

ASSESSMENT OF THE NUTRITIONAL STATUS OF UNDER-FIVE YEARS (6–59 MONTHS) CHILDREN ATTENDING FRIENDSHIP TEACHING HOSPITAL, ADEN PROVINCE, YEMEN

Nabil Q.M. Al-Hajj^{1,3*}, Abdulghany Hameed Ahmed Ahmed², Taha Naji¹, Mokhtar Alabyadh² and Sallah A. Al-Hashedi⁴

¹College of Medicine and Health Science, Department of Therapeutic Nutrition and Dietetics, University of Science and Technology, Aden, Yemen.

²College of Medicine and Health Science, Department of Pharmacy, University of Science and Technology, Aden, Yemen.

³Wathiqun Foundation for Development, Ministry of Social Affairs and Labor, Social Department Sector Sana'a, Yemen.

⁴Central Labs, King Faisal University, P.O. BOX 400, Al-Ahsa, Saudi Arabia.

Article Received on
27 Feb. 2021,

Revised on 20 March 2021,
Accepted on 11 April 2021

DOI: 10.20959/wjpr20215-20291

*Corresponding Author

Nabil Q.M. Al-Hajj

College of Medicine and
Health Science, Department
of Therapeutic Nutrition and
Dietetics, University of
Science and Technology,
Aden, Yemen.

ABSTRACT

Background: Poor nutritional status during childhood and its long-term impact on economic growth and wellbeing is well known. This study assessed the nutritional status of children in **Friendship Teaching Hospital** in Aden city, Yemen. **Objective:** the objective of this study was to assess nutritional status by looking for possible acute malnutrition or over nutrition and to identify some socio-demographic and educational factors that influence the nutritional status of children Attending Friendship Teaching Hospital, Aden province, Yemen. **Methods:** 360 under five years children were randomly recruited into the study. The socio-demographic and nutritional information of the children and mother were obtained using structured questionnaires. The data were entered and analyzed using SAS software. **Results:** In

this study, we recorded 310 cases of moderate acute malnutrition, at a rate of eighty six per cent (86%). Moderate acute malnutrition (MAM) was the most frequent form with a prevalence compared to 36 case of severe acute malnutrition (SAM), at a rate of ten per cent (10%), in addition to 14 cases of overweight was higher among girls (and = 10/350 [2.8%] compared of four boys (n = 4/350 [1.1%]. The children who received less than 3 meals per

day (10%) were more likely to suffer from wasting than those who received more than 3 meals per day (90%). **Conclusion:** Republic of Yemen, like many developing countries, remains affected by children's nutritional problems. All efforts should therefore be made to raise awareness among mothers, children and teachers about the concept of a balanced diet and the practice of intra- and extra-school sports activities.

KEYWORDS: Evaluation; Nutritional Status; Aden, Yemen; Kindergarten.

INTRODUCTION

Childhood under-nutrition in the form of chronic and acute malnutrition coexist in many populations in developing countries. Unlike acute malnutrition which is associated with immediate crisis such as periodic food shortages, chronic malnutrition is due to inadequate nutrition over a prolonged period resulting from latent poverty, chronic food insecurity, poor feeding practices and repeated episodes of health problems (such as infections) or poor health services in an unhealthy environment.^[1,2]

Malnutrition is defined by the World Health Organization (WHO) and National Centre for Health Statistics (NCHS) as a medical condition resulting from the deficiency or excess, relative or absolute, of one or more essential nutrients. Whether this condition is clinically manifested or only detectable by biological, anthropometric, or physiological analyses.^[1] Malnutrition affects physical growth, intellectual development, and consequently health and later productivity in life.^[2] In a well-nourished population, there is a reference distribution of height and weight for children under five years of age. Undernourishment and over-nutrition in a population can be measured by comparing children to a reference population. The reference population is based on WHO growth standards. Globally in 2017, about 165 million or 26% of children under 5 years of age were stunted; 101 million were underweight or nearly 16% and 52 million were moderately or severely wasted.^[3] Underweight, wasting and stunting respectively contribute to 19.0, 14.6 and 14.5 % of global deaths.^[4] Vitamin A and zinc deficiencies contribute substantially to micronutrient deficiency related-deaths whilst iodine and iron deficiencies coupled with stunting alone, contribute to children not reaching their full developmental potential.^[3] Also children who survive malnourished childhood are less productive physically and intellectually, and are more prone to chronic illness and disability in adult life.^[5,6] In Yemen, reports on child under-nutrition are indicates that 28 % of children under 5 years were stunted and 9 % were wasted.^[7-9]

According to the UNICEF (2019), the prevalence of global acute malnutrition was 8% among children aged 0 - 5 years. For chronic malnutrition, it was 34.7% nationally and 20.7% in Aden city. Four (4%) of children under five years of age are overweight and the prevalence of overweight is higher among boys than girls (5% versus 3%).^[4] In Yemen, obesity is emerging at a time when under-nutrition is still a major burden, especially among disadvantaged groups in the population. The coexistence of over nutrition and/or under-nutrition is a real problem for Yemeni health services, which are not well prepared for this trend. However, a bibliographical search showed us that work dedicated to this problem is quite rare and that none has been conducted in Yemen. To overcome this deficiency, we have set ourselves the objectives of assessing nutritional status by looking for possible under-nutrition or over-nutrition and identifying certain socio-demographic factors that influence the nutritional status of under-five children attending Friendship Teaching Hospital, Aden province, Yemen

MATERIALS AND METHODS

Friendship Teaching Hospital, Aden, Yemen, were selected from intervention sites mapped out by the Department of Therapeutic Nutrition and Dietetics in University of Science and Technology, Aden, Yemen in 2019.

After ethical clearance, 360 under five children were randomly recruited into the study. The socio-demographic and nutritional information of the children and mother were obtained using structured questionnaires.



Figure 1: Friendship Teaching Hospital, Aden province, Yemen.

Data collection

Information on participants' background characteristics was obtained using a pretested questionnaire. Questions on sex, age, caregiver's level of education, marital status, household size and occupation were obtained from the respondents through one-on-one interview. Nutritional status of children aged 0–59 months in the selected households were determined by taking anthropometric measurements based on WHO standard procedures.^[10,11] Body weight was measured using an electronic digital scale (Tanita Electronic scale BWB-800). Length and height measurements were taken using an infantometer (Seca 416) and stadiometer (Seca 207) respectively. Oedema was assessed in all children recruited. All children's birth records were assessed from their birth certificates and weighing cards. The interviewers were trained on collecting anthropometric measurements. Questionnaire was pre-tested and equipment were calibrated before use. After data collection, the questionnaire were cross-checked in the field and all necessary corrections made.

METHODOLOGY

This is a descriptive and analytical study of 360 children of under-five children attending Friendship Teaching Hospital, Aden province, Yemen, during the period from 5 September to 10 October 2019. For identifying certain socio-demographic factors that influence the nutritional status, we used simple random sampling based on the random selection method. The sample size of 360 was obtained by the following formula:

$$N = \frac{z^2 PQ}{F^2}$$

N = required sample size;

Z = (1.96); for a 95% confidence grade;

D = 5% margin of error;

P = (5.8%) the prevalence of acute malnutrition,

Q = (1-p), expected prevalence of undernourished children,

F = Absolute precision desired, expressed as a fraction of F = (2.5%) the degree of precision.

To be included in the study, children would have to be aged 0 to 5 years old. The “averages” used in this study are the standard reference values NCHS/WHO weight/height.

Children whose weight-for-height was greater than two standard deviations (-2 SD) below the median of the reference population were classified as moderately or severely emaciated,

while those who were more than three standard deviations (-3 SD) below the median were considered severely emaciated.

Those whose weight-for-height was greater than two standard deviations (+2 SD) above the median of the reference population were considered to be overweight and obese children (P/T above +3 SD). It should be noted that WHO growth standards do not present figures expressed as a percentage of the median.

WHO recommends using the classification system expressed in z-score or standard deviation which is comparable across ages and sizes for the different indicators.^[5]

WHO recommends using the classification system expressed in z-score or standard deviation which is comparable across ages and sizes for the different indicators.^[5] The child's age was determined from the date of birth recorded on the birth certificate or given by the parents. In children under 2 years of age, height was measured in a lying (lying) position using a horizontal measuring rod placed on a stable, flat surface such as a table. For those over 2 years of age, height was measured in an upright position.

For weighing, we used the UNISCALE scale (designed by UNICEF) with tare function and an accuracy of 0.1 kg (100g). Data were collected daily in the selected school groups through structured interviews between interviewers and caregivers of children aged 0 - 5 years.

The data were collected from a survey sheet containing socio-demographic data on the mother-child relationship, anthropometric measurements and child feeding. The data were entered and analyzed using SAS software. The χ^2 test in varied single analysis was used to look for an association between the different factors and the nutritional status of children.

Statistical analysis

Data was analyzed using SPSS version 20.0 and WHO Anthro. The WHO Anthro was used to convert weight, height and age of child (months) into weight-for-age z-score (WAZ), weight-for-height z-score (WHZ) and height-for-age z-score (HAZ). A child with all three anthropometric indices $< -2SD$ or $\geq -2SD$ was classified as severely malnourished or well-nourished respectively. If two of the three anthropometric indices were $< -2SD$, the child was considered moderately malnourished and when one of the three anthropometric indices was $< -2SD$, the child was considered marginally malnourished.

RESULTS

Table 1: Prevalence of severe acute malnutrition, moderate acute malnutrition and over nutrition by age of children (0 - 59 months).

Age in months	SAM (≥ -3 z-score)	MAM (≤ -3 and ≥ -2 z-score)	well-nourished (≤ -2 z score)	Overweight ($\geq +2$ z score)	Obesity ($\geq +3$ z score)	Number of children
6 - 17	4	80 (22.2%)	15 (4.2%)	-	-	90
18 - 29	5	50 (13.8 %)	26 (7.2%)	2 (0.6 %)	2 (0.6 %)	68
30 - 41	13 (3.6 %)	50 (13.8 %)	98 (27.2 %)	2 (0.6 %)	-	71
42 - 53	12 (3.3 %)	40 (11.1 %)	113 (31.4%)	2 (0.6%)	-	56
54 - 59	2	76 (21.1 %)	72 (20 %)	4 (1.1 %)	2 (0.6 %)	75
Total	36 (10%)	324 (90%)	324 (90%)	10 (2.8%)	4 (1.1%)	360

The prevalence of SAM increases in the 30 – 41 and 42 - 53 months age group and then decreases to 0.6% in children aged 54 - 59 months. As for MAM, the results show prevalence of MAM increases in all ages as in the **table 1**.

Table 2: Distribution of acute malnutrition (MAM and SAM) and over nutrition by gender.

Sex	Malnutrition	Overweight	Obesity	Number of children
Male	160 (44.4%)	0	4 (1.1%)	180
Female	186 (51.6%)	10 (2.8%)	0	180
Total	346	10	4	360

Table 2 shows that overweight was higher among girls ($n = 10/350$ [2.8%]) four boys ($n = 4/350$ [1.1%]).

Table 3. Risk factors for malnutrition by social-demographic characteristics of mothers.

Characteristic	malnourished	Eutrophic
Age		
15-30 years	10 (4.31%)	222 (95.69%)
> 30 years	8 (6.90%)	108 (93.10%)
Level of study		
Schooled	7 (4.80%)	139 (95.20%)
No schooling	11 (5.45%)	191(94.55%)
Marital status		
Married	14 (4.86%)	274 (95.14%)
Single	4 (6.67%)	56 (93.33%)
Profession		
Occupied	13 (4.83%)	256 (95,17%)
Not occupied	5 (6.33%)	74 (93,67%)

The various statistical tests carried out (**Table 3**) did not find a link between the occurrence of malnutrition and the following social demographic factors: the mother's age ($p = 0.304$), education level ($p = 0.786$), marital status ($p = 0.565$) and occupation ($p = 0.730$).

The majority of children ($n = 310/360$ [86.1%]) had received 3 meals per day. Children who received less than 3 meals per day ($n = 36/360$ [10%]) are more likely to suffer from wasting than those who received more than 3 meals per day. OR = 1.68 [0.46 - 6.11].

Table 4: Percentage of children (0 - 59 months) who received the different types of foods on the day before the collected.

Types Foods	Number of children	Percentage
Fruits, vegetables, animal proteins		
Fruits	80	22.2
Vegetables	200	55.5
Eggs	30	8.3
Meat	50	13.9
Type of spray liquid		
Rice	144	40
Sorghum	30	8.3
Millet	46	12.7
Wheat	30	8.3
Corn	20	5.5
Bread	90	25
Dairy Products		
Yoghurt	29	8.05
Cheese	19	5.3
Fresh milk	10	2.7
None	302	83.9
Water source		
Faucet	200	55.5
Fountain	155	43
Mineral water	5	1.38

Table 4 shows that nearly 55.5% of children had received a meal containing vegetables, 22.2% fruits on the day before the survey. Only 13.9% had consumed meat or fish and 8.3% had received eggs. Among dairy products, yogurt, cheese and fresh milk was the most consumed food by children (8.5%, 5.3% and 2.7% respectively). While 302 children did not consumed them (83.9%).

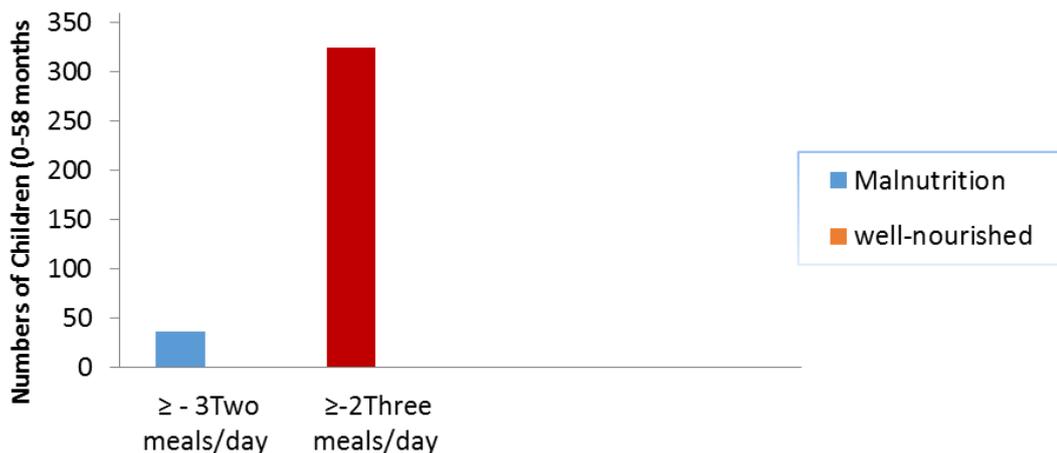


Figure 2. Distribution of Malnourished children by number of daily meals

Figure 2: Shows that children who received less than 3 meals per day were more likely to suffer from wasting than those who received more than 3 meals per day.

DISCUSSION

Adequate nutrition is important for child growth, health and development. Children's nutritional status reflects their overall health. When children have access to sufficient food, are not exposed to repeated diseases and are well cared for, they reach their growth potential and are considered well nourished. During this study, we recorded 36 cases of severe acute malnutrition (10%) in the **table 1**.

Moderate acute malnutrition (MAM) was the most frequent form with a prevalence of 86% compared to 10% of severe acute malnutrition (SAM). Our results are more than those found in Morocco (2.27%) including 0.45% of SAM^[6,7] as a result of the ongoing conflict in Yemen since years six, which has led to food insecurity, livelihoods, rising prices and poor health centers and hospitals, in addition to contamination of water and environment. (**Table 1**).

Levels of MAM in these communities studied are lower than the national prevalence of 13.4 %.^[7,8] Regional estimates indicated that children in Aden city were more likely to be underweight and stunted as compared to children from other regions in Yemen.^[7,8] This trend was observed even in these selected communities due to the high level of poverty in Aden.

A previous nationwide study in Yemen indicated that children in the poorest households were at least twice more likely to be malnourished in comparison with children from the wealthiest households.^[8-9] According to the WHO, this low rate observed in the Moroccan study is consistent with that found in a healthy and well-nourished population.^[8-10]

In Yemen, the Demographic and Health Survey (2016) found a national global acute malnutrition rate of 8%, of which 3% were in the form of SAM. This rate of leanness was four times higher than that expected in a healthy and well-nourished population (2.3%) and thirty times higher for the severe form (0.1%).^[3,4] Analysis of socio-demographic characteristics shows that the prevalence of leanness was higher among male children (6.17%) than female children (4.30%), the difference observed was not statistically significant ($p = 0.431$). Our results are consistent with those found by OCHA.^[7]

The prevalence of SAM increases in the 30 – 41 and 42 - 53 months age group and then decreases to 0.6% in children aged 54 - 59 months. The high rate of MAM (**Table 1**) in this age group could be explained by the fact that Yemeni children start eating with adults at around 24 months on average, which means that they often do not receive the amount of food necessary to cover their needs.

The table 3 shows distribution of maternal characteristics shows that children from out-of-school mothers were more affected (5.45%) by malnutrition, but we did not find a link between the mother's level of education and the occurrence of wasting ($p = 0.786$). Overweight or obesity is one of the manifestations of malnutrition and is a serious and an emerging problem. In this study, in the table 2 we recorded 2.8% cases of over-nutrition. Girls were more concerned than boys (1.1%), but the difference observed was not statistically significant ($p = 0.431$).

In UNDP study, 2018. had found 13.1% overweight children and 11.7% obese.^[4-6] In the Office for the Coordination of Humanitarian Affairs (OCHA) study, 2017 had found a quarter of the children (25.45%) were obese. Boys were more affected by obesity than girls: (27.67% versus 23.14%), a sex ratio of 1.24. According to him, this high proportion of over nutrition is due to children's excessive consumption of sweet and fatty foods.^[5-7] In general, it is increasing in developing countries and/or countries that have adopted a Western lifestyle. Advertisements and supermarkets encourage people to consume sweet and fatty products at any time of the day and children like to spend hours in front of their TV or computer screens instead of exercising physically. The physio pathological particularity in children is the ability of adipose tissue to proliferate during the gestational period and the first year of life, with an obesity called "hyperplastic", with an increased number of adipocytes; this ability to proliferate gradually decreases and disappears during adolescence. Secondly, obesity will be mainly due to the cell fat overload that characterizes "hypertrophic" obesity in adults.^[11,12]

However, the risk of an obese child becoming an obese adult remains moderate. The causes are the same as in adults and are dominated by excessive and prolonged food intake. The intervention of a genetic factor is proven by the fact that children whose parents are both obese have an 80% chance of being obese in turn compared to only 40% if only one of the parents is obese.^[12] Management is often difficult, especially since some fat children have a correct energy intake. The child may suffer from his or her condition. He may be the target of mockery or rejection by his classmates and subsequent complications are far from negligible: high blood pressure, diabetes, respiratory disorders, and orthopedic disorders.^[13]

With regard to children's feeding practices, it appears from **table 4** that 13.9% of children had received a meal containing meat or fish, 8.3% had received eggs, 16.05% dairy products and 34.8% porridge made from cereal mixture. The fish and meat are characterized by their contribution of protein of biological value (VB). The quality of a protein is called "biological value". It is determined by its amino acid composition. The higher its biological value, the greater the ability of the protein to fulfill its role.^[12-14] Fish provide 15 to 25 grams of protein per 100 grams of the same biological value as meat. The daily need for proteins in children represents 10 to 15%. The ratio between caloric intake and protein intake is important (when caloric intake decreases, protein synthesis also decreases) this ratio should be 30 kcal/1g protein.^[12]

In this study, only 22.2% of children had received fruit compared to 55.5% for vegetables. Our observations are contrary to those of Solomon A, 2008, who found in her study that the majority of children consumed vegetables on a daily basis and, above all, represented the bulk of the family meal.^[12] The low consumption rate of fruits and vegetables in our series is due to their high prices on the Yemeni market. It should be stressed that vegetables are very important in children's diets because they provide minerals such as iron, magnesium, potassium, calcium, etc.; but also fibers, carbohydrates and vitamins. The first characteristic of vegetables is that they contain a very large amount of water: 85 to 95%. As a result, they generally have the advantage of providing relatively little calorie.^[12-15]

Figure 2. shows that majority of children (90%) received 3 or more meals per day compared to 10% for those who received less than 3 meals per day. Analysis by the number of meals, shows that children who received less than 3 meals per day were more likely to suffer from wasting than those who received more than 3 meals per day. Studies of UNICEF, 2018 found that a poor educational background could be associated with child under nutrition.^[16-19] The

differences could be due to the low educational level of the caregivers in this study. Other studies have shown that as more caregivers obtain education, the more they will visit a health facility and get some nutrition and health advice from health professionals.^[20,21] A World Bank report in 2017 indicated that, teenage caregivers and caregivers in their late 30s, were significantly more likely to have children suffering from all forms of malnutrition. Although not statistically significant, an interesting trend was observed for maternal age. Increasing maternal age was poorly associated with child nutritional status. This is at variance to previously published studies due to the unequal distribution of mothers across the different age groups.^[21,22]

Household size was independently associated with poor nutritional status. A study in Ethiopia found that children from larger households were more vulnerable to malnutrition.^[23] This could be because food for each household was limited and children were easily affected.^[24]

Strengths and limitations

This paper established baseline estimates of nutritional status of children 0–59 months in Aden province, Yemen in 2019.

The cross sectional nature of this study makes causal relationships between maternal and child nutritional status less probable. However, since it was conducted in low-income communities in Aden city, it will give us an initial point to assess the impact of interventions that would be carried out by **Wathiqun Foundation for Development** in these communities future.

Further studies on food and nutrition insecurity may be needed in order to identify other determinants of poor nutritional status among children in Yemen.

CONCLUSION

Yemen, like several developing countries, remains affected by children's nutritional problems. This study shows that MAM and SAM are a real public health problem in preschoolers of the province of Aden, Yemen.

If nothing is done, the coexistence of these two forms of malnutrition will in the long run pose a real problem for Yemeni health services because they are not well prepared for this evolution. All efforts should therefore be made to raise awareness among mothers, children, school health and education staff about good nutritional practices, as well as the practice of intra- and extra-school sports activities.

REFERENCES

1. UN Development Programme (UNDP), *Living in Yemen: Voices of Resilience*, October 2018.
2. UN International Children's Emergency Fund (UNICEF), *Children's education: nutrition fall victim to ongoing crisis in Yemen*, February 2018.
3. UN Office for the Coordination of Humanitarian Affairs (OCHA), *Yemen: Humanitarian Needs Overview*, 2017, October 2017.
4. UN Office for the Coordination of Humanitarian Affairs (OCHA), *Yemen: Humanitarian Needs Overview – 2016*, December 2016.
5. Pelletier DL. The relationship between child anthropometry and mortality in developing countries: implications for policy, programs and future Research¹. *J Nutr.*, 1994; 124: 2047S–81S.
6. Millward DJ, Jackson AA. Protein/energy ratios of current diets in developed and developing countries compared with a safe protein/energy ratio: implications for recommended protein and amino acid intakes. *Public Health Nutr.*, 2017; 7(03): 387–405.
7. UN Office for the Coordination of Humanitarian Affairs (OCHA), *Yemen: Humanitarian Needs Overview – 2016*, 23 June 2016.
8. World Bank. *World Development Indicators*. Washington, DC: World Bank, 2017.
9. Victora, C. G., Adair, L., Fall, C., Hallal, P. C., Martorell, R., Richter, L., Maternal and Child Undernutrition Study Group. Maternal and child undernutrition: Consequences for adult health and human capital. *The Lancet*, 2015; 371(9609): 340-357.
10. World Health Organization (2017). *Children: reducing mortality*. Fact Sheet No. 178.
11. UN International Children's Emergency Fund (UNICEF), *In Yemen, eager to learn, despite the fighting*, September 2018.
12. Ayaya S, Esamai F, Rotich J, Olwambula A. Socio-economic factors predisposing under five-year-old children to severe protein energy malnutrition at the Moi teaching and referral hospital, Eldoret, Kenya. *East Afr Med J.*, 2004; 81(8): 415–21.
13. Victora CG, de Onis M, Hallal PC, Blössner M, Shrimpton R. Worldwide timing of growth faltering: revisiting implications for interventions. *Pediatrics*, 2010; 1519-2009.
14. UN International Children's Emergency Fund (UNICEF), *Children's education: nutrition fall victim to ongoing crisis in Yemen*, February 2019.
15. Akresh, R., Lucchetti, L., & Thirumurthy, H. Wars and child health: Evidence from the Eritrean-Ethiopian conflict. *The Journal of Development Economics*, 2015; 99(2): 330-340.

16. UN Development Programme (UNDP), Living in Yemen: Voices of Resilience, October 2015.
17. UN International Children's Emergency Fund (UNICEF), In Yemen, eager to learn, despite the fighting, September 2018.
18. Arcand J., and E. D. Wouabe. 2009. Households in a Time of War: Instrumental Variables Evidence for Angola. The Graduate Institute, Geneva Working Paper.
19. Adeladza A. The influence of socio-economic and nutritional characteristics on child growth in Kwale District of Kenya. *African Journal of Food, Agriculture, Nutrition and Development*, 2017; 9(7): 1570–1590.
20. Solomon A, Zemene T. Risk factors for severe acute malnutrition in children under the age of five: a case–control study. *Ethiopian Journal of Health Development*, 2018; 22(1): 21–5.
21. UNICEF. “Improve child nutrition: An imperative and achievable objective for global progress”. United Nations Children’s Fund, 2013.
22. Bocquet JL., et al. “Infant and Young Child Feeding Practical implementation”. *Archives de Pédiatrie*, 2003; 10: 76-81.
23. Laurence B and Bérengère M. “Nutrition-Alimentation de l’Enfant”. Studyrama Publishing, 2012; 48-49.
24. Balzano E. “Health guide for children aged 0-14 years”. Editions Flammarion, 2010; 426.