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ORIGINAL ARTICLE

Prevalence of Under-nutrition in Hospitalized Children in Aswan University Hospital

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ABSTRACT

Keywords: Under-nutrition, Children, Aswan University Hospital

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Background: Every year, more that 10 million children worldwide die from preventable and treatable illnesses. At least half of these deaths are caused by malnutrition. **Objective:** To evaluate the prevalence of under-nutrition in hospitalized children in Aswan University Hospital. **Patients and methods:** The present study was a cross-sectional study that included 250 children who were recruited from Aswan university hospitals over a period of six months from April to November 2018. We utilized non-probability consecutive sampling Technique. **Results:** The nutritional history of the included children showed that the majority of children had mixed feeding (46%) and the mean duration of breastfeeding was 1.8 ±0.15 years. Eighty percent of the child had cow milk before 1 year of age and 71.2% of the children received food by 4 month of age. There were statistically significant differences between under-nutrition and normal groups in terms of parity, and gravidity. The relation between under-nutrition and complaints of the included children showed that there was a statistically significant difference between under-nutrition and normal groups in term of diarrheal morbidity per year. **Conclusion:** In our study, we found that almost 13% of the children admitted to our hospital had under-nutrition.

INTRODUCTION

Under-nutrition is a wide spread form of malnutrition in developing countries and is the major factor in childhood mortality and morbidity [1]. Every year, more that 10 million children worldwide die from preventable and treatable illnesses. At least half of these deaths are caused by malnutrition [2].

With two thirds of child mortality attributable to malnutrition, Egypt stands as one of the 36 countries, where 90 percent of the global burden of malnutrition falls. Malnutrition rates remain high particularly among children under-five. The double burden of malnutrition is a major challenge in Egypt especially for stunting [3].

Under-nutrition in hospitalized children is common in both resource-limited as well as resource-adequate countries [4]. For instance, moderate-to-severe underweight and acute severe malnutrition have been associated with an increased mortality in children who required hospital care for bacterial pneumonia in a resource-limited country [5].

By contrast, lower total body fat mass and acute and chronic under-nutrition were also noted to be associated with worse clinical outcomes in children undergoing surgery for congenital heart disease in a resource-adequate setting [6].

Underweight is a weight-for-age measurement. Underweight is a condition, which results from inadequate consumption,

poor absorption or excessive loss of nutrients. It is a measurement of acute and chronic malnutrition. Child malnutrition is an important indicator of the nutritional and health status of a country [7].

Commonly, weight-for-height standard deviation scores are used for wasting or acute malnutrition while height-for-age standard deviation scores are used for chronic malnutrition or stunting. Body mass index is also commonly used to describe malnutrition [8].

Undernourished children who require hospital care are at risk of staying for a longer duration in hospital and have a worse clinical outcome as compared to children with normal nutrition [9]. Medical conditions leading to an increased risk of under-nutrition in children requiring hospital care [10].

In the present study, we aimed to evaluate the prevalence of under-nutrition in hospitalized children in Aswan University Hospital. In addition, we aimed to describe the clinical characteristics of hospitalized children who developed under-nutrition.

PATIENTS AND METHODS

The present study was a cross-sectional study that included children who were recruited from Aswan University Hospitals over a period of six months from April to November 2018.

Sample Size and Sampling: We utilized non-probability consecutive sampling Technique. The records of all children aged 3 months to 18 years old and were admitted to Pediatric department of Aswan University hospital during study period were retrieved.

Inclusion criteria: All children aged 3 months to 18 years old and were admitted to Pediatric department of Aswan University hospital during the study period.

Exclusion criteria: Children with Unstable medical conditions when growth parameters could not be obtained properly and children with a known syndromic diagnosis where growth charts for normal children are not applicable

Data Collection:

All included children were interviewed and data were collected in the form of structured questionnaire (was filled from parents or care givers of the included children) which includes the following data:

1-Full history taking: Child sex, age, residency, consanguinity of parents, birth weight, natal, postnatal, developmental history, vaccination history, History of upper respiratory tract infections and gastroenteritis preceding presentation, type of infant feeding (breast fed or formula fed) and history of cow milk introduction before age of one year.

2- Full physical examination.

3- Anthropometric measurements:

We used a calibrated flat beam scale for mobile use (SECA 877, scale division: 100 g, capacity: 200 kg), a stadiometer (SECA 217, graduation length: 1 cm, range: 20-205 cm) and a measuring tape to calculate the following [11]: Height, weight, head circumference, mid-upper arm circumference and body mass index.

Ethical Statement: written consent was obtained from all parents of patient before getting them involved in the study. The steps of the study, the aim, the potential benefit and hazards were discussed with the parents of patients. Confidentiality of all data was ensured. Parents had free choice to refuse or enroll in the study. Parents had the choice to withdraw from the study at any time.

Statistical Analysis:

An Excel spreadsheet was established for the entry of data. We used validation checks on numerical variables and option-based data entry method for categorical variables to reduce potential errors. The analyses were carried with SPSS software (Statistical Package for the Social Sciences, version 24, SSPS Inc, Chicago, IL, USA). The normality of the data were assessed using Shapiro-Wilk Test. Numerical data were described as mean ±SD if normally distributed; or median and interquartile range [IQR] if not normally distributed. Frequency tables with percentages were used for

categorical variables. A p-value < 0.05 is considered statistically significant.

RESULTS

Table (1) shows the demographic data of included children and their parents, the mean age of the included children was 30.29 ±31.5 months and the percentage of male to female ratio was 62:38%. The mean mother age was 30.75 ±5.2 years and 24.8% of them were non-educated, 2.4% of them were primary educated, 5.6 of them were secondary educated, 11.2% of them were high institute educated and 56% of theme were university educated. The percentage of working to nonworking mothers ratio was 34:66 %. The percentage of non-educated fathers was 10.8%, primary educated fathers was 4.8%, secondary educated fathers was 28%, high institute educated fathers was 28% and university educated fathers was 62%.

Table (1): The demographic characteristics of the included children and their parents

Variables	Children (N =250)
Age in months	
- Mean ±SD	30.29 ±31.5
- Median (range)	19 (2.5 - 180)
Gender, No. (%)	
- Male	155 (62%)
- Female	95 (38%)
Mother Age in years	
- Mean ±SD	30.75 ±5.2
- Median (range)	30 (21 - 45)
Mother Education, No. (%)	62 (24.8%)
- No	6 (2.4%)
- Primary	14 (5.6%)
- Secondary	28 (11.2)
- High Institute	140 (56%)
- University Education	
Mother Employment, No. (%)	165 (66%)
- No	85 (34%)
- Yes	
Father Education, No. (%)	27 (10.8%)
- No	12 (4.8%)
- Primary	28 (11.2%)
- Secondary	28 (11.2)
- High Institute	155 (62%)
- University Education	

*Data are presented as mean ±SD, median (Range), or number (%)

Table (2) shows the obstetric history of the included mothers. The majority of women were multipara (59.2%), 22% was para 2 and 18.8% was para 1. Almost 64% of the mothers had antenatal care and 61.2% delivered at hospital.

Table (2): The Obstetric History of Included Mothers

Variables	Children (N =250)
Parity, No. (%)	
- 1.0	47 (18.8%)
- 2.0	55 (22%)
- 3.0	73 (29.2
- 4.0	47 (18.8%)
- 5.0	17 (6.8%)
- 6.0	11 (4.4%)
Gravidity, No. (%)	
- 1.0	43 (17.2%)
- 2.0	45 (18%)
- 3.0	81 (32.4%)
- 4.0	37 (14.8%)
- 5.0	26 (10.4%)
- 6.0	15 (6%)
- 7.0	3 (1.2%)
Antenatal Care, No. (%)	161 (64.4%)
- Yes	89 (35.6%)
- No	
Site of delivery, No. (%)	153 (61.2%)
- Hospital	97 (38.8%)
- Private	

*Data are presented as mean ±SD, median (Range), or number (%)

Table (3) shows the nutritional history of the included children. The majority of children had mixed feeding (46%) and the mean

duration of breastfeeding was 1.8 ±0.15 years. Eighty percent of the child had cow milk before 1 year of age and 71.2% of the children received food by 4 month of age.

Table (3): Nutritional history of the included children

Variables	Children (N =250)
Vitamin A supplementation, No. (%)	63 (25.2%)
- Yes	187 (74.8%)
- No	
Type of feeding, No. (%)	85 (34%)
- Breastfeeding	50 (20%)
- Formula	115 (46%)
- Mixed	
Duration of Breast Feeding in years	1.8 ±.15
- Mean ±SD	1.7 (1.5 - 2)
- Median (range)	
Cow milk before 1 year, No. (%)	
- Yes	200 (80%)
- No	50 (20%)
Month of Introduction of food, No. (%)	27 (10.8%)
- 3	178 (71.2%)
- 4	6 (2.4%)
- 5	29 (11.6%)
- 6	6 (2.4%)
- 7	4 (1.6%)
- 8	

*Data are presented as mean ±SD, median (Range), or number (%)

Table (4) shows the underlying diseases of the included children. The majority of children presented with pneumonia (46%) followed by diarrhea (34%). The mean ±SD of diarrheal morbidity per attack was 3.8 ±1.15. The mean ±SD of diarrheal morbidity per year was 10.1 ±3.15.

Table (4): Underlying diseases of the included children

Variables	Children (N =250)
Complaints, No. (%)	
- Pneumonia	115 (46%)
- acute bronchiolitis	36 (14.4%)
- Diarrhea	85 (34%)
- Abdominal pain	14 (5.6%)
Diarrheal morbidity per attack	3.8 ±1.15
- Mean ±SD	4 (2 - 8)
- Median (range)	
Diarrheal morbidity per year	
- Mean ±SD	10.1 ±3.15
- Median (range)	1 (0 - 24)

Table (5) shows the anthropometric measures of the included patients. The mean weight in kg was 11.11±6.1 and the weight SDS was -0.48 ±0.81. The mean height in cm was 88.25±20.6 and the mean height SDS was 0.67 ±1.1. The mean BMI in Kg/m^2 was 21.6±5.3 and the mean BMI SDS was 0.9 ±0.79. The mean mid-arm circumference was 16.1 ±5.4cm and the mean head circumference was 46.87±6.3.

Table (5): Anthropometric Measures of the included patients

Variables	Children (N =250)	
	Mean ±SD	**Median (Range)**
Weight in Kg	11.11 ±6.1	10 (3.5 - 50)
Weight SDS	-0.48 ±0.81	-0.25 (-3.4 – 0.69)
Height in cm	88.25 ±20.6	88 (57.3 - 157)
Height SDS	0.67 ±1.1	0.6 (-2.6 – 3.1)
BMI in Kg/m^2	21.6 ±5.3	21.6 (17.6 – 28.7)
BMI SDS	0.9 ±0.79	0.9 (-2.1 – 2.3)
Mid-arm Circumference	16.1 ±5.4	16 (11 – 48)
Head Circumference	46.87 ±6.3	49 (36 - 35)

Table (6) shows the prevalence of under-nutrition and its categories. The prevalence of under-nutrition was 12.8%. 40.8% of them had mild, 40.8% of them had moderate under-

nutrition and 18.8%n of them had sever under-nutrition

Table (6): Diagnosis and distribution of Under-nutrition Classification

Variables	Children (N =250)
Under-nutrition, No. (%) - Yes - No	32 (12.8%) 218 (87.2%)
Under-nutrition, No. (%) - Mild - Moderate - Severe	13 (40.6%) 13 (40.6%) 6 (18.8%)

Table (7) shows the multivariate Logistic Regression for Predictors of Under-nutrition. Only age in months <24 months is the only predictor of under-nutrition (OR 0.94, 95% CI [0.91 – 0.98]).

Table (7): Multivariate Logistic Regression for Predictors of Under-nutrition

Variables	Patients (N =32)		
	Odds Ratio	**95 % CI**	**P-value**
Age in months <24 months	0.94	0.91 – 0.98	0.01
Mother education < University	23.1	0.4 – 62.7	0.92
Father education < University	38.6	0.2 – 57.3	0.74
High parity ≥5	1.2	0.69 – 2.2	0.46
Breastfeeding	0.48	0.1 – 2.7	0.42
Introduction of BF before 4 months	0.48	0.1 – 2.7	0.42
≥10 diarrheal attacks per year	1.2	0.27 – 0.47	0.85

DISCUSSION

In the present study, we aimed to evaluate the prevalence of under-nutrition in hospitalized children in Aswan University Hospital. In addition, we aimed to describe the clinical characteristics of hospitalized children who developed under-nutrition.

In terms of the primary outcome of the present study, we found that the prevalence of under-nutrition was 12.8% (32 out of 250 children). 40.6% of the patients had mild and 40.6% moderate under-nutrition, while 18.8% had severe under-nutrition.

In agreement with our results, **El-Sayed et al.** [12] assessed the current status of malnutrition among 1217 pre-school children aged 6-71 months from Alexandria. Under-weight was observed in 9.3% of the children respectively. Another survey conducted in Beni-Suef by **Abdelaziz et al.** [13] found that the prevalence of the underweight was 10.0% respectively.

However, other reports showed much lower rate of pediatric under-nutrition. For example, **Abdel Wahed et al.** [14] in their study in Fayoum, Egypt they found that prevalence of underweight was 3.4%, respectively. **Piernas et al.** [15] reported that 19% of 2-6-year-old children in Chinese children in 2011 were underweight. Data from four nationwide Kenya Demographic and Health Surveys, conducted in 1993, 1998, 2003 and 2008-2009 were analyzed by **Masibo and Makoka** [16] reported that prevalence of underweight was 16% in 2008-2009.

This difference may be due to the fact that the population studied included only rural areas with different socio-demographic characteristics than what is recorded in our study.

In the present study, we found that the mean ± SD age of the included children was 30.29 ±31.5 months. Children with under-nutrition were significantly older than children with normal weight as the mean ± SD of age in under-nutrition versus normal children was 77.6±42.7 vs 23.3±22.4 months with P-value < 0.001.

Similar to our findings, **Degarege et al.** [17] found in his study about undernutrition and associated risk factors among school age children in Addis Ababa, Ethiopia the risk of underweight increased significantly in children who were male, 10 to 14 years old with an increase in age.

Our explanation is due to as the children grow, especially in rural areas they become more active and need more energy, which makes them more liable for under-nutrition [18].

The percentage of male to female ratio included children in our study was (62:38) %. Regarding the association between gender and under-nutrition, we found no significant difference between females and males as the ratio of male to female in under-nutrition children was (65.6:34.4) % vs (62.1:37.9) % in normal children with P-value 0.215. This was in line with EDHS data, which was conducted on the never-married female and male youth and young adults (10 to 19 years). The EDHS study showed that males (5.0%) had comparable rates of underweight to females (3.0%) in the age group (10–19 years) [3]. However, **Abdel Wahed et al.** [14] revealed that the percent of underweight was significantly higher in females than males prevalence. **Bhargava et al.** [19] reported that females were more underweight than males especially in rural schools in India.

Abdelaziz et al. [13] in Beni-Suef concluded that females were more stunted than males in 10–14-year-age group. This may have an explanation in the cultural preference of boys over girls in rural areas which might translate into a better chance of adequate food. Previous studies reported that under-nutrition among children is still a major health problem associated with poor sanitation and personal hygiene, low socioeconomic status, overcrowding and low educated parents [20].

In the present study the mean mother age was 30.75 ±5.2 years. The study revealed that there was no significant association between under-nutrition and maternal age.

In agreement with our study **Abbas and Mohammed** [21] found was found that 21% mothers ages below 20 years or more than 35 years, 79% mothers ages 20-35 years while, 20% of mothers with malnourished children who ages below 20 years or more than 35 years, 80% of mothers ages between 20-35 years.

Our explanation that in this study, the percentage of adolescent mothers was low and may explain why no significant relation could be found between mother's age and malnutrition. We found 24.8% of them were non-educated, 2.4% of them were primary educated, 5.6% of them were secondary educated, 11.2% of them were high institute educated and 56% of themes were university educated. The percentage of working to nonworking mothers ratio was (34:66) %. The percentage of non-educated fathers 10.8%, primary educated fathers were 4.8%, secondary educated fathers 28%, high institute educated fathers 28% and university educated fathers 62%. In comparison of undernourished children to normal group, the mean ± SD of mother age in under nutrition children was 33.8±6.4 vs 29.8±4.4 years in normal children with P-value <0.003. The distribution of non-educated mothers in under-nutrition to normal mothers was (28.2: 24.5) %, primary educated was (6.3:1.9) %, secondary educated was (12.5:4.6) %, high institute education was (0:12.9) % and university education was (53.1:56.9) % with P-value < 0.001.

In agreement with our result **Abbas and Mohammed** [21] reported that about prevalence of under nutrition and associated maternal risk factors in children less than five years of age in Babylon 2013, that malnutrition was higher among mothers who had low education 62%. Mother's education plays a vital role in increased receptivity to knowledge and awareness related to nutritional requirements of their infants [22].

The distribution of working to non-working mothers in under-nutrition children was (68.7:31.3) % vs (74.7:25.3) % with P-value < 0.07. The distribution of non-educated fathers in under-nutrition children to

normal children was (28.2:8.3) %, primary educated was (6.3:4.6) %, secondary educated was (25:9.2) %, high institute education was (0:12.8) %, university education was (40.5:62.8) %.

We found that low parents education and unemployment were significantly associated with childhood under-nutrition. In agreement with our findings, **Akombi et al.** [23] aimed to examine the trend in socio-economic inequalities in child under-nutrition in Nigeria. Similarly, **Owoaje and Colleagues** [24] aimed to determine the socio-economic and family related risk factors for under-nutrition among children in Ibadan, Nigeria.

In our study we found most of mother's sought antenatal care and hospital delivery the percentage of mothers sought antenatal care in under-nutrition to normal children groups was (65.6:64.2) %. The percentage of mothers who give birth in hospitals in under-nutrition vs normal children was (56.3:61.9) %.

So, there is no significant relationship between it and under nutrition. In agreement with our study, **Abbas and Mohammed** [21] found in them study about Prevalence of under nutrition and associated maternal risk factors in children under five years of age in Babylon that there was 89% of mothers had antenatal care visits during pregnancy,11% of mother had no antenatal care visits during pregnancy. Among the malnourished children 88% whose mothers had antenatal care visits while 12% whose mother had no antenatal care visits during pregnancy.

This disagreement with other study done in Ethiopia which showed that the number of antenatal care visits of women during the pregnancy of the child had a significant effect on malnutrition. Antenatal care can help to prevent low birth- weight and birth complications while, at the same time, providing mothers with valuable information about childcare, health and nutrition. Thus, availability and accessibility of antenatal care services to pregnant women should be increased as a means to improve long term nutritional and survival status of children [25].

In our study we found that the relation between under-nutrition and nutritional history of the included children. The percentage of breastfeeding in under-nutrition vs normal children was (25:35.3) %, formula feeding (6.3:21.1) % and mixed feeding was (68.8:42.6) %. The mean duration of breastfeeding in under-nutrition vs normal children was (1.8±0.1): (1.8±.15). There were statistically significant differences between under-nutrition and normal groups in terms of type of feeding ($p = 0.002$) and time at food introduction ($p < 0.001$).

In concordance with our findings, **Nisar and Colleagues** [26] aimed to identify the factors which contribute to malnutrition and to assess the dietary pattern in the pediatric population from birth up to five months belonging to poor socioeconomic areas in Hospital Sargodha. Children who were breastfed were less likely to have severe malnutrition than those who were given formula, fresh cow's or goat's milk, or more than one type of food.

Similarly, **Zhou et al.** [27] conducted a cross-sectional study aimed to determine the prevalence of malnutrition and identify the relationship between feeding practices and malnutrition in children below 5 years, in 7 remote and poor countries of China. The prevalence of underweight and in children below 5 years old was 13.1%. Short duration of breastfeeding for children, low prevalence of exclusive breastfeeding among children below 6 months, and early introduction of complementary foods were significantly associated with childhood under-nutrition.

Direct causes of child malnutrition due to inadequate dietary intake are evidenced in poor Infant and Young Child Feeding practices (IYCF), among which the most concerning, is the decline of exclusive breastfeeding rates at 4-5 months of age from 34% to 29% down to 13 % according to the respective DHS surveys of 2005, 2008, and 2014. Early initiation of breastfeeding, one of the indicators of adequacy of care, stands at 27% [3].

CONCLUSIONS

In conclusion, children in our locality had a considerably high rate of under-nutrition that may contribute to the development of devastating health consequences. In our study, we found that almost 13% of the children admitted to our hospital had under-nutrition. In addition, parents' education, employment, parity, time of introduction of food, and diarrheal morbidity appear to affect the prevalence of pediatric under-nutrition. These findings are very important as it confirms the need for interventions that aim to minimize the prevalence of pediatric under-nutrition in Aswan. Nevertheless, further studies with rigorous design, large sample size and multiregional cooperation are required.

REFERENCES

1. **Upadhyay K, Pourcyrous M, Dhanireddy R, Talati AJ. (2015):** Outcomes of neonates with birth weight 500 g: a 20-year experience. J Perinatol., 35:768- 72.
2. **Mengistu K, Alemu K, Destaw B. (2013):** Prevalence of Malnutrition and Associated Factors Among Children Aged 6-59 Months at Hidabu Abote District, North Shewa, Oromia Regional State. J Nutr Disorders Ther., 1: 001. doi:10.4172/2161-0509.T1-001.
3. **El-Zanaty F and Way A. (2014):** Egypt Demographic and Health Survey 2014. Popul Minist Heal Popul Assoc El-Zanaty Int ICF., 229–43.
4. **Huysentruyt K, Alliet P, Muyshont L, Devreker T, Bontems P, Vandenplas Y. (2013):** Hospital-related undernutrition in children: still an often unrecognized and undertreated problem. Acta Paediatr., 102 (2013): 460-466.
5. **Lazzerini M, Seward N, Lufesi N, Banda R, Sinyeka S, Masache G (2016):** Mortality and its risk factors in Malawian children admitted to hospital with clinical pneumonia, 2001-12: a retrospective observational study. Lancet Glob Health, 4: 57-68.
6. **Radman M, Mack R, Barnoya J, Castañeda A, Rosales M, Azakie A. (2014):** The effect of preoperative nutritional status on postoperative outcomes in children undergoing surgery for congenital heart defects in San Francisco (UCSF) and Guatemala City (UNICAR). J Thorac Cardiovasc Surg., 147: 442-450.
7. **Bhutta ZA, Das JK, Rizvi A, Gaffey MF, Walker N. (2013):** Evidence-Based Interventions for Improvement of Maternal and Child Nutrition: What Can Be Done and at What Cost? The Lancet, 382 (9890): 452–77.
8. **Joosten KF, Hulst JM. (2011):** Malnutrition in pediatric hospital patients: current issues. Nutrition, 27: 133-137.
9. **Allard JP, Keller H, Jeejeebhoy KN, Laporte M, Duerksen DR, Gramlich L (2016):** Malnutrition at hospital admission – contributors and effect on length of stay: a prospective cohort study from the Canadian malnutrition task force. JPEN J Parenter Enteral Nutr., 40: 487-497.
10. **Vaughan JF, Fuchs GJ. (2015):** Identification and management of acute malnutrition in hospitalized children: developed country perspective. J Pediatr Gastroenterol Nutr. , 61: 610-612
11. **Sebo P, Herrmann FR, Haller DM. (2017):** Accuracy of anthropometric measurements by general practitioners in overweight and obese patients. BMC Obes., 4. doi:10.1186/s40608-017-0158-0.
12. **El-Sayed N, Mohamed AG, Nofal L, Mahfouz A, Zeid HA. (2001):** Malnutrition among Pre-school Children in Alexandria, Egypt. J Heal Popul Nutr., 19:275–80.
13. **Abdelaziz SB, Youssef MRL, Sedrak AS, Labib JR. (2015):** Nutritional Status and Dietary Habits of School Children in Beni-Suef Governorate, Egypt. Food Nutr Sci., 06:54–63.
14. **Abdel Wahed WY, Hassan SK, Eldessouki R. (2017):** Malnutrition and Its Associated Factors among Rural School Children in Fayoum

Governorate, Egypt. J Environ Public Health, Article ID 4783791. https://doi.org/10.1155/2017/4783791

15. **Piernas C, Wang D, Du S, Zhang B, Wang Z, Su C, et al. (2015):** The double burden of under- and overnutrition and nutrient adequacy among Chinese preschool and school-aged children in 2009-2011. Eur J Clin Nutr., 69:1323–9.
16. **Masibo PK, Makoka D. (2012):** Trends and determinants of undernutrition among young Kenyan children: Kenya Demographic and Health Survey, 1993, 1998, 2003 and 2008-2009. Public Health Nutr., 15:1715–27.
17. **Degarege D, Degarege A, Animut A. (2015):** Undernutrition and associated risk factors among school age children in Addis Ababa, Ethiopia. BMC Public Health, 15:375-82.
18. **Ashley JM. (2018):** Understanding Vulnerability to, and Resilience Against, Food Insecurity. Hum. Resil. Against Food Insecurity, 12: 13–20.
19. **Bhargava M, Aggarwal P, Kandpal SD, Semwal J. (2015):** Magnitude of undernutrition in urban and rural school-going children of district Dehradun using WHO reference standards. Natl J Community Med., 6:452–7.
20. **Galgamuwa LS, Iddawela D, Dharmaratne SD, Galgamuwa GLS. (2017):** Nutritional status and correlated socio-economic factors among preschool and school children in plantation communities, Sri Lanka. BMC Public Health, 17:377-82.
21. **Abbas A, Mohammed SK. (2019):** Prevalence of under nutrition and associated maternal risk factors in children under five years of age in Babylon 2013. AL-Qadisiyah Medical Journal, 106: 142–8.
22. **Liaqat P, Rizvi MA, Qayyum A, Ahmed H. (2007):** Association between complementary feeding practice and mothers education status in Islamabad. J Hum Nutr Diet., 20(4):340-4.
23. **Akombi BJ, Agho KE, Renzaho AM, Hall JJ, Merom DR. (2019):** Trends in socioeconomic inequalities in child undernutrition: Evidence from Nigeria demographic and health survey (2003 – 2013). PLoS One, 14: 0211883.
24. **Owoaje E, Onifade O, Desmennu A. (2014):** Family and socioeconomic risk factors for undernutrition among children aged 6 to 23 months in Ibadan, Nigeria. Pan Afr Med J., 17: 1-7.
25. **Gugsayimer. (2000):** Malnutrition among children in Southern Ethiopia: Levels and risk factors.J. Health Dev., 14(3):283-292.
26. **Nisar MU, Anwar ul Haq MM, Tariq S, Anwar M, Khawar A, Waqas A, et al. (2016):** Feeding Patterns and Predictors of Malnutrition in Infants from Poor Socioeconomic Areas in Pakistan: A Cross-sectional Survey. Cureus, 8(1): 452.
27. **Zhou H, Wang XL, Ye F, Zeng XL, Wang Y. (2012):** Relationship between child feeding practices and malnutrition in 7 remote and poor counties, P R China. Asia Pac J Clin Nutr., 21(2):234-40.