Sensitive and Reliable Indicator between Broca's Index and Metropolitan Life Insurance Height - Weight Charts in First Year Medical Student

Dr. Haresh D. Godia[*1], Dr. Lalit H Nikam[2]

[1]Associate Professor, [2]Professor (Additional)

Department of Physiology Seth G S Medical College Parel Mumbai 12

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Abstract

Aims: This study was confined to healthy groups. Care was taken to exclude persons suffering from obvious disease and/ or recent history of illness Aims and Objective of present study are:-

To assess out a sensitive and reliable indicator between Broca's Index and Metropolitan Life Insurance Height - Weight charts.

Materials and Methods: *The present study were carried out on 100 1st M.B.B.S. students of GSMC Mumbai and Tertiary Care Hospital Mumbai (50 males and 50 females) not suffering from any major illness.*

Conclusion: *Broca's Index does not take build into consideration. It therefore gives high values for weight. On the other hand Metropolitan Life Insurance Tables give more accurate estimate of person's nutritional status and they should be used as a reliable indicator for nutritional assessment. Adolescence, being an important period of physiological and psychological changes occurring in the body; is important since these changes can have effect in diet and nutrition of an individual leading to improper consumption of food and various deficiency diseases. Studies carried out on adolescents are very limited and it is needed to assess the nutritional status of adolescents*

Keywords - *Overweight, Obesity, Morbidity, Anthropometry, Dieting, smoking, alcohol consumption, sexual activity, substance abuse, violence.*

Introduction

Nutritional status of the population depends on food consumption and not solely on production and availability of food. Protein energy malnutrition (PEM) is an imbalance between the supply of protein and energy and the bodies demand for them to optimal growth and function. Such an imbalance leads to wasting, stunting and underweight when energy intake is inadequate and to overweight and obesity, when it is excessive.

WHO estimates that in developing countries about 245 million adults are moderately underweight and 93 million severely underweight. At the same time, there are over 200 million adults who are moderately of severely overweight of whom 58 million are in developing countries. For adults, even the most optimistic trend gives a global value for 2025 of 82 million for severely underweight and 131 million for moderately underweight, severe overweight prevalence in 2025 is estimated at 300 million adults. Growth in the number of severely overweight adults is expected to be double that of underweight adults during 1995-2025.[1]

Adolescence begins with pubescence the earliest signs of development of secondary sexual characteristics and continue until morphological and physiological changes approximate adult status usually near the end of second decade of life which considers individuals of about 10-24 years of age, which includes both those considered by WHO as adolescent" (10-19 years) and those defined as youth" (15-24 years) by the United Nations. Human growth and maturation are continuous processes of adolescence encompasses rapid changes in physical growth and maturation and in psychosocial development. Adolescence is also a period of increased requirements. Rapid accretion of new tissue and other wide spread developmental changes are accompanied by increased nutrition requirement relative to childhood years. For example, more than 20% of total growth in stature and upto 50% of adult bone mass are achieved during adolescence, resulting in a 50% increased in the calcium requirement.

Many important changes a psychological and social development take place during adolescence many of the responses to the transition to adulthood may include

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behavior that direct implications for health; eg. Dieting, smoking, alcohol consumption, sexual activity, substance abuse, violence. Sometimes, the lack of opportunities associated with poverty of the choice concerning education and occupation may have indirect long term effect on health.[2]

The prevalence of under nutrition in adolescents is considerably lower than that early childhood, and the need for anthropometry has seemed less pressing. Clinicians and public health workers have been left with relatively few tools meeting the need to evaluate adolescence. Anthropometry is especially important during adolescence because it allows the monitoring and evaluation of the hormone - mediated changes in growth and malnutrition during this period. Moreover, because growth may be indicators of nutritional status and health risk and may be diagnostic of obesity and underweight.[2]

An attempt is made in the present study to assess the nutritional status of adolescence to identify obesity and underweight so that corrective steps could be taken to rectify the problems.

Limitations of the Study:-

Nutritional status of an individual is assessed from information of 4 types[3]:

1. Diet history
2. Anthropometry
3. Clinical examination
4. Biochemical examination

Here due to time constraint, only anthropometry has used as a tool to assess the nutritional status.

Overweight and Obesity:-

Overweight is a major public health issue. Grade 2 overweight is relatively common in most industrialized societies and also in many less modernized cultures.

Prevalence of overweight within countries can vary substantially. This can largely be linked to variations in variations in socio-economic status and/ or degree of urbanization: for instance the prevalence of overweight has been found to be relatively high in certain professional groups in Bombay.[2] Overweight is always, the product of a energy balance resulting from relatively low energy expenditure and/ or relatively high energy intake. Social, culture and behavior factor of important determinates of both the components, but it is also clear that excess weight gain in affluent circumstances may result from a genetic predisposition. What remains unclear is the mechanism through which genetic factors exert their influence: it is probable that many genes are involved: affecting both

energy expenditure and energy intake.[2] High fat diets combined with low levels of physical activity play an important role in the increased of overweight that accompanies the transition from poverty to affluence.

Overweight and Morbidity[4]:

- Overweight and stroke: Clear relationship exists between overweight and stroke.
- Overweight and NIDDM: Overweight is a well established risk factor for non-insulin dependent diabetes mellitus
- Overweight and Gall bladder disease: Overweight is a major risk factor for the development of gallstones, particularly those made of cholesterol rather than pigmented stones containing bilirubin.
- Overweight and Osteorthritis: There is increased evidence that overweight is associated with ostreoarthritis of several joints.
- Overweight and Cancer: Overweight and the risk of endometrial cancer increased in direct proportion. Overweight probably increased the risk of post menopausal breast cancer.

Underweight[5]: Individuals of low weight are more likely to fail to appear for work because of illness or exhaustion. Physical training can substantially improve work capacity, but inactivity leads to rapid and substantial reduction in the ability to sustain heavy work. In young people, the dominant cause of reduction in body weight is a fall in blood intake; caused either by unavailability of sufficient food to meet energy needs on or by anorexia. From the above discussion on 2 malnutrition i.e. underweight and obesity it is clear that both pose a major health problem in a developing country like India. And when this problem affects the adolescent population; the problem become grave. It is therefore important that we screen adolescent properly and take necessary steps to prevent this.

Anthropometry[6]: This deals with the physical characters of a person and states the condition of health of the subject. Following are the components of anthropometry.

1. **Weight:** It represents size of cell mass of the body to determine the BMR and thus the metabolic cost of physical activity. Weight is taken on a weighing scale with mineral or no clothing; barefooted in kgs.
2. **Height:** It gives an idea about the proportion of the weight and height in an individual for particular age. It also provides the information about the BMI if computed with the weight. Height is taken with the help of a stadiometer or scale used for the same in cms/ inches.

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With the help of above factors, the present study is done to find out nutritional status of adolescents.

Materials and Methods

The present study were carried out on 100 1st M.B.B.S. students of GSMC Mumbai and Tertiary Care Hospital Mumbai (50 males and 50 females) not suffering from any major illness.

Materials:
Weighing scale for weight measurement
A scale to measure height (stadiometer)

Methods:
1) Standing Height:
Body height is measures on a stadiometer. Subject stands erect without shoes and his back close to the calibrated stand. The top piece is pressed firmly on to subjects head. Height recorded in centimeters; correct to ½ cms.

2) Body weight:
On a weighing machine, subject stands in his normal clothing with shoes off the legs, recorded in kgs; correct to ½ kg.

3) Broca's Index:
Many methods of expressing body weight have been devised. One such index is Broca's Index.[7]

Table I: profile of physical characters of Males and Females:

	Male	**Female**
Mean age	18 years 6 months	18 years 6 months
Mean height	168.95 ± 5.335 cm	159.3 ± 7.08 cm
Mean weight	59.76 ± 9.15 kg	52.65± 8.51 kg

Table I showed Mean height for males is 168.95 which is much below the 50th percentile value of 176.8, as suggested by NCHS. Mean weight for males is 59.76% which is also much below the 50th percentile value of 68.88 kg as suggested by NCHS. Mean height for females is 159.3 which is much below the 50th percentile value of 163.7, as suggested by NCHS. Mean weight for females is 52.65% which is also much below the 50th percentile value of 56.62 kg as suggested by NCHS.

Joshi S.B., Kanade A.N.[9] on their study of Growth patterns of India boys age 8-18 years showed that the mean height and weight if Indians adolescents is below the 50th percentile value of NCHS. The reason they cited was that the children's are continually exposed to lower intakes of food and subclinical infections; apart from childhood malnutrition. Therefore the catch-up growth is unlikely during adolescents.

Standard weight in kg = Height in cms – 100

This does not take body build into consideration.

Statistical Analysis Results and Discussion

Tables drawn from the available data are descriptive. Qualitative description of sets of clinical values involves measure of central tendency. Common measures of central tendency are mean, median and mode.[8]

Mean: it is arithmetic average of a set of values.

$$X = \frac{Total\ of\ all\ values}{No.\ of\ population}$$

Test of Statistical Significance[8]:
Test of statistical significance is needed to evaluate the significance of difference among comparison groups.

Standard error of differences between two means[8]**.**
This test is required to be applied very often in medical practice. Here means of a normally distributed variable in the two like or unlike group are compared such as of height, weight, S.E. of difference is the square root of the sum of squares of 2 standard error of mean, so.

Taking into consideration, the above mentioned factors, the present study is carried out. Stastical analysis shows the following results.

The findings in present study correlated well with the findings of *Joshi S.B., Kanade A.N.* It is probable that lower nutritional intakes during adolescents and also widespread childhood malnutrition lead to mean height and weight below the 50th percentile value of NCHS but also certain aspects of adolescent's behavior like the extremes of nutritional intakes in from of dieting can lead to mean height and weight below the standard value. Also may be food faddism, improper selection of food, eating junk food etc leads to a diet which is deficient in nutrients which in turn may lead to growth retardation.

James WPT and Francois PJ[10] on their study of determining the cut-off points of BMI for CED showed that women have less weight as compared to males. They suggested that women's work capacity is less than that of males and even they smaller muscle mass therefore they tend to be shorter than men and therefore at equivalent BMI's will be of lower body weight as well.

The findings in the present study correlates well with the findings of *James WPT and Francois PJ* in addition to be above cited reason probably the other reason for females to be shorter and lighter than males are as follows:-

- In equal distribution of food: Male being the earning member gets the major share of food and

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females they pay less attention towards their nutritional intakes.

- Certain belief and customs: like religious fasting etc can also lead to underweight and growth retardation in females.
- During menstruation, pregnancy etc there is drawing in of the nutrients and if proper diet is not taken it leads to malnutrition.
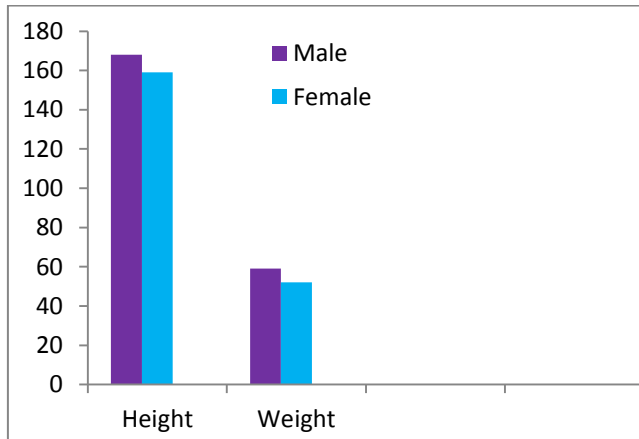
Graph I shows difference between in male and female in Height and Weight.

Table II: Profile of mean weight in males and females by Broca's Index.

	weight	Standard Deviation
Male	68.36	5.32
Female	59.28	7.040

Table II shows the mean weight in males and females by Broca's Index which is calculated as[12]: Standard weight in kg = Height in Centimeters – 100

Table III: Profile of mean weight in males and females by Metropolitan Life Insurance Tables.[13]

	weight	Standard Deviation
Male	59.87	3.99
Female	52.54	4.28

Table III shows the mean weight in males and females by referring to the Metropolitan Life Insurance Table.

Table IV: Comparison of mean weight in male and female between Broca's Index and by Metropolitan Life Insurance Tables.

	Male	Female
	Weight $\pm$ SD	Weight $\pm$ SD
Broca's Index	68.36± 5.32	59.28±7.04
LIC	59.87± 3.99	52.54±4.28

Z = 9.031 [Standard error of difference of 2 mean]
□P < 0.001
□Highly significant

Thus there is highly significantly difference between Broca's Index and Metropolitan Life Insurance Tables.

Naidu AN and *Roa PN*[11] in their study of Nutritional status of Indian Rural population, showed that the order of energy deficiency is more or less the same in all the stature groups. In other words it clearly indicates that persons with better height are also suffering from various grades of energy deficiency.

In the present study we found out that Metropolitan Life Insurance Tables give a good estimate of persons nutritional status than Broca's Index. Broca's Index, it just takes into account the height of the person which simply implies that if the height of person is more he is better nourished, which is not be case. Also Broca's Index does not take into account the person build. Metropolitan Life Insurance Table on the other hand they consider the persons build and give weight for height chart which is a sensitive tool for assessing the nutritional status of the population.

Conclusion

From the present study it is seen:

- ❖ Broca's Index does not take build into consideration. It therefore gives high values for weight. On the other hand Metropolitan Life Insurance Tables give more accurate estimate of person's nutritional status and they should be used as a reliable indicator for nutritional assessment. Adolescence, being an important period of physiological and psychological changes occurring in the body; is important since these changes can have effect in diet and nutrition of an individual leading to improper consumption of food and various deficiency diseases. Studies carried out on adolescents are very limited and it is needed to assess the nutritional status of adolescents. An attempt has therefore been made in the present study to

1) Assess the Nutritional Status of Medical Students of 1st M.B.B.S. (adolescents) with the help the help of anthropometry.
2) To find out a reliable indicator for finding the standard weight by comparing between the Broca's Index and Metropolitan Life Insurance Table.

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Corresponding Author -

Dr. Haresh D. Godia
Flat no 602 E Wing Laura Rosalie Hill Road
Khadakpada Kalyan Road West.
Email id - ambad.sawan@gmail.com