ORIGINAL ARTICLE

Dietary Habits and Nutritional Status among the Bodo Children of Kokrajhar District, Assam

Basumatary Limi Q[1*]

[1]Research Scholar, Ph.D. Department of Anthropology, North-Eastern Hill University, Shillong, Meghalaya, India.

ABSTRACT Undernutrition among children is common in India and other developing countries. Nutritional status plays a vital role in deciding health status, particularly in children. A cross-sectional study was conducted among the Bodo children of Kokrajhar District, Assam. The Bodo is the largest ethnolinguistic group in the state, Assam. Height and weight were measured using standard procedures. For dietary habits, data were collected following 24 hours recall method. BMI was computed from height and weight. The age-specific L, M, and S reference values were used to calculate height-for-age Z score (HAZ), weight-for-age Z score (WAZ), and BMI for age Z score. The total number of normal children was 63.94% and 36.06% were found to be malnourished. The prevalence of stunting, underweight, thinness, and overweight among the Bodo children were 8.33%, 8.79%, 6.67%, and 5.0% respectively, whereas, the prevalence of severely stunted, severely underweight, severely thin, and obese were found to be 1.67%, 2.57%, 2.27% and 0.76 respectively. Malnutrition is largely the by-product of inadequate education of mothers. Rice is the staple food of the Bodos which is consumed three times a day along with bathwn (chutney) including breakfast. The present population is known to be non-vegetarians, they consumed almost all kinds of meat, and pork meat is one of their favorites.

Keywords: Undernutrition, Bodo children, Nutritional Status, Kokrajhar

Address for correspondence: Basumatary Limi Q, Research Scholar, Ph.D. Department of Anthropology, North-Eastern Hill University, Shillong, Meghalaya, India. E-mail: queenlimi123@gmail.com

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INTRODUCTION

The prevalence of undernutrition is a significant area of concern and it is often considered a major public health problem in developing countries [1, 2]. Nutritional status plays a vital role in deciding health status, particularly in children. Underweight (low weight for age) represents both chronic and acute malnutrition [3]. Z-scores less than -2 standard deviations, irrespective of the indicators used [4]. A child's dietary habits acquired early in childhood continue in adulthood. Dietary choices made by the children and their families influence their health. Rice is the staple food of the Bodos which is consumed three times a day including breakfast. They take wild vegetables and seasonal fruits. The present population is known to be non-vegetarians, they consumed almost all kinds of meat, and pork meat is one of their favorites, followed by chicken, fish, mutton, etc.

In North-East India, particularly among the Bodo community, limited studies were done on the prevalence of undernutrition. A study on the prevalence of double burden of malnutrition was carried out among the urban school-going Bodo children of Udalguri district, Assam [5] which showed that the prevalence of overweight and obesity has reached a relatively greater level among children residing in urban, suburban regions and higher-income groups. The persistence of undernutrition coupled with an increasing prevalence of overweight and obesity among the tribal Bodo children residing in the urban settings in India may also be indicative of poor and public health issues in populations. The current research was carried out in order to find out the prevalence of undernutrition among the Bodo children residing in the rural areas of Kokrajhar District, which is Bodo-dominated areas (Assam), North-East India.

OBJECTIVES

1. To assess the nutritional status of the Bodo children aged 5 to 15 years and identify the factors associated with it.

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2. To study the dietary pattern of the Bodo children.

MATERIALS AND METHODS

A cross-sectional study was conducted among the Bodo children of Kokrajhar district, selected randomly to achieve the desired sample size of 660 (330 boys and 330 girls) children of the age group five to fifteen years. Informed consent was obtained from the head of the family and school principal before conducting the fieldwork. The fieldwork was carried out in Bodo-dominated villages/schools under the Gossaigaon subdivision of the Kokrajhar district in Assam. Assam is a state in North-Eastern India, located south of the Eastern Himalayas along the Brahmaputra and Barak river valleys. The Bodo is the largest ethnolinguistic group in the state, Assam. As per the 2011 Census, Kokrajhar, one of the districts of BTR, had a population of 887,142 of which males and females were 452,905 and 434,237 respectively. Out of the total population of the district, 832201 falls under rural, and 54941 are under urban areas of the district.

Standard techniques of taking the anthropometric measurements were followed [6]. Structured schedules were used to collect information about socio-economic and demographic parameters. For socio-economic status, parameters such as education, occupation, and monthly income were collected following Kuppuswamy's updated socio-economic scale. Data on the age of the children were collected from the parents. For dietary habits, data were collected following 24 hours recalled method from the children as well as from the mothers. An anthropometer rod was used for measuring the heights and a weighing machine to measure the weights.

Stunting is defined as a low height-for-age for children, and it measures the past (chronic) child undernutrition. Children with Z-scores <-2.00 are said to be stunted and those <-3.00 severely stunted. Underweight is defined as low weight-for-age and it reflects past (chronic) and present (acute) undernutrition. Children with Z-scores <-2.00 are said to be underweight and those <-3.00 severely underweight. Body Mass Index (BMI) is used to assess thinness, overweight, and obesity.

STATISTICAL ANALYSIS

All data were managed and analyzed by using IBM SPSS software (version 19). For assessing the nutritional status, three anthropometric indices were adopted, that is, height-for-age, weight-for-age, and body mass index (i.e., weight in kg/height^2 in meters) for age, which are considered as good indicators of nutritional status. The Z-scores of height, weight, and BMI for age were computed following the LMS method as per the revised growth references given by the U.S. National Center for Health Statistics [7].

RESULTS

Socio-Economic Status and Nutritional Status of the Children

The study revealed that 23.18% of the children belong to the upper-middle class, 30.46% belong to the lower-middle class and the rest 46.36% belong to the upper-lower class (Figure 1). Out of which 63.94% of children were found normal and

Figure 1: Distribution of the Children According to Socio-Economic Status

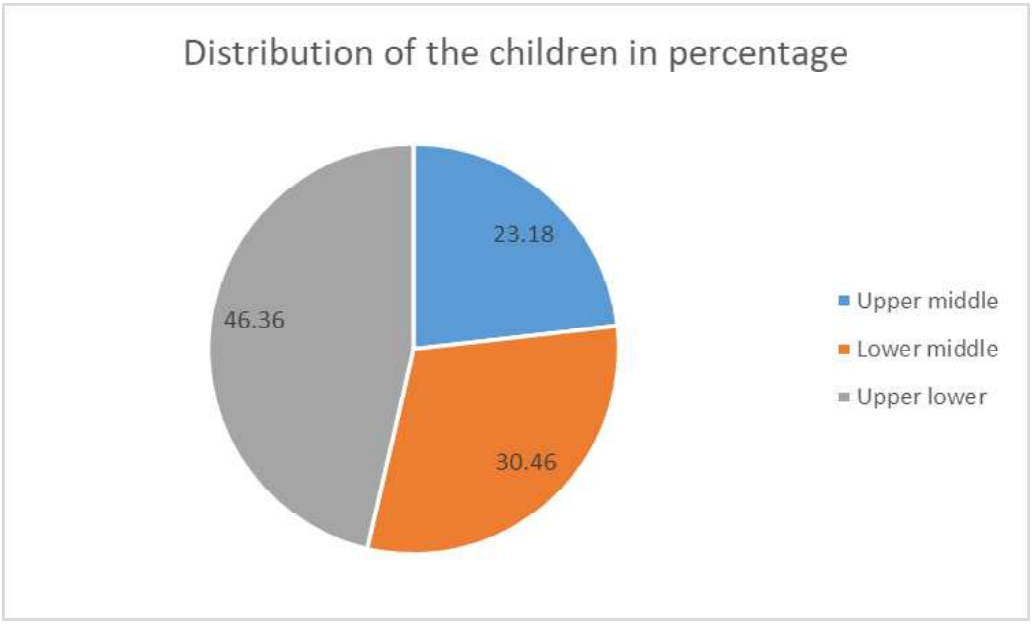

Table 1: Nutritional Status of Children According to Socio-Economic Status

Socio-Economic Class	Malnourished								
	Stunted	Severely Stunted	Underweight	Severely Underweight	Thin	Severely Thin	Overweight	Obese	Total
Upper middle	7(1.06)	2(0.30)	10(1.52)	2(0.30)	11(1.67)	3(0.45)	14(2.12)	2(0.30)	51(7.73)
Lower middle	30(4.55)	5(0.76)	32(4.85)	9(1.36)	18(2.73)	8(1.21)	8(1.21)	1(0.15)	111(16.82)
Upper lower	18(2.72)	4(0.61)	16(2.42)	6(0.91)	15(2.27)	4(0.61)	11(1.67)	2(0.30)	76(11.51)
Total	55(8.33)	11(1.67)	58(8.79)	17(2.57)	44(6.67)	15(2.27)	33(5.0)	5(0.76)	238(36.06)

Note: $\chi^2 = 16.88$, $p<0.05$ *Percentages are given in parentheses.

36.06% were found to be malnourished. As the socio-economic status decreased from upper middle to lower middle the prevalence of undernutrition increased but the prevalence of undernutrition decreased from lower middle to upper lower and the difference was found to be statistically significant ($p<0.05$). It was found that only 7.73% of the children from the upper middle class were malnourished, 16.82% of the children from lower-middle, and 11.51% of the children from upper-lower were malnourished (Table 1). The highest number of malnourished children are found among lower middle class families, though the majority of the children were from the upper lower. The total number of stunted children was found to be 8.33 percent, underweight (8.79%), thin (6.67%), severely stunted (1.67%), severely underweight (2.57%), and severely thin (2.27%). Overweight and obese were found to be 5% and 0.76% respectively.

The Educational Level of Mothers and Nutritional Status of the Children

In the present study, it was found that 7.58%, 9.40%, 19.24%, 21.21%, 22.27%, 20.30% of children belonged to mother's educational level of graduate, intermediate, high school, middle school, primary school, and illiterate respectively (Figure 2). Out of which 63.94% of children were found normal and 36.06% were found to be malnourished. A total number of malnourished children as per their mother's education are distributed as follows: graduate-1.06%, intermediate-3.03%, high school-4.54%, middle school-6.67%, primary school-8.64%, and illiterate-12.12%. The highest number of malnourished children are found among illiterate mothers whereas the least malnourished children are found among the graduate mothers and it is statistically significant, $p<0.05$ (Table 2).

Figure 2: Distribution of Children According to Mother's Educational Status

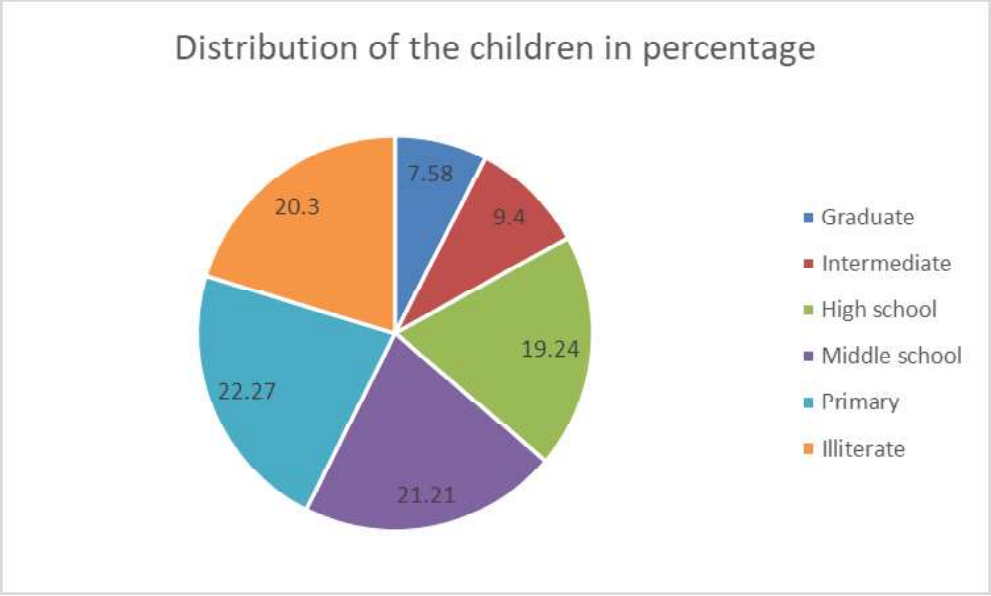

Table 2: Educational Level of Mothers and Nutritional Status of Children

Mother's Education	Malnourished								
	Stunted	Severely Stunted	Underweight	Severely Underweight	Thin	Severely Thin	Overweight	Obese	Total
Graduate	2(0.30)	0	1(0.15)	1(0.15)	1(0.15)	0	2(0.30)	0	7(1.06)
Intermediate or diploma	4(0.61)	0	3(0.45)	1(0.15)	3(0.45)	0	7(1.07)	2(0.30)	20(3.03)
High school	8(1.21)	1(0.15)	6(0.91)	2(0.30)	3(0.45)	2 (0.30)	6(0.91)	2(0.30)	30(4.54)
Middle school	13(1.97)	2(0.30)	11(1.67)	3(0.45)	6(0.91)	3(0.45)	5(0.75)	1(0.15)	44(6.67)
Primary school	13(1.97)	3(0.45)	16(2.42)	4(0.61)	10(1.52)	4(0.61)	7(1.06)	0	57(8.64)
Illiterate	15(2.27)	5(0.75)	21(3.18)	6(0.91)	21(3.18)	6(0.91)	6(0.91)	0	80(12.12)
Total	55 (8.33)	11 (1.67)	58 (8.79)	17 (2.57)	44 (6.67)	15 (2.27)	33 (5.0)	5(0.76)	238(36.06)

Note: $\chi^2 = 25.23$, $p<0.05$ *Percentages are given in parentheses.

Dietary Habits

Breakfast

Rice is the staple food of the Bodo community. Breakfast consumption has been identified as an important factor in the nutritional well-being of children. In the present study, breakfast was consumed regularly by the Bodo children. A maximum number of the children (61%) have their breakfast alone (some prefer watching television or mobile phones) while 39% of the children have breakfast with the family. It was found that 81% of the children consume plain rice with fried mixed vegetables and chutney (*bathwn*) while the remaining 19% consume cereals for the breakfast. Eggs and milk were also served as a part of the breakfast by some parents.

Lunch and Dinner

Rice is considered compulsory for lunch and dinner in the present population. Green leafy and non-leafy vegetables (fry and boil) are also added to the diet of the present population. Preference is given more on fried vegetables than boiled vegetables. Meat and poultry are great sources of protein. Fish and meat products were consumed at least once or twice a week by a large number of children. Meat and fish products were consumed by all children belonging to the age groups five to fifteen years of the present study. Therefore, we can conclude that the Bodo children of the present population are purely non-vegetarian. Data was collected on the consumption of extra salt (uncooked) with meals and found out that most of the girls consumed extra salt as compared to the boys.

Napham is basically a fermented fish product prepared by the Bodo community. *Narzi* is one of the unique cuisines of the Bodos. It is a bitter gravy prepared with dried jute leaves and pork fats. *Onla kharwi* (rice powder curry) is the most popular traditional dish of the Bodos. *Sobai kharwi* (black gram curry) is the favorite dish and delicacy for the Bodos. *Labra* is a mixed vegetable that is served twice a day. *Bathwn* (chutney) is a side dish that is consumed three times a day including breakfast. Rice is the staple food of the Bodos which is consumed three times a day along with *bathwn* (chutney) including breakfast. *Napham* (fermented fish) and *narzi* (Dried jute leaves) are consumed less by the children. It is found that 51.21% and 56.97% of children do not consume *napham* and *narzi* respectively. On the other hand, *Onla kharwi* (rice powder with organic alkali) and *sobai kharwi* (black gram with organic alkali) are almost consumed by every child except 1.36% who dislike the taste of *onla*. The present population is known to be non-vegetarians, they consumed almost all kinds of meat, and pork meat is one of their favorite, followed by chicken, fish, mutton, etc. Lunch and dinner without mixed vegetables (*labra*) is incomplete. They eat fruits, eggs, and drink milk on a weekly and monthly basis (Table 3). They also take wild edible plants, seasonal fruits like guava, mango, litchi, pomelo, jackfruit, papaya, banana, pineapple, etc. It was found that a large number of children consume junk food items regularly, not because of parents' carelessness but children's choice of junk food over healthy foods. In a study conducted by Gogoi, M. [8] among the Bodo Kachari of Assam, it was found that no Bodo Kachari meal is complete without wild leafy vegetables. Green vegetables, roots and tubers, meat, fish, etc., were consumed in varying amounts in their meals. A total of more than 80 leafy green vegetables, vegetables, and root and tubers have been found in the study that is consumed by the Bodo community.

Table 3: Distribution of the Children Based on Dietary Habits

Food Items	Frequency						
	Daily	Once a Week	Twice a Week	Monthly	Occasionally	Never	Total
Rice	660	0	0	0	0	0	660
Napham	0	0	0	65(9.85)	257(38.94)	338(51.21)	660
Narzi	0	0	0	83(12.58)	201(30.45)	376(56.97)	660
Onla kharwi	0	57(8.64)	16(2.42)	152(23.03)	426(64.55)	9(1.36)	660
Sobai kharwi	0	14(2.12)	0	57(8.64)	589(89.24)	0	660
Bathwn	509(77.12)	64(9.70)	87(13.18)	0	0	0	660
Meat	64(9.70)	289(43.78)	295(44.70)	12(1.82)	0	0	660
Fish	57(8.64)	279(42.27)	251(38.03)	73(11.06)	0	0	660
Eggs	25(3.79)	104(15.75)	93(14.10)	311(47.12)	74(11.21)	53(8.03)	660
Mixed vegetables (*labra*)	660(100.0)	0	0	0	0	0	660
Milk	58(8.79)	170(25.76)	109(16.52)	259(39.24)	0	64(9.69)	660
Fruits	0	129(19.55)	84(12.73)	447(67.72)	0	0	660
Junk food	211(31.97)	118(17.88)	257(38.94)	74(11.21)	0	0	
Sweets	155(23.49)	318(48.18)	112(16.97)	0	75(11.36)	0	

Note: *Percentages are given in parentheses.

DISCUSSIONS

The overall prevalence of stunting (stunted + severely stunted) among the Bodo children were found to be 10%, underweight (underweight + severely underweight) 11.36%, thinness (thin + severely thin) 8.94%, and overweight (overweight + obese) 5.76%. The total number of malnourished children was found to be 36.06% and 63.94% were normal. The prevalence of stunting is very low in the present population (8.33%) as compared to other Indian children like adolescents of Uttar Pradesh, Gautambudh-Nagar (12.5%) [9], Chakhesang children of Nagaland (21.6%) [10], school-age children of Aligarh district (40.3%) [11], adolescents of Karbi Anglong (42.63%) [12], Meitei (45%) [13] and children of Paschim Medinipur (49.6%) [14]. Severely stunting was found to be (1.67%) which is slightly higher than adolescents of Uttar Pradesh (1.5%) [9] but lower than children of Paschim Medinipur (24.4%) [14] and school-age children of Aligarh (27.7%) [11].

The prevalence of underweight is low (8.79%) as compared with other Indian children; Chakesang Naga (14.4%) [10], Meitei (27%) [13], and Paschim Medinipur (52.9%) [14]. Severely underweight was found to be (2.57%) which is lower than Medinipur (16%) [14]. The prevalence of thinness among the present population is (6.67%) which is very low as compared to the children of Uttar Pradesh (23.2%) [9], Aligarh (49.7%) [11], and Medinipur (67.2%) [15]. Severely thin was found to be (2.27%) in the present population when compared with other children of Uttar Pradesh (7.4%) [9] and Aligarh (29.7%) [11] is found to be much lower. The prevalence of overweight and obese was found (5.76%) in the present study which is greater than a study conducted in Medinipur (0.8%) [15] but lower than the Affluent Indian (18.2%) [16], Bodo children of Udalguri District (23.3%) [17] and Manipur (28%) [13].

Generally, low income populations have a higher burden of health problems. Prevalence of undernutrition was found to be higher among those children who belong to the lower middle class and it is found statistically significant in the present study. Children from the upper lower class were healthier than the lower middle class. The least number of undernourished children and more of overweight-obesity were found in the upper middle class which indicates that high income and changes in dietary patterns have influenced the children's health and well-being.

The predominant role of the Bodo women was that of a homemaker and this occupation was typically characterized

by cooking, housecleaning, childcare, etc. Females are equally treated as males. In the present study, a higher rate of stunted, underweight, thinness, and overweight-obese is found in those children whose mothers were illiterate whereas the least number of malnourished children were found among graduate mothers. Mothers' burden on household activities as a homemaker and poor socio-economic conditions, lack of education have led them to give less attention to dietary habits, proper sanitation, hygiene practices to their children whose nutritional status suffered as an outcome. Women's educational and social status, food availability, and access to safe water are well reported important underlying determinants that directly or indirectly cause malnutrition among children [18]. Children whose mothers have not completed middle school are less likely to be stunted, wasted, or underweight than those children whose mothers are illiterate. Children whose mothers have completed middle school or higher education are even less likely to suffer from malnutrition [19]. In a study on school aged (5 to 15 years) urban slum children of Bareilly (UP) India, mother's education was found to be a strong predictor of child nutritional status [20].

CONCLUSION

The present study has highlighted the prevalence of undernutrition among the Bodo children of Kokrajhar District, Assam (age group of 5-15 years). As compared to the other population the prevalence of undernutrition is very low in the studied population. The majority of the undernourished children were found among illiterate mothers. The education of mothers played a major role in shaping children's well-being. Educated mothers can influence the health of their children by challenging traditional beliefs, leading to a greater willingness to utilize modern healthcare. Childhood malnutrition can be lowered by spreading awareness programs on healthy behavior, sanitation practices, and nutrition knowledge by the educated women at the community level. It is clear from the above result that malnutrition is largely the by-product of inadequate education of parents (mothers), low socio-economic condition, etc., nutritional problems are not just medical problems.

REFERENCES

1. Antwi S. (2008). Malnutrition: Missed opportunities for diagnosis. *Ghana Medical Journal*, 42, 101-104.
2. Khor G. L. (2008). Food-based approaches to combat the double burden among the poor: Challenges in the Asian context. *Asia Pacific Journal of Clinical Nutrition*, 17, 111-115.
3. Janevic, T., Petrovic, O., Bjelic, I. and Kubera A. (2010). Risk factors for childhood malnutrition in Roma settlements in Serbia. *BMC Public Health*, 10, 1-8.
4. World Health Organization (2009). *WHO child growth standards and the identification of severe acute malnutrition in infants and children: joint statement by the World Health Organization and the United Nations Children's Fund.*
5. Mondal, N., Basumatary, B., Kropi, J., and Bose, K. (2015). Prevalence of double burden of malnutrition among urban school going Bodo children aged 5-11 years of Assam, Northeast India. *Epidemiology, Biostatistics and Public Health*, 12(4).
6. Weiner, J. S. and Lourie, J. A. (1981). *Practical human biology.* Academic Press Inc.
7. Kuczmarski, R. J., Ogden, C. L., Grummer-Strawn, L. M., Flegal, K. M., Guo, S. S., Wei, R., Mei, Z., Curtin, L. R., Roche, A. F. and Johnson, C. L. (2000). *Growth charts, United States. Advance Data from Vital and Health Statistics.* Revised, National Center for Health Statistics.
8. Gogoi, M. (2019). Traditional food system and diet intake pattern of the Boro kachari tribe of Assam, India. *Journal of Emerging Technologies and Innovative Research*, 6(1) (1164-1171).
9. Srivastav, S., Mahajan, H. and Grover, V. L. (2013). Nutritional status of the government school children of adolescent age group in urban areas of district gautambudh-nagar, uttar pradesh. *Community Med*, 4(1), 100-3.
10. Longvah, T., Khutsoh, B., Meshram, I. I., Krishna, S., Kodali, V., Roy, P. and Kuhnlein, H. V. (2017). Mother and child nutrition among the Chakhesang tribe in the state of Nagaland, North East India. *Maternal & child nutrition*, 13, e12558.
11. Sultan, S. (2014). Prevalence of stunting and thinness among school-age children of working and non-working mothers in rural areas of Aligarh District. *Int J Appl Basic Med Res*, 3, 51-7.
12. Rengma, M. S., Bose, K. and Mondal, N. (2016). Socio-economic and demographic correlates of stunting among adolescents of Assam, North-east India. *AnthropologicAl review*, 79(4), 409-425.
13. Loukrakpam, B., Rajendran, A., Madhari, R. S., Boiroju, N. K. and Longvah, T. (2020). Dietary adequacy and nutritional status of Meitei community of Manipur, Northeast India. *Maternal & child nutrition*, 16, e13046.
14. Bisai, S. and Mallick, C. (2011). Prevalence of undernutrition among Kora-Mudi children aged 2-13 years in Paschim Medinipur district, West Bengal, India. *World Journal of Pediatrics*, 7(1), 31-36.

15. Bisai, S., Ghosh, T., De, G. K. and Bose, K. (2010). Very high prevalence of thinness among Kora Mudi tribal children of Paschim Medinipur District of West Bengal, India. *EJ Biol Sci*, 3(1), 43-9.

16. Khadilkar, V. V., Khadilkar, A. V., Cole, T. J., Chiplonkar, S. A. and Pandit, D. (2011). Overweight and obesity prevalence and body mass index trends in Indian children. *International Journal of Pediatric Obesity*, 6(sup3), e216-224.

17. Mondal, N., Basumatary, B., Kropi, J. and Bose, K. (2015). Prevalence of double burden of malnutrition among urban school going Bodo children aged 5-11 years of Assam, Northeast India. *Epidemiology, Biostatistics and Public Health*, 12(4).

18. Smith, L. C. and Haddad, L. J. (2000). Explaining child malnutrition in developing countries: A cross-country analysis. *International Food Policy Research Institute*. Vol. 111.

19. Mishra, V. K. and Retherford, R. D. (2000). *Women's education can improve child nutrition in India*. National Family Health Survey, Bulletin No. 15.

20. Srivastava, A., Mahmood, S. E., Srivastava, P. M., Shrotriya, V. P. and Kumar, B. (2012). Nutritional status of school-age children-A scenario of urban slums in India. *Archives of Public Health*, 70(1), 1-8.