SI Science International

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Prevalence and Predictors of Nutrition among Primary School Children in Aden, Yemen

Shadha Esamil and Rosslee Rajikan
Dietetic Program, Faculty of Health Science, Universiti Kebangsaan Malaysia, 50300 Kuala Lumpur, Malaysia

ABSTRACT

Background and Objective: The prevalence of undernutrition among children has been extensively investigated, however research on undernutrition among school children and in urban areas in Yemen has been sparse. This study aimed to determine the prevalence and predictors of undernutrition among primary school children in Aden, Yemen. **Materials and Methods:** A cross-sectional study of primary school children in grades I through VI was done in government schools. A basic questionnaire was used to collect data, which included demographic and social information as well as weight and height measurements using standard instruments. **Results:** A total of 525 school children took part in the study, with 55% of them being boys and 45% being girls. The prevalence of underweight (18.5%), stunting (16.7%) and wasting (10.1%) were recorded. In comparison to the boys, the girls were more underweight and stunted. In this study, undernutrition among school children was predicted by the mothers' age, fathers' income and household food insecurity. Father's income (b = 17.28) was the major predictor of undernutrition, followed by household food insecurity (b = 2.11). **Conclusion:** In Aden, Yemen, 38% of schoolchildren were undernourished and increasing fathers' income along with reducing household food insecurity, as well as taking into account the age of mothers, could help battle undernutrition among school children.

KEYWORDS

Undernutrition, primary school, prevalence, predictor, Aden Yemen

INTRODUCTION

Nutritional intake is an important factor in maintaining human health and well-being. It is prominent and of greater concern during childhood and adolescence[1]. Providing children with appropriate health and nutrition during their primary school years leads to improved educational, growth and development outcomes[2,3]. Malnutrition is a pathological condition caused by a relative or absolute shortage in one or more important nutrients or an excess of one or more critical nutrients[4,5]. Anthropometric indicators (underweight, stunting and wasting) are regularly used to measure undernutrition in the population. World Health Organization are defined underweight, stunting and wasting as Z-scores less than -2 standard deviations of weight for age, height for age and weight for height, respectively[6]. Undernutrition is a persistent public health issue in poor countries, with one in every three people suffering from some kind used to measure undernutrition in the population. World Health Organization are defined underweight, stunting and wasting as Z-scores less than -2 standard deviations of weight for age, height for age and weight for height, respectively[6]. Undernutrition is a persistent public health issue in poor countries, with

ISSN: 2305-1884 (Print)
https://doi.org/10.17311/sciintl.2022.11.18

Received: 28 Feb. 2021
Accepted: 06 Jul. 2021
Published: 01 Jan. 2022

one in every three people suffering from some kind of malnutrition[7,8]. It was true that school-aged undernutrition caused morbidity and learning disabilities among school children and it must be addressed, especially the stunting problem, because it is an irreversible condition that leads to mental and physical development deficiency, which kept the child unable to take maximum benefit of learning opportunities[9,10]. Yemen is the Middle East and North Africa's second poorest country. It faces significant difficulties of poverty, ill-health, hunger and low educational achievement, with high population growth[11].

Yemen is a Middle Eastern desert country with 22 governorates and five islands located on the southern tip of the Arabian Peninsula. Sana'a is Yemen's political capital, whereas, Aden is its economic capital[12]. The two Yemeni republics (South and North Yemen) have been formally united as the Republic of Yemen since 1990 and a southern secessionist movement and a brief civil war in 1994 were quickly put down[13], resulting in the omission of South Yemen and especially Aden from any future study[14].

Although the prevalence of undernutrition is well documented among the Yemeni children community[15-17], there is little data on the prevalence and predictors of undernutrition among school children in Aden. Therefore, exploring the problem and finding its contributing factors is an important step to design appropriate strategies to overcome the problem. Thus, the objective of this paper was to determine the prevalence of undernutrition and its predictors among primary school children in Aden, Yemen.

MATERIALS AND METHODS

Ethics: This study was approved by the Medical Council (Republic of Yemen) with Reference No. 84521. Permission was also sought out from the Ministry of Education, school administration and the parents' signed consent.

Study design: From January, to May, 2013, a cross-sectional study was undertaken among primary school children in grades I through VI in government schools in the seven districts of Aden's governorate.

Study population and sample size: Al Mansura, Al Mualla, Al-Shaikh Othman, Altawahi, Crater, Dar Sad and Khormaksar are the seven districts that makeup Aden. Each district has several schools (A Total of 72 primary Schools). The Education office provided lists of government schools in each district and one school was chosen at random from each district using a basic random sample technique. The schools were chosen based on the criteria for inclusion (i.e., government schools and mixed-gender schools). Seven schools were chosen randomly to provide 14 subjects in each grade (one school from each of the seven districts).

With the cooperation of the instructors, the researcher delivered 680 questionnaires to students randomly. The researcher collected the questionnaire the next day. Children must be registered at the school, between the ages of 6 and 12 and have no health difficulties to be included in the survey results. Due to several reasons, including missing information, not returning the questionnaire and parents who refused to give their consent, several questionnaires were not included in the study. Twins or siblings from the same family were excluded from the study to avoid duplication of household data. As a result, 525 participants were included in the study, accounting for 76% of all respondents.

Measurements

Anthropometry: Using the computer programme Anthro plus for Windows 10, the subject's weight and height were assessed and the findings were compared to WHO 2007 growth charts[18]. The weight and height of the children were used to generate age- and sex-specific Z-scores to determine underweight, wasting and stunting.

Underweight is shown by the weight-for-age Z-score (WAZ), stunting (chronic malnutrition) is indicated by the height-for-age Z-score (HAZ) and wasting is indicated by the weight-for-height Z-score (WHZ) (acute malnutrition).

The median values of the WHO Reference Population were used to calculate the Z-scores. Malnourished children had Z-scores below -2 SD of the WHO Reference Population medians, while normal children had Z-scores over -2 SD and below +2 SD and overweight/obese children had Z-scores beyond +2 SD. Three consecutive readings were taken for each measurement and the mean was determined.

Questionnaire: A standardised socio-demographic questionnaire was employed to learn more about the participants' backgrounds. There were two sections to the questionnaire:

- Participant's age, academic level and anthropometric measurements such as weight, height and BMI were all included in the first section (body mass index)
- Family's education, the number of children in the home, the size of the household, the parent's employment status and the total household income and expenditures were all included in the second part

Data analysis: All statistical analyses were performed using Statistical Package for Social Sciences (SPSS) version 20. Probability levels of ≤ 0.05 were considered to be statistically significant. The Kolmogorov-Smirnov test was used to ensure that the data had a normal distribution. WAZ, HAZ and WAH anthropometric data, as well as socio-demographic data, were analysed descriptively using Mean and ±SD. To adjust the effects of multiple factors and control the effects of confounding variables on the response variable, bivariate analysis (with Chi-square test) was used. Multivariate logistic regression analysis forward stepwise procedure was used to adjust the effects of multiple factors and control the effects of confounding variables on the response variable. This yielded odds ratios with a 95% confidence interval, which were used to determine the independent strength of the associations.

RESULTS

Socio-demographic characteristics: This survey included 525 school children, with a 24% non-response rate. With a mean age of 9 years, 55% were boys and 45% were girls. Table 1 illustrates the socio-demographic characteristics of the parents, with a significant proportion of fathers (58.7%) in the

Table 1: Socio-demographic characteristics in Yemen (n = 525)

Characteristics	n (%)	Mean±SD	Minimum-Maximum
Age (father)			
20-40 years	217 (41.3)	42.42±9.76	26-73
41-80 years	308 (58.7)		
Age (mother)			
20-40 years	381 (72.6)	37.17±6.42	23-55
41-80 years	144 (27.4)		
Education level (father)			
Illiterate	150 (28.6)		
Primary and secondary schools	295 (56.2)		
Diploma/university	80 (15.2)		
Education level (mother)			
Illiterate	99 (18.9)		
Primary and secondary schools	248 (47.2)		
Diploma/university	178 (33.9)		
Employment (father)			
No	120 (22.9)		
Yes	405 (77.1)		
Employment (mother)			
No	444 (84.6)		
Yes	(15.4)		
Monthly income (father)**			
<100-300	514 (97.9)		
301-<1000	1 (2.1)		
Monthly income (mother)**			
<100-300	525 (100)		
301-<1000	0 (0)		

*p<0.005, **income is in USD and 1USD = 215 Ry

Table 2: Nutritional status according to gender of the children (n = 525)

	Boys (n = 9)		Girls (n = 236)		Overall (n = 525)	
Anthropometric index	n (%)	Mean±SD	n (%)	Mean±SD	n (%)	Mean±SD
WAZ	47 (16.3)	0.66±1.0	49 (20.8)	0.75±1.0	96 (18.5)	0.70±1.0
Underweight*	251 (83.7)		178 (79.2)		429 (81.5)	
Normal**						
HAZ	46 (16.0)	0.60±1.04	41 (17.3)	0.62±1.0	87 (16.7)	0.61±1.1
Stunting*	243 (84.0)		195 (82.7)		438 (83.3)	
Normal**						
WAH	31 (10.8)	0.17±1.0	22 (9.4)	0.33±0.87	53 (10.1)	1.8±0.30
Wasting*	258 (89.2)		214 (90.6)		462 (89.9)	
Normal**						

*Underweight/stunting/wasting: <-2 SD and **Normal: >-2 SD-<+2 SD

41-60-year age group and mothers (72.6%) in the 20-40 year age group. Moreover half of the fathers (56.2%) and mothers (47.2%) went to primary school. 77.1% of the fathers were employed, while 84.6% of the mothers were housewives.

Children's nutritional status (prevalence): The anthropometric parameters of the Yemeni children, who were the subject of this study, were shown in Table 2. Underweight was identified in 18.5% of children, with girls having a higher frequency (20.8%). Stunting was found to becommon in 16.7% of children, with girls (17.3%) being more stunted than boys (16.0%). Furthermore, the prevalence of wasting was lowest among children (10.1%), with boys (10.8%) having a higher frequency than girls (9.4%). In this study, underweight (18.5%) was shown to be more common than stunting (16.7%). Following a closer examination of the data, it was discovered that 196 (38%) of the children in this research were malnourished.

Predictors of undernutrition: The predictor factors for the child undernutrition are shown in Table 3. In binary logistic regression, age of the children (COR = -1.48, 95% CI: 0.14-0.38), age of the mother (COR=0.64, 95% CI: 1.09-3.30), income of father (COR = 0.50, 95% CI: 1.16-2.37), the number of working persons per household (COR = 0.78, 95% CI: 1.43-3.31), monthly income (COR = 0.45, 95% CI: 1.21-2.03), monthly expenditure (COR = 0.34, 95% CI:1.09-1.79), ownership of TV (COR = 0.48, 95% CI:1.02-2.51), availability of handphones (COR = 1.16, 95% CI: 0.19-0.52), household food security (COR = -2.86, 95% CI: 0.03-0.10) and parasitic infection (COR=0.64, 95% CI:1.11-3.24) were significant risk factors associated with underweight.

Furthermore, birth weight of the child (COR = 0.65, 95% CI: 1.10-2.75), age of the parents (COR = 0.53, 95% CI: 1.15-2.52 and COR=1.41, 95% CI: 1.99-8.44), using of treated drinking water (COR = 1.22, 95% CI: 2.05-5.60), availability of handphones and Internet (COR = -1.48, 95% CI: 0.14-0.38 and COR = -1.76, 95% CI: 0.89-0.33) and household food security (COR = -2.47, 95% CI: 0.05-0.15) were significant risk factors for stunting. While age of mothers (COR = 0.44, 95% CI: 0.35-1.16), education of the mothers (COR = -0.41, 95% CI: 0.72-1.26), availability of Internet services (COR = -1.10, 95% CI: 0.16-0.69) and household food security (COR = -2.11, 95% CI: 0.06-0.23) were relative risk factors that had significant associations with wasting.

After controlling all other independent variables, age of mothers (AOR = 0.67, 95% CI: 1.11-3.43), income of fathers (AOR = 17.28, 95% CI: 464-464), working persons per households (AOR = -0.59, 95% CI: 0.33-0.92), household security (AOR = -2,56, 95% CI: 0.03-0.10) and parasitic infection (AOR = 0.64, 95% CI: 1.11-3.23) were recorded to be an independent predictor of underweight. Birth weight (AOR=-0.65, 95% CI: 0.36-0.90), age of mothers (AOR = -1.29, 95% CI: 0.13-0.57) and household security (AOR = -2.47, 95% CI: 0.05-0.15) were proved a significant determinant of stunting. Whereas, age of mothers (AOR = -1.42, 95% CI: 0.11-0.50) and household security (AOR = -2.11, 95% CI: 0.06-0.23) were significant predictor of wasting in Table 4.

Table 3: Bivariate analysis of factors associated with undernutrition among children (n = 525)

Variables	Underweight COR (95% CI)	Stunting COR (95% CI)	Wasting COR (95% CI)
Characteristics of children			
Age of children	-1.48 (0.14-0.38)*	1.74 (3.17-10.28)	0.48 (0.89-2.89)
Gender of the children	-0.30 (0.48-1.16)	-0.11 (0.57-1.43)	0.16 (0.66-2.08)
Birth weight	-0.03 (0.63-1.49)	0.56 (1.10-2.75)*	0.40 (0.86-2.62)
Breast Feed	0.11 (0.42-3.02)	0.27 (0.44-3.85)	0.01 (1.01-3.45)
Characteristics of parents			
Age of the fathers	0.09 (0.75-1.60)	0.53 (1.15-2.52)*	-0.36 (0.49-1.17)
Age of the mothers	0.64 (1.09-3.30)*	1.41 (1.99-8.44)*	0.44 (0.35-1.16)*
Education of fathers	0.21 (0.74-2.06)	0.16 (0.69-2.00)	-0.40 (0.31-1.40)
Education of mothers	0.11 (0.90-1.40)	0.06 (0.85-1.33)	-0.41 (0.72-1.26)*
Income of the father	0.50 (1.16-2.37)*	0.29 (0.94-1.90)	-0.18 (0.57-1.22)
Income of the mothers	0.21 (0.77- 1.99)	0.30 (0.81-2.29)	0.39 (0.74-2.96)
Employment of the fathers	0.21 (0.74-2.06)	0.16 (0.69-2.00)	-0.40 (0.31-1.40)
Employment of mothers	0.53 (0.84-3.44)	0.16 (0.60-2.26)	0.61 (0.71-4.78)
Characteristics of households			
No. of children	-.49 (0.69-1.32)	-0.15 (0.61-1.21)	-0.22 (0.52-1.21)
Household size	-0.06 (0.66-1.34)	0.20 (0.84-1.79)	-0.28 (0.48-1.19)
Working persons/household	0.78 (1.43-3.31)*	-0.00 (0.59-1.66)	0.39 (0.96-2.24)
Total household income	0.45 (1.21-2.03)*	0.19 (0.95-1.55)	-0.24 (0.60-1.01)
Total household expenditure	0.34 (1.09-1.79)*	0.16 (0.92-1.49)	-0.14 (0.65-1.18)
Using drinking water for cooking	-0.28 (0.58-0.99)	-0.40 (0.51-0.88)*	-0.23 (0.57-1.11)
Treated drinking water	0.50 (1.06-2.59)*	1.22 (2.05-5.60)*	0.34 (0.79-2.49)
Washing of hands before eating/using toilets	-0.26 (0.60-1.00)	0.09 (0.82-1.45)	0.11 (0.71-1.43)
Ownership of TV	0.48 (1.02-2.51)*	0.90 (1.51-4.01)	0.09 (0.62-1.92)
Availability of handphone	1.16 (0.19-0.52)*	-1.48 (0.14-0.38)*	-0.41 (0.34-1.30)
Availability of internet	-0.57 (0.32-0.99)	-1.76 (0.89-0.33)*	-1.10 (0.16-0.69)*
Households security	-2.86 (0.03-0.10)*	-2.47 (0.05-0.15)*	-2.11 (0.06-0.23)*
Parasitic infections	0.64 (1.11-3.24)*	1.30 (2.20-6.22)	-0.72 (0.19-1.26)

*p<0.05 is significant, COR: Crude odd ratio and CI: Confident interval

Table 4: Multivariate analysis of factors associated with under nutrition among children in (n = 525)

Independent variables	AOR	95% CI	p-value
Underweight			
Age of the children	-1.55	0.13-0.36	0.11
Age of mothers	1.67	1.11-3.43	0.02*
Income of fathers	17.28	464-464	0.00*
Household size	-0.07	0.61-1.33	0.71
Working persons/household	- 0.59	0.33-0.92	0.02*
Total monthly income	-0.32	0.51-1.03	0.08
Total monthly expenditure	-0.02	0.68-1.45	0.99
Treated drinking water	-0.99	0.05-2.47	0.31
Ownership of TV	-0.47	0.39-0.98	0.38
Availability of handphone	1.16	1.93-5.23	0.23
Household security	-2.86	0.03-0.10	0.00*
Parasitic Infections	0.64	1.11-3.23	0.00*
Stunting			
Birth weight	-0.56	0.36-0.90	0.01*
Age of the fathers	-0.36	0.46-1.07	0.10
Age of the mothers	-1.29	0.13-0.57	0.00*
Using drinking water for cooking	0.40	1.14-1.94	0.12
Treated drinking water	-1.22	0.18-0.49	0.35
Availability of handphone	1.47	2.63 -7.23	0.11
Availability of Internet	1.77	3.05-11.26	0.06
Household security	-2.47	0.05-0.15	0.00*
Wasting			
Age of the mothers	-1.42	0.11-0.50	0.00*
Education of the mothers	0.07	0.84-1.38	0.58
Total monthly expenditure	-0.13	0.672-1.15	0.33
Availability of Internet	1.09	1.46-6.16	0.31
Household security	-2.11	0.06-0.23	0.00*

*p<0.05 is significant, AOR: Adjusted odd ratio and CI: Confident interval

DISCUSSION

Undernutrition is a very common and serious problem among school children in underdeveloped countries including Yemen. The prevalence of underweight, stunting and wasting (18.5, 16.7 and 10.1%) reported in this study was lower than in other studies carried out in Aden. In Aden, MOPHP and CSO found that underweight was 39%, stunting was below 25%, while wasting was 16%, according to their research[19]. Badi *et al*.[20], in their study, on the prevalence of overweight/obesity among 1885 children aged 6-16 years from Aden governorate, found that 10.1% were wasted, which was in agreement with the findings of this study. Also, Al-Mansoob and Masood[21] in their study among 3004 children and adolescents aged 5-19 years reported that 49.5% were stunted and boys were more affected compared to girls. The findings of the current study could indicate that a low undernutrition percentage among children in urban areas is due to services and easy access to food found in urban cities.

Regarding gender, this study found that girls were more likely to be underweight and stunted, while boys were more wasted. Even though boys made up the majority of the participants in this study, the girls were more underweight. This may relate to the cultural effect and favouritism against girls, which preferred boys and the tendency to indulge them with good and nourishing foods. The finding from this study is consistent with the study carried out by Nowsin *et al*.[22] in Bangladesh, as the girls were more underweight and stunted (50.3 and 72.3%) compared to boys (28.73 and 41.43%), while the boys (29.8%) were more wasted than the girls (21.4%). However, evidence suggested that boys were more prone to being underweight and stunting[23]. These differences in findings are due to variances in the study frame, gender bias and parental preferences for boys' children in Yemeni society[24].

The age of mothers was found to be a risk factor for being underweight, stunting and wasting in the current study. Even after controlling for confounding variables, the age of the mother remained a significant predictor of child malnutrition. Stunting, on the other hand, was 1.4 times more likely in children than underweight and wasting. Mazengia and Biks[25] came to the same conclusion. This could be because younger mothers had no or limited control over food distribution in the home, as well as a lack of knowledge about their health and nutrition, resulting in poor nutrition for themselves and their children[26]. Therefore, mothers' low education level and young age contributed to undernutrition in their children.

Children with low-income fathers were 17 times more likely to be underweight in this study. This finding was consistent with the study finding carried out by Abebe *et al*.[27] This might be related to that the fathers in Yemen are the breadwinner for the family providing food and shelter to their family members and being unemployed results in low income and consequently risk for undernutrition in general.

According to the findings of this study, household food insecurity was a significant risk predictor of undernutrition, with the odds being two times greater among children from insecure families. This is in line with a study by Esmail and Rajikn[12] and Ihab *et al*.[28], which found household food insecurity were linked to malnutrition. Similarly, household food insecurity is associated with undernutrition[29,30].

The study had some limitations, firstly, the study was cross-sectional in design, therefore, it couldn't establish any causal relationship between undernutrition and the estimated risk factors. But the findings have greater significance as the results from the same area using cross-sectional data have limited variation over time. Secondly, the study was conducted in one area of Yemen (Aden), thus, the generalization of the findings from this study must be interpreted with caution, as the finding of this study may not be true for other areas of Yemen. However, it has affirmed that school children had nutrition problems that required multiple parties' collaboration in the school and community for their control.

CONCLUSION

The prevalence of undernutrition affected more than one-third of the sample, which indicates a serious public health problem in Aden, according to the WHO classification. Age of mothers and household food insecurity was an independent predictor of underweight, stunting and wasting. While low fathers' income was a strong predictor of being underweight.

SIGNIFICANCE STATEMENT

This study discovered the prevalence and predictors of undernutrition among school children, which can be beneficial for planning and implementation of proper interventions and prevention or reduction of undernutrition among school children. The findings of this study have implications for government and non-government interventions for undernutrition. Hence, increasing the age of the mother, when her children are born, eliminating household food insecurity and improving family income, of which are critical for reducing the prevalence of undernutrition among school children. This study provided society, health care and policymakers with accurate and reportable data to help them build intervention programmes for schools to enhance nutrition-related practices. Furthermore, the findings will aid in filling research gaps in the discipline as well as identifying gaps that could be evaluated in the future. Thus, a new theory on how to execute appropriate interventions and policies among school children to address undernutrition may be developed.

ACKNOWLEDGMENT

The authors would like to thank the administration, children and families of Yemeni schools that participated in this study for their support and cooperation in this research.

REFERENCES

1. Elbel, B., J. Gyamfi and R. Kersh, 2011. Child and adolescent fast-food choice and the influence of calorie labeling: A natural experiment. Int. J. Obes., 35: 493-500.
2. Mwendwa, E. and J. Gori, 2019. Relationship between school feeding programme and the pupils' effectiveness in learning in public primary schools in Kitui county. Sci. Res. J., Vol. 7. 10.31364/SCIRJ/v7.i7.2019.P0719667.
3. Poh, B.K., B.K. Ng, M.D.S. Haslinda, S.N. Shanita and J.E. Wong *et al*., 2013. Nutritional status and dietary intakes of children aged 6 months to 12 years: Findings of the nutrition survey of Malaysian children (SEANUTS Malaysia). Br. J. Nutr., 110: S21-S35.
4. Varma P.M. and K.S.V. Prasad, 2017. Malnutrition and its related factors among children 0-5 years in rural Shamirpet mandal, Ranga reddy district, India. Int. J. Bioassays, 6: 5340-5342.
5. Kassa, Z.Y., T. Behailu, A. Mekonnen, M. Teshome and S. Yeshitila, 2017. Malnutrition and associated factors among under five children (6-59 Months) at Shashemene Referral Hospital, West Arsi Zone, Oromia, Ethiopia. Curr. Pediatr. Res., 21: 172-180.
6. da Silva Ferreira, H., 2020. Anthropometric assessment of children's nutritional status: A new approach based on an adaptation of Waterlow's classification. BMC Pediatr., Vol. 65. 10.1186/s12887-020-1940-6.
7. Choge, J.K., 2020. Malnutrition: Current Challenges and Future Perspectives. In: Malnutrition, Imran, M. and A. Imran (Eds.), IntechOpen, London.
8. Dukhi, N., 2020. Global Prevalence of Malnutrition: Evidence from Literature. In: Malnutrition, Imran, M. and A. Imran (Eds.), IntechOpen, London.
9. Dewey, K.G. and K. Begum, 2011. Long-term consequences of stunting in early life. Maternal Child Nutr., 7: 5-18.
10. Poh, B.K., S.T. Lee, G.S. Yeo, K.C. Tang and A.R.N. Afifah *et al*., 2019. Low socioeconomic status and severe obesity are linked to poor cognitive performance in Malaysian children. BMC Public Health, Vol. 19. 10.1186/s12889-019-6856-4.

11. Roser, M. and E. Ortiz-Ospina, 2019. Global extreme poverty. Our World in Data,
12. Esmail, S.A.A. and R. Rajikan, 2021. Household food insecurity is associated with undernutrition among primary school children in Aden Governorate, Yemen. J. Gizi Pangan, 16: 11-20.
13. Al-Majdhoub, F.M., A.B. Hamzah and M.Y. Ariffin, 2015. Focus group discussions on the coverage of the southern separatist movement crisis in Yemeni newspapers. SpringerPlus, Vol. 4. 10.1186/s40064-015-1000-0.
14. Terrill, W.A., 2011. The Conflicts in Yemen and U.S. National Security. Strategic Studies Institute, U.S. Army War College, United States, ISBN: 1584874740, Pages: 104.
15. De Souza, L.R., 2017. Correlates of child undernutrition in Yemen. De Souza Bandung J. Global South, Vol. 4. 10.1186/s40728-017-0040-y.
16. Burki, T.K., 2012. Yemen's hunger crisis. The Lancet, 380: 637-638.
17. Alsonini, N.A.A., 2015. The effect of socio-economic factors on the health indicators in Yemen. J. Nat. Sci. Res., 5: 140-146.
18. Best, C., N. Neufingerl, L. van Geel, T. van den Briel and S. Osendarp, 2010. The nutritional status of school-aged children: Why should we care?. Food Nutr. Bull., 31: 400-417.
19. Alosaimi, A.N., B. Nwaru, R. Luoto, A.W.A. Serouri and H. Mouniri, 2019. Using household socioeconomic indicators to predict the utilization of maternal and child health services among reproductive-aged women in rural Yemen. Global Pediatric Health, Vol. 6. 10.1177/2333794X19868926.
20. Badil, M.A.H., B.E.G. Trianall and R.S. Martínez, 2013. Overweight/obesity and socioeconomic status in children from Aden governorate, Yemen. Rev. haban. cienc. méd., 12: 364-373.
21. Al-Mansoob, M.A.K. and M.S.A. Masood, 2018. The relationship between stunting and some demographic and socioeconomic factors among Yemeni children and adolescents. Adv. Public Health, Vol. 2018. 10.1155/2018/5619178.
22. Nowsin, I. N. Begum, E.B. Akbar and M.M. Alam, 2014. Study on nutritional status of rural school children of Bangladesh. Bangladesh J. Physiol. Pharmacol., 30: 6-10.
23. Mwaniki, E.W. and A.N. Makokha, 2013. Nutrition status and associated factors among children in public primary schools in Dagoretti, Nairobi, Kenya. Afr. Health Sci., 13: 39-46.
24. Ba-Saddik, A.S.S. and A.S. Hattab, 2012. Emotional abuse towards children by schoolteachers in Aden Governorate, Yemen: A cross-sectional study. BMC Public Health, Vol. 12. 10.1186/1471-2458-12-647.
25. Mazengia, A.L. and G.A. Biks, 2018. Predictors of stunting among school-age children in Northwestern Ethiopia. J. Nutr. Metab., Vol. 2018. 10.1155/2018/7521751.
26. Poh, B.K., T.B.L. Kathryn, S.N. Wong and E.S. Tee, 2012. Nutritional status, dietary intake patterns and nutrition knowledge of children aged 5-6 years attending kindergartens in the klang valley, Malaysia. Malaysian J. Nutr., 18: 231-242.
27. Abebe, F., A. Geleto, L. Sena and C. Hailu, 2017. Predictors of academic performance with due focus on undernutrition among students attending primary schools of Hawa Gelan district, Southwest Ethiopia: a school based cross sectional study. BMC Nutr., Vol. 3. 10.1186/s40795-017-0138-2.
28. Naser, I.A., R. Jalil, W.M.W. Muda, W.S.W. Nik, Z.M. Shariff and M.R. Abdullah, 2014. Association between household food insecurity and nutritional outcomes among children in Northeastern of Peninsular Malaysia. Nutr. Res. Pract., 8: 304-311.
29. Siwar, C., F. Ahmed and R.A, Begum, 2014. Household food insecurity, nutritional outcome and coping strategies: Evidence from Malaysia. J. Food Agric. Environ., 12: 19-23.
30. Naser, I.A., R.A. Jalil and M.R. Abdullah, 2015. Assessment of food insecurity and nutritional outcomes in Bachok, Kelantan. J. Nutr. Food Sci., Vol. 5. 10.4172/2155-9600.1000373.