Nutritional Status of Pregnant Women Using Mid-Upper Arm Circumference and Skin Fold Thickness

JAYDIP SEN, KAPIL MITRA & SIMA DEY

Department of Anthropology, University of North Bengal, Raja Rammohunpur, District: Darjeeling, West Bengal 734013
E-mail: jaydipsen@rediffmail.com

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ABSTRACT: In the developing countries, such as India, the assessment of nutritional status of pregnant women assumes prime importance. The present investigation tries to document the changes in mid-upper arm circumference (MUAC), biceps skin fold (BSF) and triceps skin fold (TSF) to observe whether such measurements can assess the nutritional status of pregnant women. The present cross-sectional investigation was conducted among 120 pregnant women belonging to the Bengali Muslim population. The measurements taken were MUAC, BSF and TSF. There were significant statistical differences in MUAC, BSF and TSF with the length of pregnancy.

INTRODUCTION

The use of mid-upper arm circumference (MUAC), biceps skin fold (BSF) and triceps skin fold (TSF) for assessing nutritional status of adults is well established (Bose et al., 2006a; 2006b). Studies have also utilized MUAC to determine the nutritional status of pregnant women (Agarwal et al., 1987). However, studies dealing with TSF and BSF among pregnant women are scarce in the literature (Gamar et al., 1996). The main advantages of using MUAC, BSF and TSF are that they are easy to record, non-invasive, not expensive, requiring minimum equipment and can be taken in field situations. As no laboratory setup is required, the assessment of nutritional status is immediate. The present investigation tries to aim whether such measurements can be suited to assess the nutritional status of pregnant women. The present investigation further tries to document the quantum of change in these variables during the pregnancy period.

MATERIALS AND METHODS

The present cross-sectional investigation was conducted among 120 pregnant women belonging to the Bengalee Muslim population (BMP) (Das Chaudhuri, 93), who visited the Maternity OPD of the Baruipur Sub-Divisional Hospital, Baruipur, West Bengal during the period June-July 2007. All necessary permissions were obtained from the Hospital authorities. The subjects were made to understand the nature of the investigation, prior to recording the measurements (MUAC, BSF and TSF).

All the women belonged to the age group 18-30 years and to middle socio-economic class based on family income (approximately US$ 500 per month) and family size (4-6 members). They were either pregnant with their first or second child. In case of the latter, not a single one of them was breast-feeding their first child. The common foods being consumed by them were rice, cereals, vegetables and fish protein. The women were at 8 weeks, 12 weeks, 16 weeks, 20 weeks, 24 weeks, 28 weeks, 32 weeks and 36 weeks of pregnancy.
approaching full term pregnancy. The gestational age was calculated from the hospital OPD card.

The three measurements (MUAC, BSF and TSF) were taken on the left side of each woman. A total of 3 simultaneous measurements for each were taken and the mean recorded. The arm circumference was measured with the help of a measuring tape to the nearest 0.10 cm on the mid-point of upper arm (between acromion and radiale) of each individual. The skin folds were taken with the help of a skin-fold caliper with the arm hanging by the side in the anatomical position.

Nutritional status was evaluated using the following internationally recommended cut-off points of MUAC by James et al. (1994). The statistical analyses include the use of mean and standard deviation to compute MUAC, BSF and TSF. Correlations were utilized to understand the relationship between these three measurements. The dependency of MUAC on BSF and TSF was observed with the help of linear regressions. One-way analysis of variance (ANOVA) was observed that the differences in mean MUAC, mean BSF and mean TSF of the pregnant women from 8 weeks to approaching full term were statistically significant (p < 0.05). It can be thus concluded that there was an increase in all these measures during the pregnancy period. Moreover, this increase has been generally simultaneous in all the three variables.

RESULTS

The mean MUAC of the BMP pregnant women (n = 120) was 21.9 mm (sd = 2.55). The mean BSF was 1.05 mm (sd = 0.24) and the mean TSF was 1.56 mm (sd = 0.50). The circumference measure and the two skin fold measures were significantly correlated with each other (p<0.05). The correlation coefficient was 0.50 for MUAC vs TSF, 0.39 for MUAC vs BSF and 0.21 for BSF vs TSF.

Using ANOVA, it was further determined that there were significant statistical differences (p < 0.05) in MUAC, BSF and TSF with the length of pregnancy. The respective F-ratios were F = 2.12, df = 7,112, F = 3.62, df = 7,112 and F=2.78, df = 7,112.

The mean MUAC of the BMP pregnant women was well below the internationally accepted MUAC cut-off points of malnutrition for women. Hence, it may be initially concluded that these women suffered from malnutrition and an immediate nutritional intervention therefore, becomes essential. No such cut-off points are available in the literature for BSF and TSF.

Using ANOVA, it was observed that the differences in mean MUAC, mean BSF and mean TSF of the pregnant women from 8 weeks to approaching full term were statistically significant (p < 0.05). It can be thus concluded that there was an increase in all these measures during the pregnancy period. Moreover, this increase has been generally simultaneous in all the three variables.

DISCUSSION

In general, based on currently accepted cut-off points accepted by the World Health organization (WHO), the mean MUAC observed in the present investigation indicates that these Muslim pregnant women suffer from mal-nutrition. Hence, immediate nutritional intervention is necessary. The results further indicate that there was a general increase in MUAC from 8 weeks to full term of gestation, which is in general agreement with the observations made by Taggart et al. ('67). There was also a tendency of an increase in BSF during this period. It was further observed that TSF decreased during the period of 28 weeks to 32 weeks, and subsequently increased from 32 weeks to approaching full term, although (Adair et al., '83) has reported a decrease in TSF during the last trimester. On the contrary, (Zekan et al., '98) observed that such changes in skin fold thickness were neither proportional nor simultaneous during pregnancy. Hence, all these studies including the present one have yet to reported consistent results with regards to the quantum of change in these variables during the pregnancy period.

The results of the present investigation also indicate that there was a positive association between MUAC, BSF and TSF. Statistically significant ‘r’ values have been obtained when correlation analysis was performed between these three variables. No such correlations were done in the earlier studies.

A major point of concern here relates to the presence of an oedema visible on the extremities during pregnancy. Fluid retention and formation of oedema is common in normal pregnancy and the total body water increases by 6 to 8 liters, 4 to 6 liters of which are extra cellular and the rest 2 to 3 liters are interstitial. This is partly due to the growth and
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The development of the fetus and partly to water retention by the mother. The major endocrine changes that occur during the pregnancy period are the causes of this oedema. Moreover, this retention of water is brought about by the hydrostatic element of osmotic water regulation that is primarily under fetal control. Also during pregnancy, there is an expansion of plasma and extracellular fluid volume, increased cardiac output, and increased glomerular filtration rate and renal blood flow. These in turn lead to primary renal sodium and water retention with secondary enlargement of the body. This is a major issue while recording MUAC measurements among pregnant women.

Even though the studies involving MUAC and skin fold thickness among pregnant women may bear great significance, the interpretation of such measurements must be done with caution. Further studies are needed to understand the true nature of changes in MUAC and skin fold thickness during the pregnancy period. Moreover, ethnic differences in MUAC have not been sufficiently studied to determine whether a universal cut-off point for MUAC could be used for all human groups. Another important point is that no such cut-off points exist for TSF and BSF. Finally the question of oedema needs to be addressed.

REFERENCES CITED


