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The association between socio-economic factors and nutritional status among children: evidence from Nagaland, North-East India

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Abstract

The study on children's nutrition is important in order to understand the health status of the population, especially in a developing country like India, where the coexistence of both under nutrition and over nutrition is becoming a public health concern. Under this backdrop, a cross-sectional study was done to examine the nutritional status of the Ao Naga boys from Nagaland, North-East India, and its association with socio-economic factors. Anthropometric data such as height and weight were collected. Nutritional status was assessed using Body Mass Index (BMI) following the classification made by Cole et al. Data on socio-economic status was collected using appropriate schedule. In order to test the level of significance at 0.05 levels, chi-square test was used. The result showed that, BMI increased with an advancement of age, and the prevalence of underweight decreased slightly with age in a fluctuating pattern. There was a significant variability of BMI regarding socio-economic indicator in relation to income group. Children belonging to better socio-economic status were taller, heavier, and fatter than their non-affluent counterparts. Both underweight and overweight co-existed among the children, although underweight was significantly higher.

Keywords: *Body mass index, underweight, overweight, family income group, Ao Naga*

Introduction

Nutrition is an important environmental factor in maintaining health and well-being of an individual and society as a whole. It is a process by which living organisms receives and utilizes the material necessary for the maintenance of its function as well as renewal of its function (Vaid and Vaid, 2005). In the study of nutrition, childhood and adolescence stages are found to be of great interest as it is a period during which the dietary habits of the future adult are consolidated. It is this school age period that is considered as a dynamic period of growth and development because children undergo physical, mental, emotional, and social changes. The foundations of good health and sound mind are thus laid during the school age period (Lien et al., 2001;

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Newmark et al., 2003; Srivastava et al., 2012). The nutritional status of children also reflects directly the Socio-Economic Status (SES) of the family, social wellbeing of the community, efficiency of the health care system, influence of the surrounding environment, and also for national and regional policy planning (Khongsdier, 1995; Srivastava et al., 2012).

In a developing country like India, one of the major health problems is malnutrition. It creates lasting effect on growth, development and physical fitness of a person. The presence of malnutrition in a person is ordinarily established in public health and clinical contexts with the use of anthropometry, specifically weight and height. The prevalence of under nutrition can occur at any age period, however, it is during infancy and early childhood that receives most emphasis because of its association with morbidity and mortality early in life and its long-term consequences (Malina et al., 2004). Overweight is another form of malnutrition, which is of public health significance all over the world including developing countries. The terms overweight and obesity is often used interchangeably, but they are not synonymous. Overweight is more likely to result from behavioral factors such as dietary practices and lack of physical activity, whereas, obesity typically has a stronger behavioral and metabolic and possibly genetic etiology (Bouchard, 2000). It has been shown that, overweight or obesity assessed by BMI during childhood is a strong predictor of overweight or obesity and coronary heart disease risk factors in young adulthood (Janssen et al., 2005).

SES is an important factor that helps clearly understand the nutritional status of a person in particular and community as a whole. It is a complex concept including not only the purchasing power of an individual, but also his education, occupation and place in social life (Adler et al., 1994; Chen et al., 2006). In developing countries, with India being one of them, proportion of overweight and obese people now co-exist with those who are undernourished (Popkin, 2002). According to World Health Organization estimates (1997), by the year 2020, non-communicable diseases will account for approximately three quarters of all deaths in the developing world. Such increase in non-communicable diseases all over the globe will account for an increase in both morbidity and mortality if proper measures are not implemented early to tackle such increasing health hazards. Under this backdrop, the present study has been taken up to understand the association between socio-economic factors and nutritional status among the Ao Naga children from Mokokchung district in Nagaland, North-East India.

Methods

A cross-sectional investigation on 404 Ao Naga boys aged 8 to 18 years was carried out in Mokokchung town for the present study. Mokokchung is one of the major districts of the state of Nagaland in North-Eastern part of India. Majority of the population living in this district belong to the Ao community, a major tribal group in the state. Mokokchung town is the districts headquarter, and is the cultural center of the Ao people, and is economically and politically the most important urban center in Northern Nagaland. The district is located at a height of about 1,326 meters above sea level, and has an average altitude of 1,352.08 meters, the latitude being $26^0 20'$ north and longitude being $94^0 32'$ east having an area of 1,615 square kilometers. As per the 2011 census, the total population of the district is 193,171, where, the urban area has a total of about 55,654 and rural area about 137,517.

For the present study, seven wards from Mokokchung town were selected randomly using lottery method as mentioned in Snedecor and Cochran (1967). No

statistical sampling of households and individuals was done for the purpose of collection of data, instead an attempt was made to include all those children who were willing to co-operate for the purpose of the present study.

In order to assess nutritional status, anthropometric measurements such as height and weight were considered. Data on height and weight were collected using anthropometric rod to the nearest 0.1cm and weighing machine to the nearest 0.5kg respectively. BMI was assessed computing the international cut off points for child and adolescent according to age and sex as recommended by Cole et al. (2000, 2007).

Socio-economic factors such as age, family size, parents' education and occupation, and family income were collected from each subjects using appropriate schedule in order to define the SES data. Date of age of the children was collected from the parents taking into account the school records and birth certificate, if any. Decimal age of each subject was calculated by subtracting the date of birth of the subject from the date of data collection, using decimal age calendar (1969). The family size was grouped into Small Family Size (SFS), Medium Family Size (MFS), and Large Family Size (LFS). The subject's parents' educational backgrounds were grouped in three categories: illiterate or primary, secondary, and higher secondary and above. The fathers' occupations were grouped into three categories: government employee, businessman, and unemployed/laborer. Mothers' occupations were also grouped into three categories: government employee, businesswoman, and house-wife/laborer. As for data on income, it was crosschecked taking into consideration some aspects of socio-economic conditions like housing condition, type of occupation and monthly expenditure. It was grouped into three categories: Low Income Group (LIG), Middle Income Group (MIG), and High Income Group (HIG). This grouping was classified according to the 75th percentile and 50th percentile.

All the parameters taken in the present study were analyzed statistically to find out the frequency and percentage. Finally, chi-square test was used to test the level of significance at 0.05 levels for all analyses employing MS office excel and SPSS 17 for windows software

Results

The mean and standard deviation of BMI of the Ao boys, according to age, has been shown in Table 1 and figure 1. As can be seen, BMI increased with the advancement of age, with a slight fluctuating pattern at 10 years. At the age of 8 years, the boys showed a mean BMI of about 15.25 that increased to 19.80 at the age of 18 years, which showed a difference of about 4.55 value within a span of 10 years.

Figure 2 reveal the distribution of BMI by age according to the classification by Cole et al. (2000, 2007). As can be seen, the prevalence of overweight was found during the age groups of 9 to 12, 15, and 18 years with a percentage of about 2.86%, 2.78%, 2.78%, 2.63%, 5.71%, and 2.44% respectively. On the other hand, the prevalence of underweight was found at all the age groups under study with a percentage ranging from about 20.51% to 44.44%. The figure also reveals that, although not significantly, the prevalence of underweight decreased slightly with the advancement of age.

Table 2 shows the distribution of BMI according to socio-economic factors. As can be seen, a higher percentage of underweight boys belonged to LFS (39.13%), followed by MFS (32.94%), and finally SFS (27.13%). On the other hand, a higher percentage of overweight boys belonged to LFS (4.35%), followed by SFS (3.10%), and finally MFS (0.79%). However, there was no statistically significant association between BMI and family size.

Table 1: Mean and standard deviation of BMI according to age

Age in years	Mean	SD
8	15.25	1.25
9	15.39	1.82
10	15.26	1.67
11	15.69	2.04
12	16.21	2.06
13	16.35	2.88
14	17.68	2.17
15	18.73	2.53
16	18.84	1.56
17	19.23	1.49
18	19.80	2.01

BMI, body mass index; SD, standard deviation

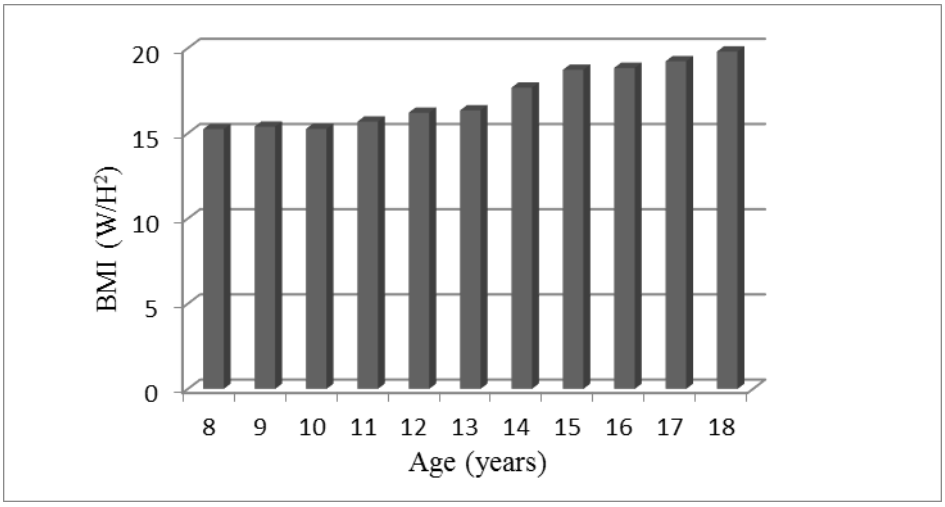

Figure 1: Chart showing mean BMI according to age groups.

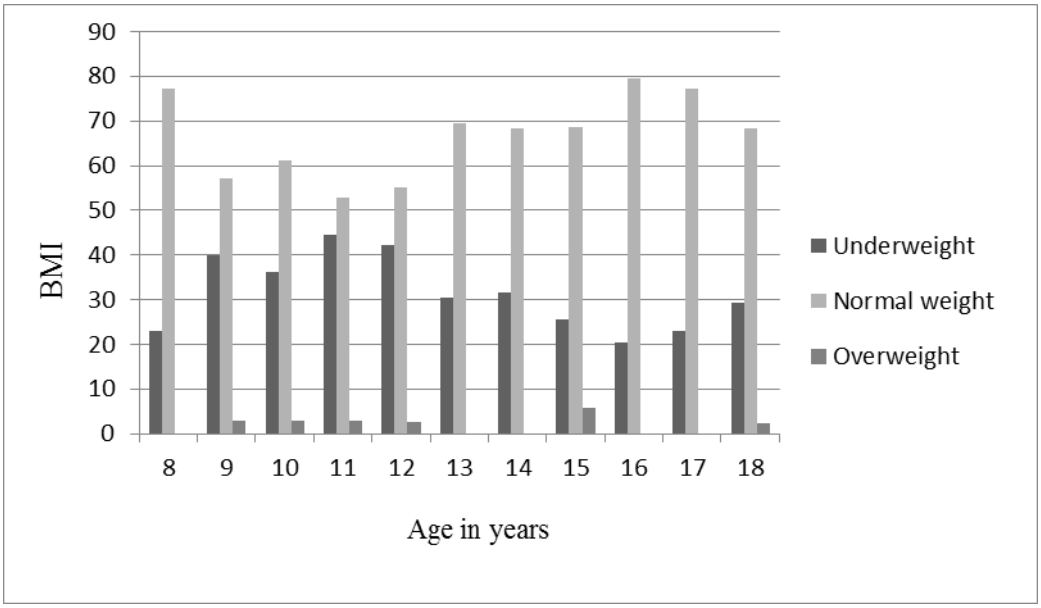

Figure 2: Chart showing distribution of BMI by age groups.

A comparison within fathers' education level showed a higher percentage of underweight boys whose fathers' were illiterate or had primary education (37.04%), followed by secondary education (33.54%), and finally higher secondary education and above (28.13%). It also showed that all the overweight boys had fathers' with higher secondary and above education level (3.65%). As for comparison within mothers' education level, a higher percentage of underweight boys had mothers' with secondary education level (32.41%), followed by illiterate or primary educational level (31.46%), and finally higher secondary and above education level (29.29%). It also showed that, the prevalence of overweight boys was higher among those whose mothers' had higher secondary and above education level (3.03%), followed by secondary education (1.85%). However, there was no statistically significant association shown between both the parents' education level and BMI (Table 2).

Table 2: Distribution of BMI according to SES at all age groups combined (8 to 18 years)

Socioeconomic status	N (%)	Underweight N (%)	Normal N (%)	Overweight N (%)
Family size				
SFS	129 (31.93)	35 (27.13)	90 (69.77)	4 (3.10)
MFS	252 (62.38)	83 (32.94)	167 (66.27)	2 (0.79)
LFS	23 (5.69)	9 (39.13)	13 (56.52)	1 (4.35)
χ^2 value			5.50, df= 4	
Fathers education				
Illiterate and primary	54 (13.37)	20 (37.04)	34 (62.96)	0 (0.00)
Secondary	158 (39.11)	53 (33.54)	105 (66.46)	0 (0.00)
Higher secondary and above	192 (47.52)	54 (28.13)	131 (68.23)	7 (3.65)
χ^2 value			9.34, df= 4	
Mothers education				
Illiterate and primary	89 (22.03)	28 (31.46)	61 (68.54)	0 (0.00)
Secondary	216 (53.47)	70 (32.41)	142 (65.74)	4 (1.85)
Higher secondary and above	99 (24.50)	29 (29.29)	67 (67.68)	3 (3.03)
χ^2 value			2.82, df= 4	
Fathers occupation				
Government servant	228 (56.44)	66 (28.95)	157 (68.86)	5 (2.19)
Business	73 (18.07)	25 (34.25)	46 (63.01)	2 (2.74)
Unemployed/laborer	103 (25.50)	36 (34.95)	67 (65.05)	0 (0.00)
χ^2 value			3.88, df= 4	
Mothers occupation				
Government servant	75 (18.56)	19 (25.33)	54 (72.00)	2 (2.67)
Business	32 (7.92)	10 (31.25)	22 (68.75)	0 (0.00)
House-wife/laborer	297 (73.51)	98 (33.00)	194 (65.32)	5 (1.68)
χ^2 value			2.47, df= 4	
Income group				
LIG	209 (51.73)	77 (36.84)	132 (63.16)	0 (0.00)
MIG	82 (20.30)	23 (28.05)	56 (68.29)	3 (3.66)
HIG	113 (27.97)	27 (23.89)	82 (72.57)	4 (3.54)
χ^2 value			12.80*, df= 4	

*Significant at 0.05 level; df: degree of freedom; SFS: small family size; MFS: medium family size; LFS: large family size; LIG: low income group; MIG: middle income group; HIG: high income group

Further, descriptive statistics showed that, a higher percentage of underweight boys belonged to fathers' who were unemployed or laborers (34.95%) and mothers' who were housewives or laborers (33.00%), and lowest among those whose parents'

were government employees. On the other hand, a higher percentage of overweight boys belonged to fathers' who were businessmen (2.74%) and mothers' who were government employees (2.67%). However, parents' occupation also did not show any significant association with BMI (Table 2).

Of the four socio-economic factors that were taken into consideration for a comparison within the BMI classification, only income group showed a statistically significant association (12.80, $P<0.05$). It was noticed that, a higher percentage of underweight boys belonged to families classified under LIG (36.84%), and a lower percentage of them belonged to families from HIG (23.89%). Also, a higher percent of overweight boys belonged to families classified under MIG (3.66%), which showed a close margin with HIG (3.54%). There was no prevalence of overweight among boys belonging to LIG.

It can thus be noted that, although there were differences in the classification of BMI due to the socio-economic factors that were taken into account, only family income group showed statistically significant association with nutrition.

Discussion

Socio-economic status is a complex concept that represents one's lifestyle, and its effect on the morphological structure of the human body differs from one population to the other. Many studies have shown that some urban families may be able to afford sufficient quantity and diversity of foods for children to expose them to obesity. At the other extreme, the more affluent urban families seem to have greater possibilities for their children to adopt a healthy life-style. Although the determinants of differences between middle and high-income urban groups are not clear, these causes are likely to involve differences in parental education as well as the family economical wherewithal (Oyhenart et al., 2008). Developing societies like India, which are rapidly urbanizing, and as standards of living continue to rise, weight gain and obesity are beginning to pose a growing threat to the health of the citizens (Shetty, 2002). The obtained results from the present study also showed a significant variability of BMI regarding socio-economic indicator in relation to income group. Our present finding was found to be in consonance with other studies confirming the finding that, children from higher SES were taller, heavier, and fatter (Vijayalakshmi et al. 2002; Eiben et al., 2004; Freitas et al., 2007). In the present study, family size showed a difference in the distribution of underweight, although not significantly, where, large family size showed the highest prevalence of underweight boys and small family size the lowest. From this finding we can assume that larger families may have more mouth to feed and thus lack of sufficient nutrients in the body are most likely to cause under nutrition. This finding is in consonance with various other studies (Wolde et al., 2015). Also, although the differences were not profound, parents' with higher education level had a low percentage of underweight boys and higher percentage of overweight. Various other studies in the past also confirm the present finding (Eveleth and Tanner, 1990; Pelin et al., 2010). Parental education, especially mothers' education, was found to be a key element in improving children's nutritional status (Waters et al., 2004; Boyle et al., 2006; Srivastava et al., 2012). Furthermore, the prevalence of underweight was lower, and overweight higher among boys whose parents' had better occupations such as government service and business as compared to laborers or unemployment. This proved that the prevalence of overweight was higher among boys from better SES and underweight among boys from lower SES).

Conclusion

The present finding thus confirms the general view on nutritional status of children from developing countries such as India. It confirms that, children belonging to better socio-economic status are taller, heavier and fatter than their counterparts from non-affluent families. It can be clearly seen that both underweight and overweight co-exists among the Ao Naga tribal boys from Nagaland. And although the prevalence of underweight is significantly higher, we can notice the prevalence of overweight slowly increasing, which can become a serious health hazard to the people and the society as a whole. Therefore, proper measures and intervention/awareness programs should be implemented early in life in order to make the society aware of the non-communicable diseases and their associated co-morbidities that are increasing rapidly all over the globe due to various factors, which can cause significant health issues in the community.

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