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Investigating the Prevalence of Malnutrition and Its Relationship with the Educational Status of Elementary School Students in Zahedan, Iran

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ABSTRACT

Background: Malnutrition and improper nutrition may lead to physical and mental growth disorder and cognitive function. This study aims to determine the prevalence of malnutrition and its relationship with educational status among primary school children in Zahedan, Iran. **Methods:** During a cross-sectional study with a multi-stage random sampling method of 780 boy and girl students, first, second, and third grades of elementary school were included to study. Demographic and anthropometric of students were collected based on the sample size. Malnutrition was assessed according to World Health Organization indicators for the relevant age group. This assessment was based on body mass index (BMI) for age, height for age, and weight for age. **Results:** The prevalence of malnutrition was severe wasting, wasting, overweight, and obesity which were 0.8, 4.6, 6.4, and 5%, and severe underweight and underweight which were 0.9 and 4.7%, respectively. Severe stunting and stunting were observed in 0.3 and 2.8%, respectively. A statistically significant relationship was found between BMI for age, height for age and weight for age and educational status (P<0.05). Moreover, the educational status of students showed a statistically significant relationship with first and second-grade gender, birth rank, and Parent's job and education (P<0.0001). **Conclusion:** Different forms of malnutrition among the students can negatively affect their performance, especially their educational status. Therefore, proper nutrition and increasing nutritional knowledge of primary school children and parents may help to prevent the problem.

Introduction

Children make up a large part of the world's population. Therefore, prosperity and growth at this stage of life ensure a healthy society (Moridi and Fathi, 2009). Nutrition in childhood is critical because childhood is a stage of development in which health behaviors are mainly transferred to adolescence and adulthood (Owusu *et al.*, 2017). Nutrition of mother, neonate, and child plays an important role in proper growth and development of social and economic status of the child in the future (Narayan *et al.*, 2019).

Malnutrition is defined as a state of imbalance of energy or protein and other nutrients that leads to measurable adverse effects in human body

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(Saunders and Smith, 2010). Malnutrition in children is a public health problem in many developing countries, and in addition to enormous human suffering, both physical and mental, it also has a negative impact on the development prospects of these countries (World Bank, 2009). Malnutrition in children also causes a delay in body's growth, stunting, frequent diseases and infections, disorder in mental development, lack of educational progress, decrease in work efficiency, and mortality (Fenske *et al.*, 2013, McSweeney *et al.*, 2015, Moestue and Huttly, 2008, Mohammadi *et al.*, 2018, Siddiqi *et al.*, 2011). Malnutrition accounts for 54% of child deaths worldwide (Duggan *et al.*, 2016). According to World Health Organization (WHO) estimates in developing countries, 52% and 34-62% of school-age children are stunted and underweight, respectively (De Onis *et al.*, 2012, World Health Organization, 2006). Factors such as insufficient intake of food, lack of nutritional knowledge, parents' education level, household economic conditions, infection, psychological problems, high food prices, food shortages, and digestive problems are involved in the occurrence of malnutrition in children (Akhtar, 2016, Akombi *et al.*, 2017, Arthur *et al.*, 2015, Khan *et al.*, 2017a, Khan *et al.*, 2017b, Motedayen *et al.*, 2019). Nutritional deficiency in early life can affect cognitive growth, behavior, illness, and increased symptoms of headache and stomachache, which lead to absenteeism in school and reduced academic performance of students. Therefore, nutrition access increases students' cognition, concentration, and energy level and improves their academic progress (Ross and Anderson, 2010). In many studies, the mutual influence of nutritional status, growth, intelligence, and educational status has been reported (Asmare *et al.*, 2018, JM and Cáceres, 2001, Sarma *et al.*, 2013).

Ayalew's study, which was conducted on 505 elementary school students living in the village, who did not study regularly, being underweight and stunted was associated with a decrease in academic achievement, and higher education of the mother was associated with an increase in academic achievement (Ayalew *et al.*, 2020). Also, based on the studies conducted in developing and low-income countries, the occurrence of recurrent and intermittent diseases and insufficient nutrition are related to the academic performance of children in school (Pollitt, 1994). Studies have been conducted on the prevalence of malnutrition in primary school children in Iran, which show the high prevalence of malnutrition in this section of society (Darvishi *et al.*, 2009, Dehghan *et al.*, 2011, Karimi *et al.*, 2016, Namakin *et al.*, 2011, Veghari, 2013). One of the most common nutritional deficiencies among students in Iran is the general lack of food, which causes children's growth to be delayed (Aghamolaei and Sobhani, 2004).

Growth monitoring in childhood and identifying nutritional problems and the health level of society have a direct relationship with health in old age. Furthermore, the appropriate physical development of primary school children provides the basis for increasing their learning power and progress in the future. The present study was conducted to investigate the prevalence of malnutrition and its relationship with the academic status of first, second, and third-grade students in Zahedan, Iran.

Materials and Methods

Design and participants

During a cross-sectional study in 2018, 780 students were selected by multi-stage random sampling from the first, second, and third grades of elementary schools in Zahedan, Iran. The sample size was calculated based on the study of Pasdar *et al.* in Kermanshah (Pasdar *et al.*, 2014) , by taking into account (P=0.14, d=0.05):

$$n = \frac{\left(z_1 - \frac{\alpha}{2}\right)^2 p(1-p)}{d^2}$$

According to above formula, 740 students were calculated. Taking into account possible attrition, 780 students were included in the study and were examined. Necessary arrangements were made to get admission to the schools and obtain the necessary information by presenting a letter of introduction from Zahedan University of Medical Sciences to the General Department of Education, and the selected schools were referred.

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At each school, verbal consent to participate in the study and a written consent form from the parents for entering the study was obtained from the students, and the students who met the criteria for entering the study were evaluated.

The inclusion criteria included first, second, and third-grade students and giving consent to participate in the study. Exclusions include having any underlying medical or mental illness, an incomplete academic record, non-cooperation of the child during the measurement of anthropometric indicators, the death of the father, mother, or both, and a student renewing the course of that section.

Measurements

To measure anthropometric variables, the weight and height of the students were measured. Weight was measured with a Seca scale (Germany) with minimum clothes and no shoes with an accuracy of 100 grams. Height was measured with a Seca (Germany) measuring tape with an accuracy of 0.1 cm when the student was without shoes and stood in front of the measuring tape in such a way that the back of the heel, legs, hips, and shoulders were in contact with the measuring tape and the head to form a 90-degree angle with the horizon. Body mass index (BMI) was obtained by dividing the weight (kg) by the square of height (m^2).

In addition, demographic information and the report card at the end of the academic year of the students were recorded in the information form prepared by the researcher. Educational status was measured based on the final descriptive evaluation of the first, second, and third-grade students in all the students. To measure malnutrition in the studied children, the following indicators were used. BMI for age, weight- for- age, and height –for- age, according to WHO standards and the classification of Z-score was considered as follows: Based on the Z-score of BMI for age, the values between -2 and +1 standard deviation were considered normal, between +1 and +2 standard deviation were considered overweight, and the values above +2 standard deviation were classified as obese. Values less than -2 and -3 standard deviation were considered wasting and severe wasting, respectively.

Based on weight-for-age Z-score, the values less than -2 and -3 standard deviation were considered underweight and severe underweight, respectively. Values more than -2 standard deviation were classified as normal.

Based on the Z-scores of the height-for-age, the values less than -2 and -3 standard deviations were considered stunted and severely stunted, respectively; Z-score values between -2 and +3 standard deviation were considered normal, and Values above +3 standard deviation were classified as very tall,(Pangaribowo *et al.*, 2013, World Health Organization, 2021)

Ethical considerations

It should be mentioned that this research was approved by the ethics committee of Zahedan University of Medical Sciences with Registration No IR.ZAUMS.REC.1397.509.

Data analysis

Data analysis was done using SPSS.22 software. Centrality and dispersion indices were used to describe quantitative data, frequency distribution tables (absolute and relative) were used to describe qualitative data, and the chi-square test was used to analyze data. P-value less than 0.05 was considered significant.

Results

The mean age of the students was 8.00±0.81, and the mean age of the mothers was 35.09 ± 6.33 years. The findings of the descriptive analysis of the data are shown in **Table 1**.

The frequency of indicators such as BMI-for-age, height-for-age, and weight-for-age are shown in **Table 2**. Based on BMI-for-age, 6.4% of the students were overweight based on height -for -age, 2.8% of students were stunted and based on weight–for-age, 4.7% of the students were underweight. The educational status of the studied students was also evaluated, and the findings showed that 48.3% of them had a very good academic status, and 7.8% needed more effort.

The relationship between anthropometric indices and the educational status of the students was

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measured, the findings of which are shown in **Table 3**.

Table 1. Frequency distribution of demographic characteristics of students.

Variable	n	%
Grade		
First	258	33.1
Second	264	33.8
Third	258	33.1
Gender		
Boy	370	47.4
Girl	410	52.6
Father job		
Unemployed	59	7.6
Employee	144	18.5
Driver	61	7.8
Self-employed	516	66.1
Mother job		
Housewife	701	89.9
Employed	79	10.1
Father education		
Illiterate	88	11.3
Primary and middle school degree	391	12.5
High school and diploma degree	188	24.1
Higher education	113	14.5
Mother education		
Illiterate	120	15.4
Primary and middle school degree	390	50.0
High school and diploma degree	178	22.8
Higher education	92	11.8

Accordingly, there was a statistically significant relationship between BMI-for-age and the educational status of the studied students (P=0.04). Hence, 75.8% of the students with a normal BMI had a good and very good educational status, and 8% of them had a poor educational status (**Table 3**). A statistically significant relationship was observed between the weight-for-age index and educational status (P=0.03). 94.2% of the students who had a very good educational status had normal weight, and the status of 5.8% of them was mild to severely underweight (**Table 3**).

A statistically significant relationship was also observed between the height-for-age index and the educational status of students (P=0.009). Among the students who had a very good educational status, 97.1% had a normal height, and 2.9% were stunted and severely stunted (**Table 3**).

Table 2. Frequency distribution of antheropometric indices of the students.

Anthropometric indices	n	%
Body mass index-for-age		
Severe wasting (Z < -3SD)	6	0.8
Wasting (-3SD <Z <-2SD)	36	4.6
Normal (-2SD < Z <+1SD)	649	83.2
Overweight (+1SD < Z <+2SD)	50	6.4
Obese (Z >+2SD)	39	5.0
Height-for-age		
Severe stunting (Z < -3SD)	2	0.3
Stunting (-3SD<Z<-2SD)	22	2.8
Normal (-2SD<Z<+3SD)	750	96.1
Tall (Z > +3SD)	6	0.8
Weight-for-age		
Severe underweight (Z <-3SD)	7	0.9
Uunderweight (-3SD <Z<-2SD)	37	4.7
Normal (Z >-2SD)	736	94.4
Total	780	100

Discussion

The findings of the present study showed that the prevalence rates of severe wasting, wasting, overweight, and obesity were 0.8, 4.6, 6.4, and 5%, respectively.

In a study conducted by Pasdar *et al.* on 704 elementary students in Kermanshah, Iran, the prevalence rates of underweight, overweight, and obesity were 16.7, 13.2, and 4.3%, respectively. The prevalence of obesity was almost the same as this study, but wasting and overweight was higher in Pasdar's study.

In Karimi *et al.*'s study, which was conducted on 2195 elementary school students in Semnan, Iran, the prevalence rates of wasting, underweight, and stunting were reported as 12.5, 9.2, and 9%, respectively (Karimi *et al.*, 2016), and the prevalence rate of wasting was higher than the values obtained in the present study.

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Table 3. Frequency distribution of anthropometric indices according to the educational status of the students.

Anthropometric indices	Educational status								Total		P-value[a]
	Need to make an effort		Acceptable		Good		Very good				
	n	%	n	%	n	%	n	%	n	%	
Body mass index-for-age											
Wasting and severely wasting	6	9.8	3	2.4	11	5.0	22	5.8	42	5.4	0.041
Normal	52	85.3	105	85.4	191	87.2	301	79.8	649	83.2	
Overweight and obese	3	4.9	15	12.2	17	7.8	54	14.4	89	11.4	
Height-for-age											
Stunted and severely stunted	6	9.8	1	0.8	6	2.7	11	2.9	24	3.1	0.009
Normal	55	90.2	122	99.2	213	97.1	366	97.1	756	96.9	
Weight-for-age											
Underweight and severely underweight	8	13.2	3	2.4	11	5.0	22	5.8	44	5.6	0.03
Normal	53	86.8	120	97.6	208	95.0	355	94.2	736	94.4	
Total	61	7.8	123	15.8	219	28.1	377	48.3	780	100	

[a]: *Chi- square test*

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Malnutrition as well as the inappropriate selection and consumption of food groups, especially lack of attention to the consumption of dairy products, meats, and not eating breakfast, are among health threatening factors and can have a negative effect on students' performance, especially their academic progress (Pasdar *et al.*, 2014).

The findings of the current study on the prevalence of malnutrition using BMI-for-age did not match the results of Meshki *et al*.'s study, which was conducted on 375 elementary school students in Gonabad, Iran, because in their study, all the samples based on this index were in the normal range (Moshki *et al.*, 2011). These inconsistencies may be attributed to people living in different geographical and cultural regions and to different economic and social deprivations in provinces.

Evaluating malnutrition using the weight-for-age index, the findings of the present study showed that the prevalence rates of severe underweight and underweight were 0.9% and 4.7%, respectively. Dehghan *et al*.'s study on 876 elementary school students showed that the rate of severe underweight among the studied students was 7.3% and mild underweight was 26.3%. Compared to similar findings obtained from the present study, the study showed a higher prevalence of underweight among the studied students (Dehghan *et al.*, 2011).

In the current study, the prevalence rates of severe stunting and stunting were 0.3 and 2.8%, respectively, which was much lower than the values obtained from Karajibani *et al*.'s research on 2067 elementary school students conducted in Zahedan, Iran. They reported a 15% stunting (Karajibani *et al.*, 2005). Furthermore, the results of the study by Namakin *et al*. on 1211 students aged 7 to 14 in South Khorasan in Iran showed that 70% of the students suffer from stunting, which was much higher than the amount obtained in the present study. Also, the results indicated the existence of a statistically significant relationship between the prevalence of stunting and the increase in mother's education level, such that the prevalence of stunting decreased with increase in mother's education level (Namakin *et al.*, 2011); this was while such a relationship was not observed in the present study.

The findings of this research showed that there was a statistically significant relationship between BMI of the students and their educational status. As the status of BMI-for-age of the students goes towards optimal direction, the academic level of the students also improves, which was in line with the findings of the study by Pasdar (Pasdar *et al.*, 2014).

In the present study, there was a significant statistical relationship between the height-for-age index of the students and their educational status; the more the number of students with the ideal height for age was, the higher was the student's academic evaluation. In Sarma *et al*.'s study, which was conducted on 802 elementary school students in Sri Lanka, a significant relationship between the height-for-age index and educational status was observed(Sarma *et al.*, 2015) , which was in line with the results of the present study.

In this study, a significant and direct relationship was seen between BMI-for-age with student's educational level and mother's education. As the student's educational level increases; the BMI-for-age does not increase favorably. In this regard, the study by Lazzeri *et al*. on 1751 students aged 8 to 9 in Italy showed that there was a significant relationship between BMI- for-age of the students and the level of education of the mother (Lazzeri *et al.*, 2011), which was in line with the findings of the present study. In the present study, the largest number of students who had an unfavorable BMI-for-age had housewife mothers. It can be said that having a working mother is effective in improving the economic status of the family, and as a result, the children have better nutrition and the cases of malnutrition decrease.

Also, a good educational status was observed in students with employee fathers, compared with the students with driver, unemployed, and self-employed fathers. It can be said that the stability of the employees' income can be effective in improving economic status and nutritional

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conditions of household members, including students. The findings of the research by Obiakor-Okeke et al. on 302 elementary school students in Nigeria showed a significant relationship between parents' occupation and the incidence of malnutrition in children (Obiakor-Okeke, 2014). The findings of Abebe *et al.*'s research on 630 elementary school students in Ethiopia showed that educational status had a significant relationship with demographic indicators such as gender, educational level, parents' income status, and parent's education level. Thus, girl students had a better academic status than boy students (Abebe *et al.*, 2017), which was in line with the results of the present study in this field in first and second grades. Also, students with educated parents had better academic performance than students whose parents were illiterate (Abebe *et al.*, 2017), which was in line with the results of the present study.

Non-cooperation of some students and parents to participate in the study was the limitation of this study. On the other hand, the strength of this study was measuring the relationship between educational status and malnutrition, which few studies have addressed, and also using several important anthropometric indices as a tool to measure malnutrition in the studied groups.

Conclusion

The findings of the present study showed that there are various forms of malnutrition in the studied students (underweight, wasting, obesity, stunting) which can have negative effects on their academic performance. Paying more attention to a healthy lifestyle, especially the correct nutrition of students, increasing nutritional awareness, and providing job opportunities with stable household income are among the effective factors in improving the educational status of school-aged children and adolescents.

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Conflict of interest

The authors declared no conflict of interests.

Authors' contributions

Mortazavi Z, Mokhtari S and Moein AA designed research; Mokhtari S conducted the research; Mortazavi Z analyzed data; and Eslahi H, Mortazavi Z, Jamalzehi A wrote the paper. Mortazavi Z had primary responsibility for final content. All authors read and approved the final manuscript.

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References

Abebe F, Geleto A, Sena L & Hailu C 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 nutrition.* **3 (1)**: 1-8.

Aghamolaei T & Sobhani A 2004. Anthropometric evaluation of nutritional status in primary school students at Bandar Abbas (2001-2002). *Scientific journal of school of public health.* **2 (3)**: 49-56.

Akhtar S 2016. Malnutrition in South Asia—A critical reappraisal. *Critical reviews in food science and nutrition.* **56 (14)**: 2320-2330.

Akombi BJ, et al. 2017. Stunting, wasting and underweight in sub-Saharan Africa: a systematic review. *International journal of environmental research and public health.* **14 (8)**: 863.

Arthur SS, et al. 2015. Tackling malnutrition: a systematic review of 15-year research evidence from INDEPTH health and demographic surveillance systems. *Global health action.* **8 (1)**: 28298.

Asmare B, Taddele M, Berihun S & Wagnew F 2018. Nutritional status and correlation with academic performance among primary school children, northwest Ethiopia. *BMC research notes.* **11 (1)**: 1-6.

Ayalew M, Bayray A, Bekele A & Handebo S 2020. Nutritional status and educational

[DOI: 10.18502/jnfs.v9i4.16900]

performance of school-aged children in Lalibela Town primary schools, Northern Ethiopia. *International journal of pediatrics.* **2020 (1)**: 5956732.

Darvishi S, Hazhir MS, Reshadmanesh N & Shahsavari S 2009. Evaluation of malnutrition prevalence and its related factors in primary school students in Kurdistan Province. *Scientific journal of Kurdistan University of Medical Sciences.* **14 (2)**: 78-87.

De Onis M, Blössner M & Borghi E 2012. Prevalence and trends of stunting among pre-school children, 1990–2020. *Public health nutrition.* **15 (1)**: 142-148.

Dehghan A, Ershad Langroudi M, Kamali Sarvestani M & Shahoseini S 2011. Prevalence of malnutrition in students of elementary schools in Larestan city in 2010. *Journal of North Khorasan University of Medical Sciences.* **2 (4)**: 25-28.

Duggan C, Watkins JB, Koletzko B & Walker WA 2016. Nutrition in pediatrics: basic science, clinical applications. PMPH USA, Ltd.

Fenske N, Burns J, Hothorn T & Rehfuess EA 2013. Understanding child stunting in India: a comprehensive analysis of socio-economic, nutritional and environmental determinants using additive quantile regression. *PloS one.* **8 (11)**: e78692.

JM JM & Cáceres U 2001. The impact of malnutrition on brain development, intelligence and school work performance. *Archivos latinoamericanos de nutricion.* **51 (1)**: 64-71.

Karajibani M, Montazerifar F, Mohammadi M & Dashipour AR 2005. The prevalence of obesity and wasting in primary school girls in the city of Zahedan. *Tabib-e-Shargh [Persian].* **6 (4)**: 289-296.

Karimi B, Ghorbani R & Niaki MA 2016. Malnutrition and some related factors in primary school children, Semnan, Iran. *Journal of the Egyptian public health association.* **91 (4)**: 174-178.

Khan A, Khan S, Zia-ul-Islam S, Tauqeer A & Khan M 2017a. Causes, sign and symptoms of malnutrition among the children. *Journal of nutrition and human health.* **1 (1)**: 24-27.

Khan S, Khan A, Khan S, Khan M & Khan S 2017b. Perception of athletes about diet and its role in maintenance of sports performance. *Journal of nutrition & food sciences.* **7**: 592.

Lazzeri G, Pammolli A, Pilato V & Giacchi MV 2011. Relationship between 8/9-yr-old school children BMI, parents' BMI and educational level: a cross sectional survey. *Nutrition journal.* **10 (1)**: 1-8.

McSweeney L, Rapley T & Adamson A 2015. The preschool child, food photography and a parent's bed: a feasibility study to determine acceptable visual date collection methods. *Journal of nutrition and health sciences.* **2**: 4.

Moestue H & Huttly S 2008. Adult education and child nutrition: the role of family and community. *Journal of epidemiology & community health.* **62 (2)**: 153-159.

Mohammadi M, et al. 2018. Prevalence of underweight in Iranian children: a systematic review and meta-analysis. *Tehran University Medical Journal* **76 (4)**: 241-249.

Moridi G & Fathi M 2009. Malnutrition in children under five in Iran. *Advances in nursing & midwifery.* **18 (64)**: 49-56.

Moshki M, Bahrami M, Ahkoundi R & Hosseini Z 2011. Evaluation of Body Mass Index and some socio-economic variables related to the primary schoolchildren in Gonabad. *Journal of research and health.* **1 (1)**: 73-76.

Motedayen M, Dousti M, Sayehmiri F & Pourmahmoudi AA 2019. An Investigation of the Prevalence and Causes of Malnutrition in Iran: a Review Article and Meta-analysis. *Clinical nutrition research.* **8 (2)**: 101-118.

Namakin K, Sharifzade G, Majnone H, Firouzi F & Latifi M 2011. Prevalence of malnutrition in students of deprived areas in South Khorasan. *Knowl health.* **6**: 38-42.

Narayan J, John D & Ramadas N 2019. Malnutrition in India: status and government initiatives. *Journal of public health policy.* **40 (1)**: 126-141.

[DOI: 10.18502/jnfs.v9i4.16900]

Obiakor-Okeke P 2014. Anthropometric Indices of Primary School Children from Different Socio-Economic Classes in Owerri Municipal. *European journal of preventive medicine.* **2 (5)**: 63.

Owusu JS, Komeley Colecraft E, Aryeetey R, Vaccaro JA & Huffman F 2017. Nutrition intakes and nutritional status of school age children in Ghana. *Journal of food research.* **6 (2)**: 11-23.

Pangaribowo EH, Gerber N & Torero M 2013. Food and nutrition security indicators: a review, Department of Political and Cultural Change Center for Development Research, University of Bonn.

Pasdar Y, Mozafari HR, Darbandi M, Niazi P & Hashemian AH 2014. Educational achievement relationship with nutritional status and primary school children growth in suburb areas of Kermanshah (2012). *koomesh.* **15 (4)**.

Pollitt E 1994. Poverty and child development: Relevance of research in developing 1 countries to the United States. *Child development.* **65 (2)**: 283-295.

Ross A & Anderson DL 2010. Nutrition and its effects on academic performance how can our schools improve. In *Michigan: At Northern Michigan Undersity*.

Sarma M, Wijesinghe DGNG & Sivananthawerl T 2015. The Effects of Nutritional Status on Educational Performance of Primary School Children in the Plantation Sector in Nuwara Eliya Educational Zone. *Tropical agricultural research.* **24**: 203.

Sarma MSG, Wijesinghe D & Sivananthawerl T 2013. The effects of nutritional status on educational performance of primary school children in the plantation sector in Nuwara Eliya educational zone. *Tropical agricultural research.* **24 (3)**: 203-214.

Saunders J & Smith T 2010. Malnutrition: causes and consequences. *Clinical medicine.* **10 (6)**: 624.

Siddiqi MNA, Haque MN & Goni MA 2011. Malnutrition of under-five children: evidence from Bangladesh. *Asian journal of medical sciences.* **2 (2)**: 113-119.

Veghari G 2013. The relationship of ethnicity, socio-economic factors and malnutrition in primary school children in north of Iran: a cross-sectional study. *Journal of research in health sciences.* **13 (1)**: 58-62.

World Bank 2009. World bank report on malnutrition in India. Washington, DC.

World Health Organization 2006. Report of the Standing Committee on Nutrition at Its Thirty-ThirdSession. WHO: Official Records (United Nations General Assembly).

World Health Organization 2021. Obesity and overweight,https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight.

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