*Journal of Advances and Scholarly Researches in Allied Education*
*Vol. 16, Issue No. 9, June-2019, ISSN 2230-7540*

# Analytical Study of Trends in Anthropometry among Puberty Students

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***Abstract – The cross-sectional study explores the influence of physiological growth on Body Mass Index (BMI) in Pubescent. Baseline data of 475 students examined on BMI index were calculated. Both sexes exhibited high values of overweight and found to be advancing towards obesity with increasing age. This can be a matter of great concern as overweight aggravates not only physiological problems, but it may affect adversely on the self-concept of young children. Though, increase in height is very consistent between groups and children are found with very little progression in height. Researcher wants to find is there any association between emotional maturity and the puberty, it was studied in this paper; this paper is an analytical study for finding the impact of physiological changes during the puberty.***

***Key Words: Puberty, Anthropometry, Body Mass Index, Physiological, Teenage, Emotional***

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## 1. INTRODUCTION

This paper is based on analytical study of puberty and its impact on the body mass index and emotional maturity. Puberty, mostly considered as a part of physical and sexual progression, though, recently, emphasis is being given on investigating and correlating behavioral, social and other factors, making the studies more comprehensive. Researches in this area are providing fresh insights and giving wider prospects on assorted forum helping to mobilize the public and Government bodies to support health, well-being and wholesome development of adolescent. Emotional maturity indicates 'adultness.' Emotional maturity, can be defined as how well a person is able to respond to situations, control his emotions and behave in an adult manner when dealing with others. Emotional maturity -Emotional maturity is the ability to handle situations without unnecessarily escalating them. Instead of seeking to blame someone else for their problems or behavior, emotionally mature people seek to fix the problem or behavior.

As the onset of puberty is unnoticed or rather it is mostly neglected by parents, this stage does not get prior importance. In case of girls, sometimes, observed by mother when she starts developing breast buds, and pubescent boys are still considered children, until they show the growth of facial hair and voice change. Menstruation in girls is a clear symptom of sexual maturity and after that she is labeled as "grown up". As for boys, muscle development and increase in height and showing manly behavior is enough to rate them fully grown.

Anthropometry refers to the study of human variation in physical attributes and is primarily used in growth studies.

It is a collective term, mainly consists of measuring

a) Size- height, weight surface area and volume.

b) Structure- sitting-standing height, width, length and circumference.

c) Composition- body fat percent, lean body mass, water content etc.

Though, anthropometry is used to calculate the physical properties, and the body changes, it has been widely used as an important tool to study the racial, cultural and psychological attributes with physical one. Increased efforts in the area of establishing an association between physical characteristics and psychological attributes gave boost to ample research and its application have been elongated to Medicine and Health Care, Behavioral Science, Ergonomics, Architecture and Design etc. Assessment of overweight and obesity in populations has still been based on the body mass index, which is considered the universal indicator of adiposity.

## 2. REVIEW OF LITERATURE

Girls were found to report more Flexibility and Adaptability than boys while boys were found to report more Emotional-Regression and Faulty Social Adjustment than girls. Faulty Social Adjustment was reported more among Low Socio-Economic Status respondents while no other significant results were found on any other dimensions of Emotional Maturity across SES.(Gupta & Srivastava, 2016). It is found out that less emotionally mature persons tend to prefer inefficient coping methods than that of useful methods and the more mature people prefer more wise and useful methods Verma and Verma (1989). Pastey & Aminbhavi (2006) on impact of emotional maturity on stress and self-confidence of adolescents found that adolescents with high emotional maturity have less stress and high self-confidence.

According to Zanden (2000) emotional immaturity includes emotional instability and it is basically individuals' lack of capacity in solving problems and they will show case irritability and always wanted help from others they seem to be more stubborn and usually showcase temper tantrums. Emotional maturity is considered as one of the major determinant in shaping an individual's personality, behavior and attitudes and it helps in enhancing the relationship with others and to enhance the self-worth of the person and emotional stability is considered as one of the major component in mental health (Anand, Kunwar, & Kumar, 2014). Bruni et al.(2006) explored the relationships among academic achievement , demographic and psychological factors. On the sample of 380 school students of Italy, school achievement index was used as an instrument to measure their academic achievement. The findings of the study indicated significant difference in academic achievement of male and female students. Female students were found to have higher academic achievement than males.

## 3. METHODS:

The study is a combination of qualitative and quantitative research. Since some of the primary data is in the form of psychological assessments of the respondents the basic nature of the data used is qualitative. However, due level of quantification has been used in the study to reach objective and measurable conclusions. Main objective of the research was to study the relationship between the variables, physiological changes, and emotional maturity

Data was collected from a representative sample (475) of 12-16 year old school children attending $7^{th}$, $8^{th}$ and $9^{th}$ class. In this study, anthropometric measurements used were-height, weight and BMI (Body Mass Index), the formula weight/height$^2$ is used. The measurements were subdivided in three categories, i.e., Size, Circumference and Skin Fold Thickness. Weights in kg., height in meters were measured. To calculate skin fold thickness a caliper is used and recoded in mm.

**Sampling:** Purposive sampling technique is adopted to select the samples from the schools. Students fall in the age group of 12-16 are listed. Physical characteristics suggested as per Tanner stage are observed with the help of medical professional.

**Sample Size:** The study was conducted on 475 children studying in class $7^{th}$, $8^{th}$, $9^{th}$ for validation of scale for finding the association between physiological changes and the emotional maturity sample size was 60 students

## 4. OBJECTIVES:

1. To study Physiological Changes of puberty students.
2. To compare the BMI and other anthropometric measurements.
3. To study association between physiological changes and the emotional maturity

It was not feasible to go through the Tanner stages in identifying and selecting the pubescent, as children find it embarrassing and uncomfortable, limiting its use. For the purpose of this study, after brief deliberation with physician, observation of external characteristics has been decided as criterion and samples were selected accordingly.

Following hypothesis were stated for this study, researcher think that, the association is very strong between puberty and the emotional maturity as well as between the BMI and the anthropometric measurements

**Hypothesis:**

a. There is association between BMI and puberty

b. There is an association between Physiological Changes and Emotional Maturity

## 5. DATA ANALYSIS:

For testing first hypothesis "There is association between BMI and puberty" following methods were applied,

BMI- Body Mass Index

BMI Formula is used to measure the fatness /obesity

BMI= weight/height $^2$

BMI -- 25.0 or more is overweight

Between --18.5 to24.9 is moderate

Less than-- 18.5 is underweight.

Following table no 1, describes mean score of BMI and its association with puberty

**Table No. 1 Mean score of BMI**

| Description | Class 7th Students | | | Class 8th Students | | | Class 9th Students | | |
|---|---|---|---|---|---|---|---|---|---|
| | N | M | SD | N | M | SD | N | M | SD |
| BMI | 149 | 24.530 | 3.396 | 179 | 25.834 | 4.903 | 147 | 26.668 | 5.686 |
| Age (yrs.) | 149 | 12.711 | .700 | 179 | 13.726 | .677 | 147 | 14.721 | .977 |
| Weight (kg) | 149 | 33.892 | 5.322 | 179 | 37.530 | 6.438 | 147 | 39.795 | 5.271 |
| Height (m.) | 149 | 1.174 | .032 | 179 | 1.359 | 1.536 | 147 | 1.415 | 1.699 |

Total mean score of BMI for all the respondents is **25.67** with **4.6** as Standard Deviation. Considering the normal range of BMI, which is 18.5- 24.9, average pubescent are found overweight.

The above table shows:-

a) 7th std. students fall in the in the normal category.

b) 8th std. students showing a trend of getting overweight.

c) Fat deposition is found increasing as the children advances in the next class (9th std.) and with progressing age, pubescent are prone to accumulate fat tissues.

d) 9th class children have scattered scores than the Mean BMI with 5.68 as SD.

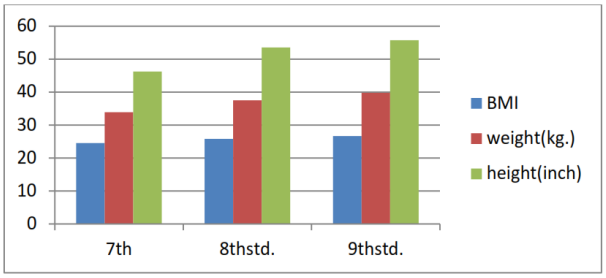


**Fig- no 1 Comparison of BMI**

From above figure no.1, we can say that BMI is increasing from class 7 to class 9; it indicates that during puberty the physiological changes are very prominent, and it shows that BMI of students increased along with height and weight during the puberty.

**Table No. 2 Mean plot of structure of puberty students.**

| Description | Class 7th Students | | | Class 8th Students | | | Class 9th Students | | |
|---|---|---|---|---|---|---|---|---|---|
| | N | M | SD | N | M | SD | N | M | SD |
| Sitting Height | 149 | 30.010 | 2.205 | 179 | 32.265 | 2.042 | 147 | 30.602 | 2.966 |
| Shld Height. | 149 | 12.473 | 1.666 | 179 | 12.773 | 1.058 | 147 | 13.466 | 1.372 |
| Leg | 149 | 35.681 | 2.010 | 179 | 35.293 | 3.268 | 147 | 36.887 | 3.054 |
| Hip joint to knee | 149 | 17.771 | 1.515 | 179 | 18.480 | 2.238 | 147 | 18.945 | 1.818 |
| Knee to toe | 149 | 16.916 | 1.792 | 179 | 18.530 | 1.612 | 147 | 18.646 | 1.678 |
| Full Hand | 149 | 25.177 | 1.506 | 179 | 26.215 | 1.759 | 147 | 27.693 | 3.174 |
| Shoulder to elbow | 149 | 11.359 | .988 | 179 | 11.639 | 1.487 | 147 | 11.346 | 1.407 |
| Elbow to wrist | 149 | 15.130 | 1.276 | 179 | 16.134 | 1.025 | 147 | 15.683 | 1.108 |
| Shoulder | 149 | 13.338 | 1.607 | 179 | 14.131 | 1.170 | 147 | 14.112 | .964 |
| Head | 149 | 18.302 | 2.464 | 179 | 20.539 | 1.530 | 147 | 20.761 | 1.698 |
| Neck | 149 | 11.721 | 1.259 | 179 | 11.930 | 1.038 | 147 | 11.812 | .817 |
| Relaxed Arm | 149 | 7.959 | .893 | 179 | 8.600 | 1.320 | 147 | 8.704 | .977 |
| Contracted Arm | 149 | 8.522 | .988 | 179 | 8.980 | 1.076 | 147 | 9.081 | .932 |
| Forearm | 149 | 7.959 | .722 | 179 | 8.223 | .777 | 147 | 8.408 | .588 |
| Wrist | 149 | 8.070 | .665 | 179 | 8.318 | .560 | 147 | 8.418 | .719 |
| Chest | 149 | 25.745 | 2.084 | 179 | 27.254 | 2.251 | 147 | 27.775 | 2.206 |
| Waist | 149 | 23.781 | 1.729 | 179 | 24.569 | 2.188 | 147 | 24.404 | 2.169 |
| Abdomen | 149 | 26.036 | 2.140 | 179 | 26.882 | 2.372 | 147 | 27.901 | 2.279 |
| Hip | 149 | 28.657 | 2.683 | 179 | 29.740 | 3.766 | 147 | 30.602 | 2.865 |
| Calf | 149 | 10.971 | 1.528 | 179 | 11.435 | 1.418 | 147 | 11.534 | 1.105 |

**Table No. 3 Mean plot of skin fold of puberty students**

| Description | Class 7th Students | | | Class 8th Students | | | Class 9th Students | | |
|---|---|---|---|---|---|---|---|---|---|
| | N | M | SD | N | M | SD | N | M | SD |
| Subscapular | 149 | 9.24 | 2.63 | 179 | 10.95 | 3.92 | 147 | 12.53 | 4.51 |
| Triceps | 149 | 11.76 | 4.06 | 179 | 14.16 | 4.61 | 147 | 13.71 | 4.89 |
| Biceps | 149 | 8.60 | 3.69 | 179 | 12.36 | 4.07 | 144 | 10.60 | 4.19 |
| Abdominal | 149 | 9.07 | 3.17 | 179 | 10.60 | 3.46 | 147 | 10.41 | 3.63 |
| Super Iliac | 149 | 9.37 | 3.07 | 179 | 13.14 | 4.39 | 147 | 12.04 | 3.65 |

**Table No.4 Significance level of BMI**

| Psychological change | SV | Sum of Squares | df | Mean sqr. | F | Sig. |
|---|---|---|---|---|---|---|
| BMI | Between Groups | 344.943 | 2 | 172.472 | 7.603* | Sig |
| | Within Groups | 10707.471 | 472 | 22.685 | | |
| | Total | 11052.415 | 474 | | | |
| Weight (KG) | Between Groups | 2634.367 | 2 | 1317.183 | 39.780** | Sig |
| | Within Groups | 15628.740 | 472 | 33.112 | | |
| | Total | 18263.107 | 474 | | | |
| Height (M) | Between Groups | 4.786 | 2 | 2.393 | 1.341 | NS |
| | Within Groups | 842.059 | 472 | 1.784 | | |
| | Total | 846.845 | 474 | | | |

Skin fold measurements are widely utilized to assess body composition and to estimate general fatness and the distribution of subcutaneous adipose tissue. Fat is pinched between a two-pronged caliper on designated body sites such as triceps, biceps, and abdomen, iliac crest, just below the scapula, the thigh and the chest.

For testing second hypothesis that, “there is an association between Physiological Changes and the Emotional Maturity” correlation method was used, and if p-value < 0.05, then reject the null hypothesis

**Validity of Emotional Maturity Scale**:

Emotional Maturity scale was developed based on a similar scale developed by Yashvir Singh and Mahesh Bharagava. Investigator applied Emotional Maturity Scale on 60 secondary students then applied the self-constructed Emotional Maturity Scale. The scores were compared on both the scales. The component wise validity calculated is as follows.

**Table no. 5 Validity of Emotional Maturity Scale**

| Sr. No. | Component | N | Validity Co-efficient |
|---|---|---|---|
| 1 | Self-Reflection | 60 | +0.617 |
| 2 | Social Reflection | 60 | +0.672 |
| 3 | Emotional Maturity | 60 | +0.589 |

Emotional Maturity Scale validity coefficient respect to self-reflection of emotional maturity of students is +0.617, Social reflection of emotional maturity of puberty students is +0.672 and overall Emotional maturity of puberty students is +0.589. This coefficient is valid compared to self-constructed Emotional Maturity scale.

**Table no. 6 Summary statistics of correlation**

| Variable | Observations | Minimum | Maximum | Mean | STD-DEV |
|---|---|---|---|---|---|
| BMI | 475 | 7.168 | 31.824 | 17.920 | 4.581 |
| EMS-z Score | 475 | -1.237 | 2.076 | 0.000 | 1.000 |

**Table no. 7 Correlation matrix (Spearman)**

| Variables | BMI | EMS-z Score |
|---|---|---|
| BMI | **1** | 0.585 |
| EMS-z Score | 0.585 | **1** |

Correlation between the BMI (Physiological Changes) and Emotional Maturity Grade was found to be 0.585, it is strong association it means that emotional maturity is positively correlated with BMI index

## 6. CONCLUSION:

There is strong evidence that the increasing rates of obesity in children over the same time period are a major factor in Puberty. Since the BMI is rising from $7^{th}$ to 9th class, one would like to be able to assess directly the influence of body fat mass on indices of puberty. The effects of gonadal steroids on body composition in adults concluded that estrogens and possibly progesterone largely account for the greater degree of body fatness in women as opposed to men. Monitoring the obesity at this stage is very important and proper intervention will help the students to understand the changing body pattern and how to adjust with the changes.

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