ABSTRACT

Introduction:

Nutrition is the process of taking in food and using it for growth, metabolism and repair. Through the process of nutrition a living organism are enable them to maintain, grow and to reproduce. To meet physiological requirements and functions, the human body needs appropriate nourishment from a well-balanced diet. Unhealthy eating habits can result in a lack of micronutrients (undernutrition) or excessive calorie consumption (causes over-nutrition). Undernutrition and overnutrition are becoming major public health concerns in developing nations such as India. As a result, nutritional status is now widely acknowledged as a key indication of an individual's health, and the World Health Organization (WHO) considers that the ultimate goal of nutritional evaluations is to improve human health. Nutritional status is beneficial to overall health. The prevalence of under-nutrition along with regional adiposity is known to cause ailments such as hypertension, diabetes, cardiovascular disease, and cancer in both developed and developing countries. India is no different; due to the country's vast population and extensive poverty, the most of its citizens are malnourished and underprivileged. One of the major groups of the country that remain nutritionally vulnerable is *women*, both among tribal and non-tribal populations. The double burden of malnutrition leads to nutrition-related difficulties and a variety of diseases, as well as a reduction in immunity. Undernutrition and overnutrition affect body function, resulting in low weight, growth retardation, a weakened immune system, which leads to an increase in infections, the emergence of chronic diseases (such as diabetes, hypertension, and coronary heart disease), and mental health problems. Females are more likely to be underweight than their male partners due to biological and behavioral factors. Infertility, abortion, premature birth, and

neonatal mortality are all problems that women with insufficient nutrition face. The nutritional status of a woman has a significant impact on her health, as well as the health of her children and family. To improve maternal and child heath as well as the nutritional status of overall population, it is important to evaluate the nutritional status of adult women. Keeping the above-issues in mind, the present study aims to assess the nutritional status of adult women of an ethnic population of North Bengal using anthropometric method. The current study is likely to be the first of its sort in North Bengal, and it will provide basic information on nutritional status and associated issues. Anthropometry method was utilized in this study to measure the nutritional status of Rajbanshi populations because it is the most widely used methodology for assessing nutritional status.

The objectives of present study are as follows:

- To assess the nutritional status and body composition measurement by using internationally accepted cut-off values.
- To assess the prevalence of undernutrition among Rajbanshi female population.
- To find out the association of different socioeconomic, demographic and lifestyle related variables with nutritional status and body fat distribution.
- To assess the age related changes in anthropometric characteristics and body fat distribution among this targeted population.
- To assess the mean age at menarche and menopause among this population.
- To compare the results of the current study with other (national and international) studies.

Materials and Methods:

The present cross-sectional study has been conducted among 800 adult female *Rajbanshi* individuals aged between 18-64 years of age. Present study was carried out in rural area of Darjjeling District of North Bengal. The population was exclusively selected from Rajbanshi dominated villages under Block: Kharibari (Latitude 26. 34' 19" N, Longitude 88. 08' 51" E), Sub-Division: Siliguri, Police Station: Kharibari, District: Darjeeling, West Bengal, India. This study area is situated adjacent to the Mechi River which is forms the Indo-Nepal International border and an approximate distance of 32km to 39km from the sub-divisional town of Siliguri. The population of the present study was selected by using multistage stratified sampling procedures. The data have been collected during the period from April 2018 to December 2019. In this process 12 villages were listed but further it is reduced to 10 villages which were convenient for data collection, easy road accessibility and subjects availability. Demographic, socio-economic, reproductive and life style data of these target population are being collected by door to door surveys using a structured schedule. The data recorded about the different socio-economic and demographic variables were age, marital status and educational status, birth order, no of children, family size, family type, water supply, electricity facility, toilet facility, monthly income and occupations. Reproductive data like age at menarche and age at menopause was also recorded. The anthropometric measurements are recorded from the individuals using standard protocols and instruments as outlined by Weiner and Lourie (1981). The measurements are: Height, Weight, Mid upper arm circumference (MUAC), Biceps skin fold (BSF), Triceps skin fold (TSF), Sub-scapular skin fold (SSF), Supra iliac skin fold (SISF), Waist circumference (WC) and Hip circumference (HC). Various nutritional and body composition indices were derived from these measurements to assess nutritional

status of this population. The all statistical analyses such as mean ± SD, ANOVA, $\chi 2$, correlation, regression, logistic regression were performed by using SPSS 20.

Results:

The mean value of anthropometric measurements like height, weight and MUAC were considerably lower but the mean value of HC, WC, BSF, TSF, SSF and SISF were slightly higher. Age specific variations in different anthropometric variables were also observed in present study. Some derived indices like WHR, WHtR, TUA and UFA were slightly higher among Rajbanshi female individuals. In present study body composition indices like PBF%, FM, FFM and FFMI had lower value. The central adiposity measured by WC, WHR and WHtR were above the cutoff values. It is indicated that some people had higher risk of adiposity related health issues. The result of Pearson correlation analysis between different anthropometric variables showed that all variables were significantly correlated with each other ($p<0.05$).The result of linear correlation of age on different anthropometric variables reported that age is significantly co-related with height, weight, WHR, TUA, UMA, BFMA and FMM ($P<0.05$). The result of linear regression of BMI on different anthropometric variables indicated that all variables were significantly co-related with BMI.

The prevalence of undernutrition based on BMI classification (WHO, 1995) among Rajbanshi women was high (39.88%) and most of the individuals were suffered from CED grade I level of undernutrition. And the prevalence was high among early (18-29 years) and later (50-94 years) aged women. When nutritional status assessed by MUAC (James et al., 1995), the observed prevalence was 37.00%. In present study the prevalence of undernutrion was 23.75%, based on BMI measure in combination with MUAC.

The overall prevalence of overweight and obesity was 15.62% and 9.78% respectively based on BMI classification (WHO, 1995). The prevalence of regional adiposity was 52.37%, 96.63% and 68.37% respectively when adiposity measured by WC, WHR and WHtR. The prevalence of regional adiposity was high among middle aged women (30-49 years). Fat individuals were less in present study. Only 16.23% (based on Neiman classification, 1995) and 12.88% individuals (based on Muth classification, 2009) have identified with over fat status. Thus amount of risk factors associated with PBF% was less in number in present study. A logistic regression analysis was performed to find the effect of different socioeconomic, demographic and lifestyle variables on underweight among Rajbanshi women population. The association of BMI, WHR and WHtR with different variables showed a significant influence on being underweight and overweight. The result of this analysis indicated that family type, source of water supply, toilet type, house type, family occupation, living conditions and low socioeconomic status of family were significantly associated with underweight ($p<0.05$).

The association of high WC, HC, WHR, WHtR with different socioeconomic, demographic and life style variables showed a significant effect on high adiposity among Rajbanshi female population. Present study also reported the mean ages at menarche and menopause among Rajbanshi individuals were 12.42 years and 48 years respectively.

Conclusion:

According to the findings of this study, a large number of adult Rajbanshi women in North Bengal have received schooling and have become educated, but they still suffer from undernutrition. The prevalence of undernutrition in this population was higher than the WHO cutoff values (1995). This research also found a strong relation between

a low BMI and poor socioeconomic status. In present study there is a high frequency of normal weight but centrally obese individuals who are normal by BMI but defined as obese by WC, WHR and WHtR. Thus present study population show a high risk of regional adiposity related co-morbidity and mortalities along with diseases related with low BMI. This nutritional disease is now more common through worldwide which are commonly known as double burden of malnutrition (DBM).