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Somatotype traits of college students of urban areas near Kolkata , West Bengal, India

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ABSTRACT

A study was done as a part of Master's project for finding out the trait of body type of urban college students near Kolkata, an Indian Metropolitan city. 124 college students (57 boys and 67 girls) were studied from two colleges of urban areas near Kolkata. The male students were 19.2(±1.4) year old in average whereas that of female students was 18.6 (±0.9). Average 167.2 (±6.8) cm tall boys were significantly taller than the girls' height of 155.2(±6.2) cm in average.Significantly less body weight of 54.1(±10) kg in average was observed for the girl students than the average weight of 63.1 (12.3) kg for the boys. Both the groups were Mesomorphic endomorph body type with average values of 5.4(±1.8)-4.0(±1.6)-2.5(±1.7) and 7.4(±1.8)-3.9(±1.4)-2.0(±1.7) for boys and girls respectively. Though both the groups were Mesomorphic endomorph but the girls were more endomorphic than the boys when component values were considered in numerical number. High average adiposity was observed in the girls compare to the boys with moderate adiposity in average. Both the boys and girls were with moderate muscularity with very close mesomorph component indicating similar physical activities or similar intake of protein by both groups. A significant number of boys (29.8 %) and girls (25.4 %) were with low muscularity which might be due to poor socioeconomic condition of the family where they belong. 12.4 % boys and 10.4 % girls were with very poor muscularity which might be due to poor protein intake during their growing period or may be due to intake of less protein by their mothers during pregnancy which may have negative impact on the development of fetus resulting a child with poor mesomorph component continues during the adulthood. But for final conclusion more studies are required.

Key words: *Somatotype, College students, Endomorph, Mesomorph, Ectomorph, Genotype*

INTRODUCTION

Somatotype is the interaction between genotype and phenotype characteristics of a human body which can be defined as the shape and size of person (Heath and Carter 1990, Silventoinen 2020). Three components of somatotype which represent the fat ness, muscularity and linearity of a human body are Endomorph, Mesomorph and Ectomorph components respectively. Identifying somatotype is an important part of a population study to find out the population's

health and wellness as somatotype indicates the state of adiposity and muscularity along with linearity of the body. College students are the large population of a society which reflects the health trait of that society where they belong. Very few works had been done on the somatotype of college students in India. In India, 1st time Somatotype study on students was done by Berry and Deshmukh in 1964 from Nagpur and surrounding areas but they use Sheldon's Photoscopic somatotype method as Heath and Carter method was introduced only after 1964. Later on most of the Somatotype works in India was on sedentary population or athletic populations (Singh 1981, Singh et al 1988, 2007, Dkhar 1996, Saha 2013, 2014, 2015, Singh 2013, Chatterjee et al. 2016, Gill 2018). Absence of sufficient references on sedentary college going students of suburban areas of Kolkata created a necessity of a project on them. Hence, the present study was aimed to find out the trait of somatotype characteristics of college students of urban areas of North 24 Paraganas near Kolkata.

MATERIAL AND METHODS:

Population under study:

The study had considered 124 students from urban areas near Kolkata with 59 students from Bramhananda Kesab Chandra College, Dunlop and 65 students from Mrinalini Dutta Mahavidyapith, Birati. Out of which 57 individuals are male and 67 individuals are female. The participants were from the age group of 17-21years having no physical deformity or recent illness history as well as non-pregnant (in case of female). Both the colleges are selected because of the mixed economical and caste to establish an overall scenario about Somatotype of college going students of urban area.

Research Ethics:

To pursue the permission for data collection the researcher contacted with the principals from the above mentioned colleges. With proper valid certifications from supervisor and mentioning all the format of research it was consolidated that there were no ethical issues for collecting data from the students. The data collection had done only with oral consent of the participants and written documentation as permission from the principal's desk.

Anthropometric Measurements:

All the measurements had been done by following the standard of International Society for Advancement of Kinanthropometry (ISAK) 2019 manual. Investigators took measurements from right side as all the participants are flexible to use their right part of the body.

To measure the Height the investigators used Stadiometre and to measure the Weight digital weighing machine had used. Harpenden Skinfold Caliper (Baty International (UK) had been

used to measure Skinfold thickness. CESCORF (Brazil) Sliding caliper was used to measure Bi-epicondyler bone breadth (Humerus and Femur). CESCORF (Brazil) Anthropometric Tape was used to measure girths.

For stature closest mm reading, for weight the accurate, for skinfolds closest 0.1mm, for girth 0.5 mm, and for breadth measurements nearest 0.5mm had been taken.

Stature:

The Standing Height was measured by Stadiometre in a Stretched Standing Position. The Orbitale-Porion Line was maintained for Frankfort Horizon of face and the heels joint together to stand in anatomical position of a participant.

Body Mass (Weight):

The participants were asked to come with a least clothing for weighing. The approximate nude weight had been taken by nullify the clothing weight (10^{th} of a kg).

Skinfold Thickness Measurements:

To measure the skinfold thickness the investigators used the landmarks in reference to the ISAK (2019) manual. The subcutaneous fat layer was pulled by detaching it from the muscle fibers on the prescribed landmarks. The folds were made in a manner like claws by thumb and the index finger of left hand to exert the perfect pressure and the caliper was pushed 1cm lower than the fold. The reading is to be taken within 2 sec.

1. Triceps Skinfold:

The Triceps skinfold was taken on the point where Acromiale-Radiale line crossed the Mid Upper Arm Circumference line on the triceps muscle as a vertical skinfold. The volunteers were asked to stand in relaxed anatomical position.

2. Subscapular Skinfold:

The Subscapular skinfold was taken at 2cm obliquely downward of inferior angle of Scapula bone. The fold was of a diagonal kind.

3. Supraspinale Skinfold:

“Supraspinale skinfold. Raise the fold 5-7 cm (depending on the size of the subject) above the anterior 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.)” (Carter and Heath 1990)

4. Calf Skinfold:

The Calf skinfold was taken as a vertical skinfold on the point where the medial line cross the maximum circumference (calf girth) line.

5. Bi-epicondyler Breadth of the Humerus:

Bi-epicondyler Breadth of the Humerus (right) was taken as the width between Medial and Lateral epicondyler process of right Humerus. The volunteers were asked to flex the right hand (not tensed) to make a right angle. The investigator putted the sliding caliper on the prescribed site and compressed it in order to avoid the effect of subcutaneous tissue.

6. Bi-epicondyler Breadth of the Femur:

Bi-epicondyler Breadth of the Femur (right) was taken as the width between Medial and Lateral epicondyler process of the right femur. The volunteers were asked to be seated on a low bench to make a right angle from knee. The investigator putted the sliding caliper on the prescribed site and compressed in order to nullify the effect of subcutaneous tissue.

7. Upper Arm Girth (Flexed and Tensed):

The flexed and tensed Upper arm girth (right) was measured on the maximum circumference on biceps muscle (middle of the acromiale-radiale line) in a maximum tensed condition of it. The volunteers were asked to make the shoulder 90 degree and 45 degree with the elbow.

8. Calf Girth:

The calf girth was taken as the maximum girth over the calf muscle. The volunteers were asked to stand in a position with legs slightly apart.

Somatotyping Method:

The present study had followed Heath-Carter Somatotyping rating method (1967). The method is on the basis of the following equations.

Endomorphy = ─ 0.7182 + 0.1451 × ΣSF ─ 0.00068 × ΣSF2 + 0.0000014 × ΣSF3
Where ΣSF = (sum of triceps, subscapular and supraspinale skinfolds) multiplied by (170.18/height in cm).

Mesomorphy = 0.858 × Humerus breadth + 0.601 × Femur breadth + 0.188 × corrected arm girth + 0.161 × corrected Calf girth ─ Height × 0.131 + 4.5

Ectomorphy: Three different equations use for calculating ectomorphy according to the Height -Weight ratio (HWR):
If HWR is greater than or equal to 40.75 then, Ectomorphy = 0.732 × HWR ─ 28.58
If HWR is less than 40.75 and greater than 38.25 then, Ectomorphy = 0.463 × HWR ─ 17.63
If HWR is equal to or less than 38.25 then, Ectomorphy = 0.1

Statistical analysis:

All the statistical analyses had been done by SPSS 25.0. And all the tabulation had been done by MS Excel, 2016. A p-value less than 0.05 was considered as statistically significant.

RESULTS

Table 1: Physical and somatotype characteristics of male (n=57) and female (n=67) college students.

Endo = Endomorphy, Meso= Mesomorphy, Ecto=Ectomorphy; * = significant at P<0.05

	Sex	Age (yr)	Height (cm)	Weight (cm)	Endo	Meso	Ecto
Mean	M	19.2	167.2	63.1	5.4	4.0	2.5
	F	18.6	155.2	54.1	7.4	3.9	2.0
SD	M	1.4	6.8	12.3	1.8	1.6	1.7
	F	0.9	6.2	10.0	1.8	1.4	1.7
Min	M	17	149.0	45.3	2.4	1.2	0.1
	F	17	142.1	31.3	2.7	1.5	0.1
Max	M	24	186.9	115.0	10.1	7.4	6.8
	F	21	172.0	83.6	11.2	7.8	8.3
t-value			10.3*	4.5*	6.166*	0.359	1.632

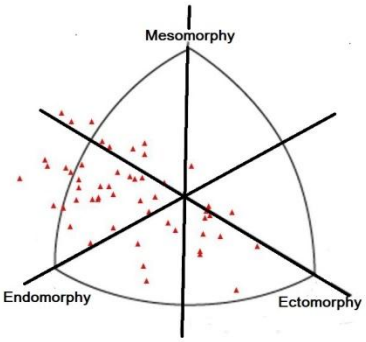

Fig 1: Somatotype distribution of the Male students of the present study.

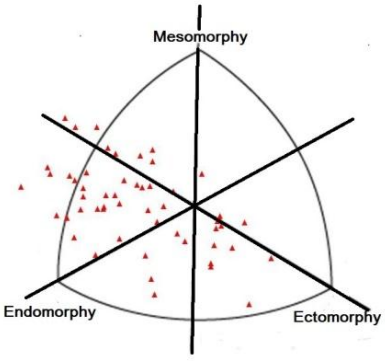

Fig 2: Somatotype distribution of the Female students of the present study.

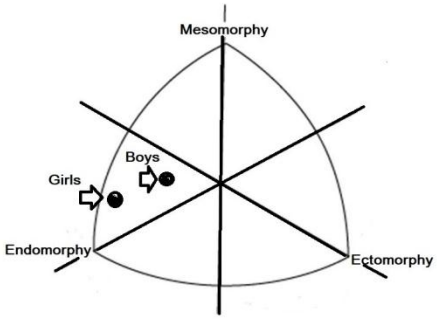

Fig 3: Average Somatype of male and female students of the present study.

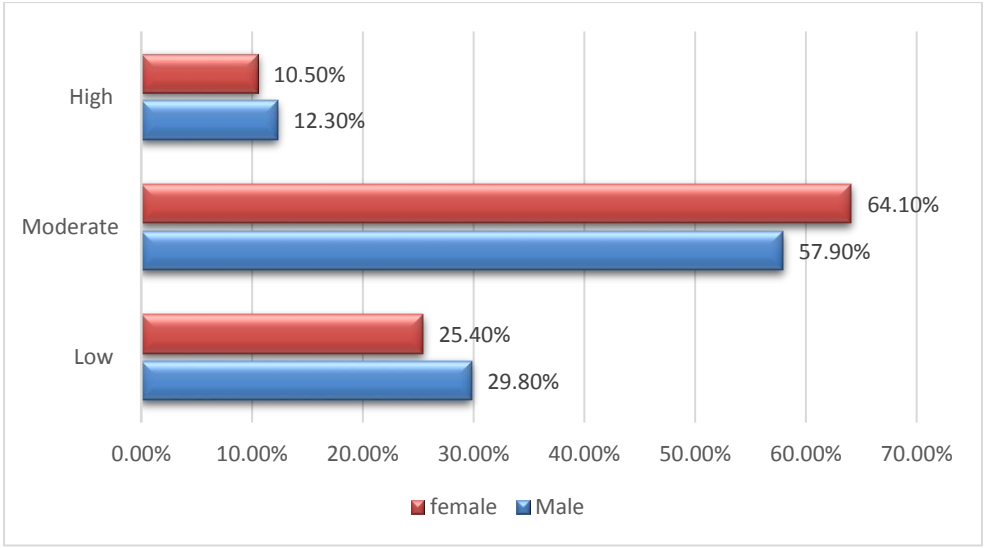

Fig 4: Percentage of Muscularity present in the Students.

DISCUSSION

Somatotype represents the body shape and size of a human body and somatotype character changes by different factors like nutrition, exercises and environment both social and cultural set up as somatotype is a combination of genotype and phenotype character (Carter and Heath 1990). In the present study average somatotype category of the boys was 5.4(±1.8)-4.0(±1.6)-2.5(±1.7) whereas that of female students was 7.4(±1.8)-3.9(±1.4)-2(±1.7). Both boys and girls were Mesomorphic endomorph category in average (Fig 1, Fig 2, Fig 3)

Endomorphy component represent the fattiness of human body. In the present study girls were more endomorphic than the boys as expected. Average endomorphy component for the Girls was 7.4 (±1.8), whereas that of boys was 5.4 (±1.8). Thus, girls were with high adiposity

whereas the boys were with moderate adiposity in average. But the range of endomorphy component of both groups was very close (Table 1, Fig 1, Fig 2, Fig 3). For the boys the range of endomophy component was 2.4 to 10.1 whereas that of girls was 2.7 to 11.2. Thus prevalence of adiposity in boys and girls were very similar which indicated similar food intake and similar fashion of energy expenditure. Generally boys were involved in different physical activities in their daily life compare to the girls in Bengali urban societies. Thus boys were expecting less fattiness compare to their female counterparts. But in the present study though the average value for endomorphy component was less in boys but prevalence were same both in male and females. This might be due to involvement of both boys and girls in similar intensity of physical activities with different nature.

Mesomorph component indicates the muscularity of a person. In the present study, both boys and girls had the same values which were 4.0 (±1.6) for boys and 3.9(±1.4) for girls (Table 1). The ranges were also very similar which were 1.2 -7.4 and 1.5-7.8 for boys and girls respectively. Both boys and girls were with moderate muscularity in average according to Carter and Heath (1990) classification. But when individually analyzed, both boys and girls had very low muscularity as well as high muscularity with a minimum value of 1.2 and maximum value 7.8 (Fig 1, Fig 2, Fig 3). Moderate muscularity was observed in 57.9 % boys, followed by 29.8 % boys with low muscularity and 12.3 % boys with high muscularity. On the other hand, 64.3 % female students were with moderate muscularity, 25.4 % were with low muscularity and 10.5% with high muscularity. Thus in the present study most of the boys and girls were with moderate muscularity. Thus both boys and girls were involved in same level of physical activities which was also reflected in similar endomorphy components discussed earlier. A sufficient number of boys (29.8 %) and girls (25.4 %) were with low muscularity which might be due to poor socioeconomic condition of the family where they belong. 12.4 % boys and 10.4 % girls were with very poor muscularity (below 2 muscularity component). This might be due to poor protein intake during the growing period or genetic. In some community, there is a traditional beliefs till persists where pregnant women are not allowed to take any animal protein like meat, egg, chicken with a belief that animal protein will harm the fetus (Rao 1985, Nag 1994, Catherin et al 2015). Thus absence of protein in mother's food may affect the development of fetus in the womb resulting a child with poor Genotype mesomorph component which remain unchanged still adulthood as different studies revealed that the neonates of most poorly nourished mothers, became more growth retarded with less number of muscle fibers (Naeye et al 1973, Kennaugh 1987, Dwyer et al 1994, Battaglia and Thureen, 1997)

CONCLUSION

Thus from the above discussion it could be concluded that most of the college students in urban areas of Kolkata were mesomorphic endomorph. A large number of students were with very low muscularity. There might be two important factors besides other factors which caused low muscularity in the boys and girls. One might be insufficient intake of protein during childhood and adolescent period which caused less muscle mass. The other factor may be the insufficient intake of protein by the pregnant mother which restricted the formation sufficient myosin in the fetus causing poor development of muscle mass in the baby after birth. More study is required for final comment.

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