ABSTRACT

INTRODUCTION

Malnutrition (undernutrition and overnutrition) undoubtedly is a serious public health challenge in many of the developing countries including India. Child undernutrition has long-term negative influence on all areas of life including health, education and productivity of an individual as well as of a community. Moreover, prevalence of child undernutrition seriously affect the human capital and economy of a country because poor nutritional conditions are strongly associated with faltered growth pattern, delayed mental/cognitive development and depleted intellectual capacity of individuals. Childhood undernutrition has been observed to be interlinked with maternal nutritional status as suggested by research studies. Maternal malnutrition is a prevalent factor for morbidity and mortality in children of the developing countries. Several studies also have observed the prevalence of undernutrition as well as overweight and obesity simultaneously among women/mothers in one population. The contributing factors for maternal malnutrition include inadequate food intake, poor nutrient supply through diets, frequent infections, short inter pregnancy intervals, number of child birth, occupation and husbands occupation etc. The results of poor maternal nutritional status are low weight gain during pregnancy, low birth weight (LBW) of baby and high infant mortality as well as maternal morbidity and mortality. The coexistence of undernutrition and overweight-obesity among the members of a same household raises questions about its cause. According to some researches one of the possibilities is that the economic development and urbanization declines the severe poverty improving household income levels and food availability. In one hand some household members remain undernourished due to the deficiencies of essential nutrients and on the other handsome of them become overweight from excess energy and nutrient intake.

Anthropometry is the universally applicable, inexpensive, non-invasive and easy to handle technique available to researchers for the assessment of nutritional status and body composition of the human body. The most commonly utilised anthropometric measures of nutritional assessment are height-

for-age (stunting), weight-for-height (wasting), weight-for- age (underweight) and BMI-for-age (thinness) among children.

Studies have observed some socio-economic and demographic factors play significant roles in the nutritional status. Such variables include family size, number of siblings, residence, family income, education, clean water supply, hygienic sanitary facility, age, sex, birth intervals and mother's age at childbirth.

Assessment of nutritional status and body composition of individuals is recognized as the most significant indicator of health and wellbeing status of an individual or population. The ultimate objective of nutritional assessment studies is to improve the quality of human health and life conditions by implementing various nutritional intervention programmes.

The objectives of the present study are as follows:

1. To assess the nutritional status of the children (1-5 years) and mothers of the Bengali Muslim population of Darjeeling district, West Bengal using conventional anthropometric measures.
2. To ascertain the effect of maternal body composition and nutritional status on the child nutritional status.
3. To find out the association and effect of certain socio-economic, demographic and lifestyle variables on child and maternal nutritional status.
4. To compare the child and maternal nutritional status of the Bengali Muslim population with the available studies done on different Indian and non-Indian population.

MATERIAL AND METHODS

The present cross-sectional study was carried out among 612 Bengali Muslim children (boys: 325; girls: 287) aged 1-5 years and their mothers (N=612) living in Phansidewa Block of the Darjeeling district of West Bengal, India. The Bengali Muslim is the largest religious minority population in West Bengal and comprises a considerable percentage of the state's population. According to the census of 2011, the Muslim population has 14.2% contribution to total population and is the second largest religious group in India. Muslims constitute 27.10% of West Bengal's total population. West Bengal

occupies the second top most position in terms of percentage of Muslim population among all the states and about 12.16% are Muslim women. The Bengali Muslim Population (BMP) is a Bengali speaking ethnic community and by religion faithful to the Islam. They contribute a large share to the social and economic well-being of the state and of the country as a whole. In 2011, religion wise sex ratio for Muslims in India and West Bengal is 951 females for 1000 males. Anthropometric measurements were recorded using standard procedures.

Statistical Analysis

The data of the present study were statistically analyzed utilizing the Statistical Package for Social Sciences (SPSS, Chicago IL, version 16.0). The statistical tests include descriptive statistics (mean and standard deviation), Homogeneity of variance, One way analysis of variance (ANOVA), Pearson correlation coefficient analysis and chi-square test were done to analyse the data. The descriptive statistics (mean and standard deviation) was used to describe the anthropometric measurements of height, weight, MUAC, TSF, SSF, PBF, FM, FFM, FMI, FFMI, TUA, UMA, UFA, AFI, UME, UFE, BMI, PBF-BMI Ratio among children. All the differences were considered to be statistically significant at $p<0.05$ and $p<0.01$ level. Binary logistic regression and multinomial logistic regression analysis have been performed for assessing the association of socio-economic demographic and lifestyle variables with the nutritional status of children and mothers.

RESULTS

The age sex-specific mean weight and height were observed to be higher among boys than girls except in 1 year among children. The age-sex specific mean values of weight and height were observed to be progressively increasing with age in both sexes. The descriptive statistics (mean± SD) of anthropometric measures indicated that there is no statistically significant differences in the age-sex-specific mean of height, weight, MUAC, FM, FFM, FFMI, TUA, BMI. But statistically significant differences were observed in case of HdC, TSF, SSF, PBF, FMI, UMA, UFA, AFI, UME, UFE and PBF-BMI Ratio ($p<0.05$). The sex-specific adiposity pattern and skinfold thicknesses (e.g., TSF, SSF, FMI, AFI, UFA and UFE) and PBF were found to be significantly higher among girls than the boys

($p<0.01$). The sex-specific overall muscularity pattern (e.g., UMA and UME) was observed to be significantly higher among boys than girls ($p<0.05$). Therefore, results showed that there is existence of sexual dimorphism in muscularity and adiposity pattern among Bengali Muslim children. The age-sec specific mean anthropometric variables (e.g., height, weight, HdC, FM, FFM, TUA, UMA, UFA, UME and UFE) were observed to increase with age with few exceptions among Bengali Muslim children. Hence, the results of the present study indicate the attainment of physical growth in anthropometric variables is an age related effect among Bengali Muslim boys and girls. Age-specific mean differences in anthropometric variables of physical growth pattern were found to be statistically significant in case of almost all the anthropometric and body composition variables for boys and girls ($p<0.01$ and $p<0.05$). Most of anthropometric variables of children were significantly correlated with each other ($p<0.01$). The overall prevalence of stunting, underweight, thinness, wasting and low HdC-for- age was observed to be 44.61%, 40.03%, 26.31%, 26.96% and 33.66%, respectively. Statistically significant sex-differences was observed in the prevalence thinness (Low BMI- for-age), wasting (low weight-for-height), low HdC-for-age between boys and girls ($p<0.01$). The high magnitude of undernourishment indicates the high nutritional demand among the children. In case of the mothers of the Bengali Muslim children all the anthropometric and body composition variables were observed to show an age specific increasing trend. Prevalence of a double burden of malnutrition (undernutrition, overweight and obesity) has been observed among the Bengali Muslim mothers. Most of anthropometric variables were highly significantly correlated with each other ($p<0.01$). The results showed that BMI has positive effect on most of the variables (e.g., weight, BSF, TSF, SSF, SISF, MUAC, WC, etc.). The result showed that the overall prevalence of undernutrition was (BMI< 18.50 kg/m^2) 10.29%. The overall prevalence of overweight (BMI= 23.00-24.99 kg/m^2) and obesity (BMI≥ 25.00 kg/m^2) were 21.08% and 15.36%, respectively. Therefore, overall prevalence of overnutrition (BMI≥ 23.00 kg/m^2) was 36.44%. The overall prevalence of undernutrition in terms of low MUAC value was 7.03%. Prevalence of overweight-obesity was 40.85%, 90.20%, 64.05%, 54.41% and 69.61% in terms of WC, WHR, WHtR, PBF and Σ4SKF, respectively. Several socioeconomic and demographic correlates were observed to have

statistically significant ($p<0.01$ and $p<0.05$) effect on the nutritional status of the Bengali Muslim children (e.g., family type, family size, number of sibs, fathers occupation, electricity, monthly family expenditure, etc.) and mothers (e.g., age at marriage, age at menarche, family type, house type, etc.).

CONCLUSION

Present study has been conducted among the Bengali Muslim children and their mothers to assess the body composition and nutritional status. The proper evaluation, identification, explanation and understanding of body composition and nutritional status will definitely help the researchers to tackle or answer several unwanted nutritional and health situations (e.g., undernourishment, over nourishment, growth retardation, delayed and poor cognitive development and mortality or morbidity). With the presence of overweight-obesity, India is also a home for undernutrition which is a major cause of child and maternal mortality and morbidity in its populations. The results of the present study established a high prevalence of undernutrition in terms of stunting (low height-for- age), underweight (low weight-for-age), thinness (low BMI-for-age) and wasting (low weight-for-height) and low HdC-for-age among the Bengali Muslim children of Darjeeling district, West Bengal. Moreover, present study has observed double burden of malnutrition (DBM) (i.e., undernutrition and overweight-obesity) among the mothers of these Bengali Muslim children. Associations and effect of several socio-economic and demographic correlates have been observed among the Bengali Muslim children and their mothers. Therefore, present study has proved that the Bengali Muslim children and their mothers are in a critical junction nutritionally. Importance should be given to improve the overall nutritional status of the children and mothers. Present study indicates that the prevalence of undernutrition does not have an age specific trend. Therefore, it is very necessary to give equal importance in improving nutritional condition of the children of all groups. The mothers of Bengali Muslim community should be taken care of for improvement of the condition of malnutrition (undernutrition and overnutrition) so that it does not perpetuate to their future generation. More extensive population specific studies among the Bengali Muslim children and women should be performed to get more insights in the nutrition situation in the population. Moreover, data on diet and food habit should be incorporated in research studies in the studied population which

the present study lacks. Both government and non-governmental intervention is very necessary to combat and improve the present poor nutritional situation among the Bengali Muslim children and mothers. There is an urgent need to look into the problem and proper nutritional intervention programmes should be incorporate to ameliorate the nutrition situation among the Bengali Muslims.