ethics Review Committee of the Faculty of Medicine at Assiut University approved the study, IRB.no: 17100463.
- Verbal and written consents were obtained from all guardians of minors with heart failure.
- Privacy and confidentiality of all obtained information was observed without intervention in the prescribed treatment.

Results:

The socio-demographic data as shown in (Figures 1, 2):

The study reports that the average age of the children under investigation was 22.43 ± 1.27 months. Among the 300 studied participants, 169 (65.3%) were identified as male, while 104 (34.7%) were identified as

female. Regarding residence, most studied children, 182 (60.7 %) were from rural areas, and 118 (39.3%) were from urban areas. 180 (60.0%) were born in families with less than four children, and 120 (40.0%) were born in families with equal or more than four children.

Almost all of the studied children were full term: 283 (94.3%) with normal birth weight, 262 (87.3%) versus 17 (5.7%) were born pre-term, and 38 (12.7%) were suffered from low birth weight.

The average age of mothers of the studied children was 27.72 ± 5.65 years and ranged from 18 to 41 years old.57 (19.0%) of children's mothers were illiterate, 55 (18.3%) had primary education, 117 (39.0%) had secondary education, and 71 (23.7%) had high-level education. Only 66 (22.0%) were employed, and the rest were housewives.

Around 46 (15.3%) of children's fathers were illiterate, 69 (23.0%) had primary education, 101 (33.7%) had secondary education, and 84 (28.0%) had high-level education.

Regarding the socioeconomic level of the studied participants, more than half 186/300 (62.0%) have moderate Socioeconomic status (SES), 88 (29.3%) have low SES, and 26 (8.7%) have high SES.

As regards the main complain as shown in Figure (3):

More than one-third of the studied children, 118 (39.3%), presented with diarrhea, 27 (9.0%) with abdominal pain, 64 (21.3%) with wheezy chest, and 91 (30.3%) with cough and fever.

As regards to the nutritional history as shown in Figure (4):

Around 165 (55.0%) children were exclusively breastfed, 51 (17.0%) received formula, and 84 (28.0%) received combined feeding (breast milk and formula). Fifty-four infants (18%) received complementary nutrition before six months, while 246 infants (82.0%) received complementary feeding after six months.

Regarding the prevalence of under-nutrition among the studied children (Table 1):

Around 61/300 (20.3%) were suffered from under-weight (WAZ score < -2), 92/300 (30.7%) were stunted (HAZ score < -2), and 34/300 (11.3%) were suffered from wasting (WHZ score < -2)

On univariate analysis (Tables 2 and 3):

Older children exhibited a higher prevalence of underweight and stunting in contrast to their younger counterparts who were two years of age. In comparison to their urban counterparts, children residing in rural areas exhibited a higher likelihood of being underweight and stunted, with statistical significance observed at P values of 0.004 and 0.005, respectively. Offspring originating from households with a higher parity of four exhibited a greater likelihood of being underweight than those with a lower parity of four (P= 0.000). The results of the study indicate that children who were born with low birth weight exhibited a higher likelihood of being underweight and wasted in comparison to children who were born with normal birth weight. This finding was statistically significant, with a P-value of 0.000 and 0.003, respectively.

Children born to mothers with limited education had a higher likelihood of being underweight, stunted, and wasted in comparison to their counterparts (P= 0.001, 0.000, and 0.001, respectively). Furthermore, the study found that the offspring of fathers with low literacy rates exhibited a higher likelihood of being underweight, stunted, and wasted than their counterparts (P= 0.002,.001, and 0.000, respectively).

The study found a statistically significant association (P= 0.009) between lower socioeconomic status and underweight status in children, indicating that children from families with lower income and resources were more likely to be underweight than those from higher socioeconomic backgrounds. The prevalence of underweight was found to be higher among children diagnosed with gastroenteritis in comparison to those without the condition (P = 0.009).

The likelihood of being underweight was higher (P= 0.003) among children who were given complementary feeding before reaching six months of age compared to those who were not given complementary feeding before this age.

Discussion:

The research conducted on a sample of 300 pediatric patients revealed that 20.3% of the participants had a weight for age "Z score -2" and were classified as underweight, 30.7% had a height for age "Z score -2" and were classified as stunted, and 11.3% had a weight for height "Z score -2" and were classified as suffering from atrophy.

As per the UNICEF report, Egypt is among the 36 nations that account for 90 percent of the worldwide burden of malnutrition. It has been observed that malnutrition is responsible for two-thirds of infant mortality in Egypt. The incidence of malnourishment persists at a significant level, especially among individuals who are below the age of five. According to recent prevalence estimates, the rates of underweight, stunting, and wasting among children under the age of five in Egypt were 6%, 21%, and 8%, respectively.[9]

Furthermore, Zottarelli and colleagues have documented that within the population of Egyptian children aged below 5 years, 18.67% exhibited stunted growth (i.e., low height-for-age), 2.52% were wasted (i.e., low weight-for-height), and 4.06% were underweight.[10]

The results of the univariate logistic regression analysis indicate that children who are older than 2 years are at a higher risk of being underweight and stunted compared to those who are 2 years old. This finding aligns with the research conducted by Asfaw and Giotom, which found a significant association between the age group of children in Aynalem village, Tigray, and the prevalence of stunting and underweight. The study found that children between 12 and 24 months had the highest incidence of stunting and underweight, whereas children aged 0 to 6 months had the lowest incidence of stunting, wasting, and underweight.[11]

Furthermore, a separate investigation revealed that individuals between the ages of 12 to 23 months exhibited a higher probability of being underweight than those aged 0 to 5 months, thereby suggesting an escalation in the incidence of undernourishment with advancing age [12]. In contrast to their urban counterparts, children residing in rural areas exhibited a higher likelihood of being underweight and experiencing stunted growth. This finding aligns with previous research [13]

Khatab et al. reported a lower prevalence of stunting among urban children than their rural counterparts in Egypt. Meanwhile, the author reported no significant association between residence, atrophy, and underweight, as per reference [14].

The present research has revealed that the offspring of mothers who have given birth to multiple children are at a higher risk of being underweight compared to those born to mothers who have had four or fewer children. This discovery aligns with studies conducted in Vietnam, Bangladesh, and South Ethiopia. This phenomenon could be attributed to households with more dependents experiencing a more significant economic strain in meeting their dietary needs [15]

Infants who were born with a lower-than-average weight were found to have a higher probability of being underweight and emaciated compared to those who were born with a weight within the normal range. Consistent with our research, the study conducted by Mazumdar et al. in Egypt revealed that neonates with a low birth weight exhibited a higher vulnerability to chronic malnutrition [16] .

Boah et al. (2019) reported a positive correlation between low birth weight and underweight status[12].

The current investigation revealed an independent association between parental education and undernutrition in children. Specifically, children whose parents have

lower levels of education or are illiterate exhibit a higher likelihood of being underweight, stunted, and wasted in comparison to their counterparts. The observation above aligns with the outcomes reported by Amsalu et al. [17], wherein it was established that malnutrition was positively correlated with children having fathers who lacked literacy skills.

Furthermore, Asfaw and colleagues have shown that the educational level of parents is significantly linked to the prevalence of underweight children, even after controlling for other factors. Offspring fathers lacking literacy skills exhibited a higher probability of being undernourished than those whose fathers possessed formal education.

The present investigation revealed that children who exhibited recurrent diarrhea as their primary symptom had a higher probability of being underweight in comparison to those who did not manifest the condition. The results above align with the research conducted by Asfaw and colleagues, which demonstrated that diarrheal morbidity within the 14 days before data collection was a contributing factor to undernourishment, stunted growth, and wasting. According to the findings, children who were introduced to complementary feeding before six months of age exhibited a higher likelihood of being underweight than those who were not introduced to complementary feeding before the aforementioned age threshold. Consistent with our research, Hien and Hoa [18] discovered that infants who received exclusive breastfeeding for 6 months exhibited a higher likelihood of being overweight compared to those who were exclusively breastfed for the same duration.

Conclusion:

Malnutrition is a commonly observed health issue among pediatric patients who are hospitalized. Communities with children under the age of six have shown a significant occurrence of undernutrition, which includes conditions such as being underweight, stunting, and wasting. The research discovered noteworthy correlations between being underweight and several factors, such as being of advanced age (over two years), residing in rural regions, having given birth to more than four offspring, being born with low birth weight, having parents who lack literacy, having a low socioeconomic status, and experiencing morbidity caused by diarrhea.

The study revealed a significant correlation between stunted growth and advanced age (> 4 – 6), rural residency, and parental illiteracy. Furthermore, a noteworthy correlation was detected between the condition of wasting and a background of low birth weight, as well as parents lacking literacy skills.

Tables and Figures:

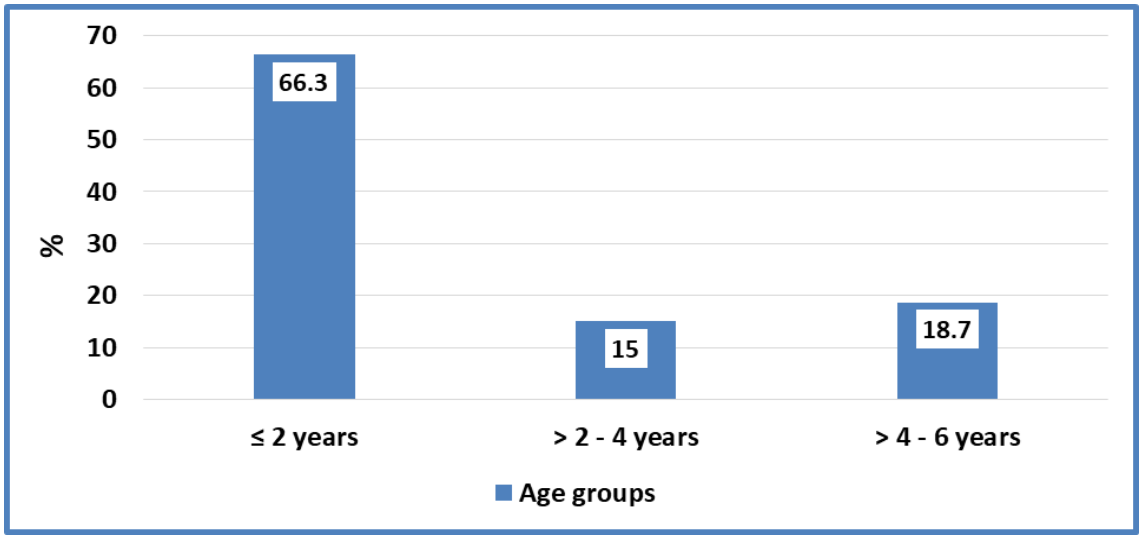

Figure 1: The distribution of age among the studied participants

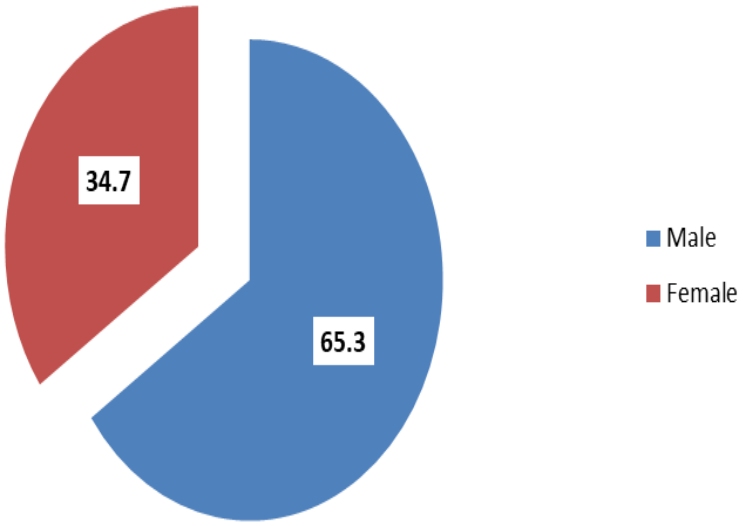

Figure 2: The distribution of gender among the studied participants

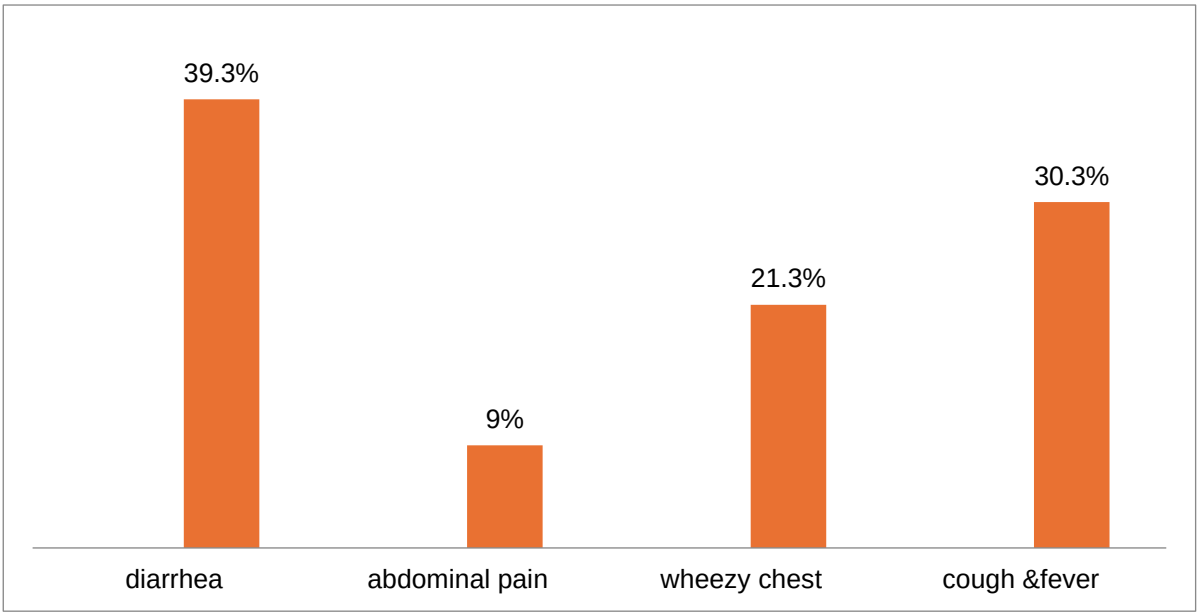

Figure 3: The different complains among the studied participants

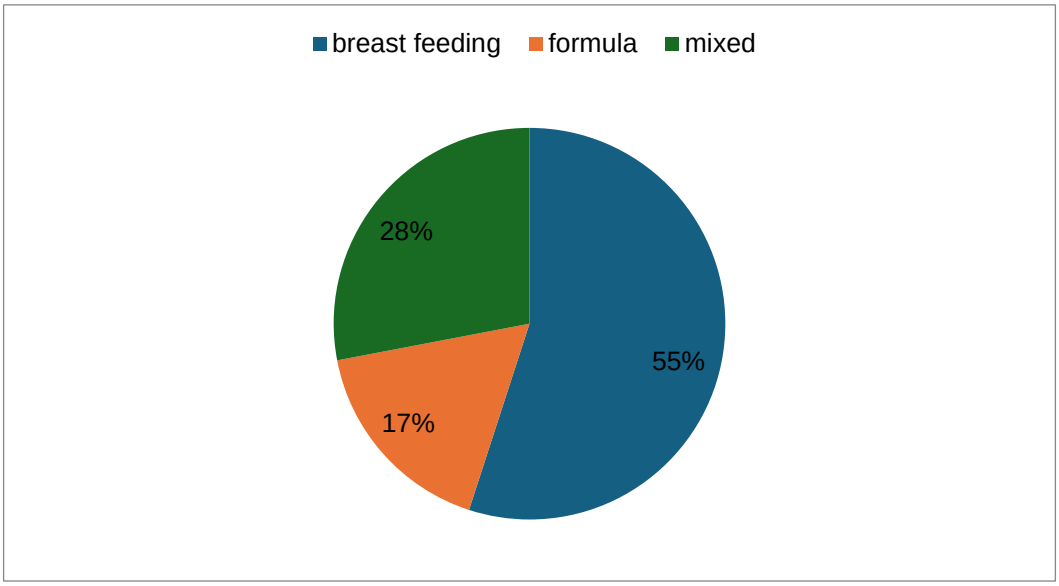

Figure 4: Nutritional history among the studied participants

Table 1: The prevalence of under-nutrition among the study participants (n=300)

Variable name	N	(%)
Weight for age		
• Normal	239	(79.7)
• Under-weight	61	(20.3)
Height for age		
• Normal	208	(69.3)
• Stunted	92	(30.7)
Weight for height		
• Normal	266	(88.7)
• Wasted	34	(11.3)

Table 2: Univariate logistic regression analysis of risk factors for under-nutrition in children as regards demographic data

	Underweight			**Stunting**			**Wasting**		
	OR	**95% CI**	**p-value**	**OR**	**95% CI**	**p-value**	**OR**	**95% CI**	**p-value**
Age groups									
- ≤ 2 years	ref								
- > 2 - 4 years	2.557	1.103-5.930	**0.029**	5.749	2.870-11.515	**0.000**	1.745	0.685-4.443	0.243
- > 4 - 6 years	11.098	5.507-22.366	**0.000**	8.384	4.344-16.180	**0.000**	1.579	0.651-3.827	0.312
Sex									
- Male	ref			ref			Ref		
- Female	0.900	0.496-1.635	0.730	1.007	0.602-1.687	0.978	0.648	0.291-1.445	0.289
Residence									
- Urban	ref			ref			Ref		
- Rural	2.586	1.351-4.950	**0.004**	2.167	1.270-3.699	**0.005**	1.641	0.754-3.569	0.212

Table 2: Univariate logistic regression analysis of risk factors for under-nutrition in children as regards demographic data. ***(Cont.)***

	Underweight			Stunting			Wasting		
	OR	**95% CI**	**p-value**	**OR**	**95% CI**	**p-value**	**OR**	**95% CI**	**p-value**
Parity									
- < 4	ref			ref			Ref		
- ≥ 4	3.163	1.767-5.665	**0.000**	1.592	0.969-2.617	0.067	1.809	0.883-3.706	0.105
Gestational age									
- Full term	ref			ref			Ref		
- Pre term	1.689	0.572-4.991	0.343	1.249	0.448-3.488	0.671	2.595	0.795-8.469	0.114
Low birth weight									
- Normal	ref			ref			Ref		
- Low birth weight	5.989	2.919-12.289	**0.000**	1.780	0.886-3.574	0.105	3.542	1.536-8.164	**0.003**
Mother education									
- Illiterate	6.092	2.096-17.708	**0.001**	5.320	2.40-11.790	**0.000**	32.308	4.153-251.315	**0.001**
- Primary	4.086	1.358-12.293	**0.012**	2.170	0.952-4.948	0.065	8.571	1.00-73.456	**0.050**
- Secondary	3.587	1.305-9.857	**0.013**	1.538	0.741-3.195	0.248	5.833	0.723-47.056	0.098
- High	ref			ref			Ref		
Father education									
- Illiterate	3.857	1.647-9.033	**0.002**	3.448	1.621-7.335	**0.001**	13.065	3.536-48.268	**0.000**
- Primary	1.667	0.722-3.849	0.232	1.160	0.575-2.342	0.678	1.662	0.359-7.690	0.516
- Secondary	1.129	0.502-2.543	0.769	0.739	0.377-1.448	0.378	3.640	0.992-13.364	0.051
- High education	ref			ref			Ref		
Socio-economic status									
- Low	4.583	1.459-14.403	**0.009**	2.368	0.904-6.199	0.079	1.971	0.532-7.306	0.310
- Moderate	0.553	0.171-1.794	0.324	0.841	0.332-2.132	0.715	0.576	0.153-2.175	0.416
- High	ref			ref			Ref		

Table 3: Univariate logistic regression analysis of risk factors for under-nutrition in children as regards initial diagnosis and nutritional history

	Underweight			Stunting			Wasting		
	OR	**95% CI**	**p-value**	**OR**	**95% CI**	**p-value**	**OR**	**95% CI**	**p-value**
Main complain									
- Diarrhea									
- No	ref			ref			Ref		
- Yes	2.135	1.209 – 3.772	**0.009**	1.126	0.683 – 1.857	0.642	1.634	0.798-3.344	0.179
- Abdominal pain									
- No	ref			ref			Ref		
- Yes	1.132	0.436 – 2.941	0.789	1.630	0.725 – 3.665	0.238	0.280	0.037-2.130	0.219
- Wheezy chest									
- No	ref			ref			Ref		
- Yes	0.493	0.221 – 1.099	0.084	1.135	0.628 – 2.050	0.675	0.605	0.224-1.632	0.321
- Cough& fever									
- No	ref			ref			Ref		
- Yes	0.626	0.325 – 1.207	0.162	0.633	0.362 – 1.108	0.109	1.112	0.518-2.389	0.787

Table 3: Univariate logistic regression analysis of risk factors for under-nutrition in children as regards initial diagnosis and nutritional history. ***(Cont.)***

	Underweight			**Stunting**			**Wasting**		
	OR	**95% CI**	**p-value**	**OR**	**95% CI**	**p-value**	**OR**	**95% CI**	**p-value**
Nutritional History									
- Breast	ref			ref			Ref		
- Formula	1.189	0.549 – 2.576	0.661	1.148	0.581 – 2.268	0.692	2.311	0.935-5.710	0.069
- Mixed	1.264	0.664 – 2.404	0.476	1.324	0.754 – 2.324	0.329	1.625	0.703-3.756	0.256
Introduction of complementary feeding									
- Before 6 months	2.637	1.377 – 5.050	**0.003**	1.569	0.850 – 2.894	0.150	2.102	0.939-4.704	0.071
- After 6 months	ref			ref			Ref		

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