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Original Research Article

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Equity and disparity in somatotype characteristics of Muslim women of two different places with similar socio-economic but different sociocultural practice

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ABSTRACT

Background: Somatotype characteristics of 76 muslim women of same socio-economic status were studied from two slum areas of two different places, one in a metropolitan city and one in a suburban area in West Bengal. Women were selected on convenient way from two slum areas, one in Kolkata, the metropolitan city and one in Contai, suburban town of Medinipur district of West Bengal.

Methods: Anthropometric measurement were taken for somatotyping. All measurements for each subject was taken in the same day to avoid Technical Error of Measurement (TEM).

Results: All women were aged in between 22 and 38 year. Average height for the muslim women from Kolkata slum area was 150.7 (± 3.5) cm and that of Contai was 151.6 (± 6.5) cm. Average body weight of the muslim women form the Kolkata slum area was 59.7 (± 6.0) kg whereas that of Contai slum area was 55.3 (± 11.6) kg. The body type of Muslim women from Kolkata slum area was Mesomorphic Endomorph and that of Contai slum area was also Mesomorphic Endomorph. But the endomorph component of Muslim women from Kolkata slum area was 6.4 (± 0.5) which was significantly higher from 5.9 (± 0.8) Endomorph component of women from Contai slum area. Similarly mesomorph component of Muslim women from Contai slum area was 3.9(± 0.8) which was significantly higher than 3.5(± 0.4) mesomorph component of Muslim women from Kolkata slum area. No significant difference was observed in Ectomorph components which were 1.7 (± 0.9) and 1.5 (± 0.9) for Kolkata and Contai respectively.

Conclusions: Disparity was found in weight, endomorphy and mesomorphy but equity was found in height and ectomorphy. Equity in height and ectomorphy were due to same ethnical group but disparity in body weight, fattiness and muscularity were due to socio-cultural differences of two places where they live.

Keywords: Adiposity, Muslim women, Somatotype, Socio-culture

INTRODUCTION

Somatotype is the classification of human body shape and size. Somatotype expresses the human body into three number rating components which are endomorph, mesomorph and ectomorph. Endomorph component represents the relative fattiness or fatness of the body,

Mesomorph represents the muscularity and Ectomorph component represent linearity. The components are represented in order of Endomorph-Mesomorph-Ectomorph and expressed in numbers from 0.5 to 9. Health-Carter method is the method for calculating somatotype. Adiposity increases basically when intake of calorie crosses over the required amount body needed and

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body gain weight in sedentary population. On the other hand any change in muscularity reflects in Mesomorphy component. Muscualrty increases due to muscular activities in sedentary population. Thus, though somatootype characteristics are genetic but activities and nutrition can change the somatotype characteristics. The present study was designed to find out if there were any similarity or dissimilarity in body size and shape of women of two places with identical culture, ethnicity, religion, socio-economic status but different socio-cultures, ecology and geography.

METHODS

76 Bengali muslim women of two different places were studied randomly. 42 Bengali Muslim women were measureds form a slum at Dumdum Cantonment of Kolkata Metropolitan city area and 34 Bengali Muslim women were measured from a slum at Contai town, a small town of Purba Medinipur district of West Bengal. The socio-economic status was same for both groups but socio-culture practice was different. Both groups were from low socio-economic status.

Research ethics

As the study deals with human participants, the research proposal was submitted for ethical clearance to the respective Governmental authority and consent were collected from the participant and their families prior to the actual commencement of the study.

Anthropometrical measurements

All anthropometric measurements were taken on the same day for each subject in same session to avoid the technical error of measurement (TEM). Measurement taken by two internationally accredited anthropometrist, accredited by International Society for the Advancement of Kinanthropometry (ISAK). Manual of International Society for The Advancement of Kinathropometry was followed to measure the anthropometric parameters. Stature was measured with a Stadiometer and body mass was measured with an electronic weighing scale.2 Harpenden Skinfold caliper (Baty, UK) was used to measure skinfold thicknesses. For girth measurement an anthropometric tape (CESCORF, Brazil) was used. Sliding caliper (CESCORF) was used to measure bone diameter.

Following parameters were measured according to ISAK manual 2 and Carter 3 for the calculation of somatotype. 1,4

Stature (height)

Height was taken the stretched height against a stadiometer with subject's head in the Frankfort plane (the upper border of the ear opening and the lower border of the eye socket on a horizontal line), and the heels together while holding a full breadth.

Body mass (weight)

Body mass was taken with the subject wearing minimal clothing to the nearest tenth of a kilogram. A correction is made for clothing so that nude weight is used in subsequent calculations.

Skinfolds

A fold of skin and subcutaneous tissue was firmly raised between thumb and forefinger of the left hand and away from the underlying muscle at the marked site. Edge of the Skinfold calliper branches were placed 1 cm below the marked site where two fingers of the left hand were fixed and allowed them to exert full pressure for 2 sec on the thickness of fold and reading was taken. All skinfolds were taken on the right side of the body. The subject stands relaxed in anatomical position, except for the calf skinfold, which was taken putting the subject's leg seated.

Triceps skinfold

With the subject's arm hanging loosely in the anatomical position, a fold was raised at the back of the arm at a level halfway on a line connecting the acromion and the olecranon processes.²

Subscapular skinfold

The subscapular skinfold was raised on a line from the inferior angle of the scapula in a direction that is obliquely downwards and laterally at 45 degrees.²

Supraspinale skinfold

The fold was raised 5-7 cm (depending on the size of the subject) above the anterior the superior iliac spine on a line to the anterior axillary border and on a diagonal line going downwards and medially at 45 degrees. This skinfold was formerly called suprailiac, or anterior suprailiac. The name has been changed to distinguish it from other skinfolds called "suprailiac", but taken at different locations.³

Calf skinfold

A vertical skinfold was raised on the medial side of the leg, at the level of the maximum girth oaf the calf.

Biepicondylar breadth of the humerus

This is the width between the medial and lateral epicondyles of the humerus, with the shoulder and elbow flexed to 90 degrees. The calliper was applied at an angle approximately bisecting the angle of the elbow with firm pressure on the crossbars in order to compress the subcutaneous tissue.

Biepicondylar breadth of the femur

This is the greatest distance between the lateral and medial epicondyles of the femur. Subject was seated on a tool with knee bent at a right angle and the diameter was measured with firm pressure on the crossbar to compress the subcutaneous tissue. Upper arm girth, elbow flexed and tensed, right. The subject flexed the shoulder to 90 degrees and the elbow to 45 degrees, clenches the hand, and maximally contracts the elbow flexors and extensors. Measurement at the greatest girth of the arm was taken.

Calf girth, right

The subject stood with feet slightly apart. The tape was placed around the calf and measure the maximum circumference.

Somatotype

Somatotype rating was done by Heath - Carter method 1. The following equations were used for calculating somatotype

Endomorphy = $-0.7182 + 0.1451 \times \Sigma SF - 0.00068 \times \Sigma SF2 + 0.0000014 \times \Sigma SF3$

where $\Sigma SF = (sum of triceps, subscapular and supraspinale skinfolds) multiplied by (170.18/height in cm).$

Mesomorphy = $0.858 \times$ Humerus breadth + $0.601 \times$ Femur breadth + $0.188 \times$ corrected arm girth + $0.161 \times$ corrected Calf girth — Height \times 0.131 + 4.5

Three different equations use for calculating ectomorphy according to the Height -Weight ratio (HWR)

If HaWR is greater than or equal to 40.75 then, Ectomorphy = $0.732 \times HWR - 28.58$

If HWR is less than 40.75 and greater than 38.25 then, Ectomorphy = $0.463 \times HWR - 17.63$

If HWR is equal to or less than 38.25 then, Ectomorphy = 0.1

Socio-economic status

Socioeconomic status was assessed by Kuppuswamy scale 5 revised by Shaikh et al.⁶ Kuppuswami scale was a widely used method to measure the socio-economic status of an individual in a society. It was based on three variables namely education, occupation and income. Kuppuswami scale was modified later on, where the education, occupation of the head of the family and income per capita per month was used.

This scale consists of composite scores of education and occupation of the head of the family along with monthly income from all the sources of the family. It yields a score of 3 - 29 and it classifies the study population into high, middle and low socio economic status (SES). Of the three variables, education and occupation of the head of the household do not change frequently with time. However, the steady inflation and the resultant devaluation of the rupee necessitate periodic revisions of the income variable. The changes in the income scale are proportional to the change in AICPI. The AICPI values are interpreted with reference to a particular base year. The previous base years were 1960, 1982 and at present 2016 year was considered as base year.

RESULTS

Muslim women from both areas were in between 22 to 38 years old with an average age of $31.1~(\pm4.3)$ and $30.8~(\pm4)$ for the Kolkata and Contai areas respectively where the differences were non significant. Similarly non significant differences were also observed in body height when two groups were compared. The average heights observed in the present study for both groups were very similar with other studies on Muslim Bengali women. Women from Kolkata and women from Contai were from same Bengali Muslim ethnic group from identical socio economic status. That might be the reason for non-significant difference in height.

Table 1: Physical characteristics and somatotype characteristics of muslim women form Kolkata and Contai with significant level (ns= non-significant, sd=standard deviation).

Physical characteristics	Muslim women from Kolkata			Muslim women from Contai			't' value	Significant level at p<0.05
	Mean	±SD	Range	Mean	±SD	Range		level at p<0.05
Age (year)	31.1	4.3	22-37	30.8	4.0	23-38	0.286	NS
Height (cm)	150.7	3.5	143.3-156.3	151.6	6.5	137-162.2	-0.657	NS
Weight (kg)	59.7	6.0	48-69	55.3	11.6	35 .5-90.0	1.813	Significant
Endomorphy	6.4	0.5	5.3-7.5	5.9	0.8	4.4-7.5	2.649	Significant
Mesomorphy	3.5	0.4	2.2-4.6	3.9	0.8	2.6-5.0	2.544	Significant
Ectomorphy	1.7	0.9	0.8-5.0	1.5	0.9	0.5-3.2	0.640	NS

The muslim women from both areas were with msomorphic endomorph body type though average endomorphic component of the muslim women from Kolkata was more than the endomorphic component of the muslim women from Contai area indicating more adiposity in Kolkata Muslim women than the Muslim women from Contai. On the other hand, average mesomorphy component of the Muslim women from the Contai area was more than the mesomorphy component of Muslim women from Kolkata indicating more average muscularity in Muslim women of Contai (Table 1).

Both groups of Muslim were in endomorph zone of the Somatochart indicating adiposity for both groups. But the Muslim women from Kolkata area was more endomorphic than the Muslim women from the Contai area indicating more adiposity in Kolkata Muslim women. The somatochart also indicated presence of more muscle in Muslim women of Contai area than the Muslim women from Kolkata though both group had less muscularity (Figure 1).

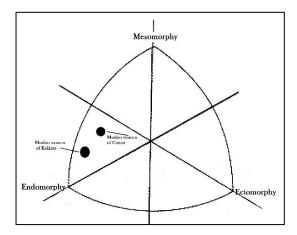


Figure 1: Average somatotype of Bengali Muslim women from Kolkata and Contai.

The Muslim women from Kolkata area were more homogenous with endomorphic character whereas the Muslim women from Contai area were heterogeneous with a range of muscularity from lower to higher (Figure 2).

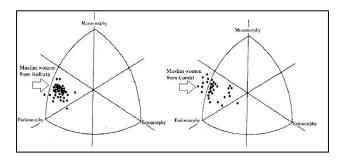


Figure 2: Individual somatotype characteristics of Muslim women from Kolkata and Contai.

DISCUSSION

The somatotype character is a genetically influenced character but it can be changed by different factors like physical activities, socio-economic as well as sociocultural status and nutrition.⁴ In the present study Mesomorphic endomorph body type was observed for both groups with average somatotype of 6.4 (±0.5)- $3.5(\pm0.4)-1.7(\pm0.9)$ and $5.9(\pm0.8)-3.9(\pm0.8)-1.5(\pm0.9)$ for Kolkata and Contai Muslim women respectively (Table 1). Endomorph component was significantly higher in Muslim women from Kolkata slum area than that of the Muslim women from Contai (Table 1, Figure 1, Figure 2). Thus, adiposity of Muslim women from Kolkata were more than the Muslim women from Contai slum area (Figure Figure 1, Figure 2). High adiposity of Muslim women from Kolkata slum area was also reflected in their body weight. Average 59.7 (±6.0) kg body weight was observed for the Muslim women from Kolkata slum areas whereas that of the Muslim women from Contai slum area was 55.3 (±11.6) kg. The difference was statistically significant (Table 1).

Significant differences in endomorphy component as well as in body weight might be due to consumption of sufficient food by the women from slum areas of Kolkata compare to their counterparts in Contai. This differences were due to different socio-cultural practices between a Metro city culture and suburban culture. The women from Kolkata slums live in a place which are surrounded by families with high socio-economic status. So slum women of Kolkata work in those rich houses as domestic helper for whole day. The socio-cultural practice of Kolkata Metro city gave the opportunity to have sufficient food to eat during their stay at their workplace. Culture allowed the domestic helpers to have similar food to share with the families where they work for whole day which is absent in rural areas. In suburban areas like Contai, women of slum areas works either as house maid in nearby houses or work on the paddy fields or other physical labor jobs where owners of the houses or field owners are from middle class society with medium or low income group and don't provide foods to their workers. Pathak et al, Adhikari et al worked on Bengali women from slum areas in Kolkata Metro city and found overweight with excess body fat. 10,11 Their study revealed that the overweight and excess body fat were due to consumption of excess food, where most of the women from slum areas worked in nearby houses of rich families and had sufficient food while working in those houses for whole day.

In the present study Muslim women of Contai slum area were more muscular than their Kolkata counterparts. Average mesomorphy component of Muslim women from Contai was 3.9 ± 0.8 , whereas that of Kolkata slum women was 3.5 ± 0.4 which were significantly different (Table 1, Figure 1, Figure 2). This significant difference in mesomorph component was also due to the difference

in socio-cultural status. In the rural areas women who works as house maid or field work or physical labor have to do more physical work compare to their counterparts in metro cities. Thus more physical activities increase the mesomorph component of the rural women. Increase in muscularity due to field work or labor work in rural areas was supported by the study of Adhikari et al and Dash et al on aborigine Santal women of same geographical areas where older women possessed more muscularity than the young girls due to more involvement of old women in field or labor works.¹³

Socio-economic status also had an impact on body type. In the present study, Muslim women from both areas were from low socio-economic status which was reflected in their moderate muscle mass according to Heath-Carter classification.4 The average mesomorph component for Muslim women from Kolkata slums was 3.5±0.4 (range 2.2-4.6) and that of Muslim women from Contai slum was 3.9±0.8 (range 2.6-5). Thus, all women were with moderate muscle only. On the other hand, as because both groups were from same ethnic group with similar geographical environment, ectomorphy components of both groups were very similar. No significant difference was observed between the two groups where Kolkata women possessed an average value of 1.7±0.9 for ectomorphy and Contai women possessed an average value of 1.5 ± 0.9 (Table 1).

CONCLUSION

Both groups were of same ethnical groups with similar religion and socio-economic status but with different socio-cultural practice. Hence, socio-cultural practice caused dissimilarities in body weight, endomorphy and mesomorphy component whereas but socio-economic culture caused similarities in stature and ectomorphy component. Thus from the present study it could be concluded that socio-cultural practice had an impact on somatotype besides socio-economic and ethnical status.

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Institutional Ethics Committee

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