International Journal of Applied Research 2017; 3(3): 706-709

ISSN Print: 2394-7500
ISSN Online: 2394-5869
Impact Factor: 5.2
IJAR 2017; 3(3): 706-709
www.allresearchjournal.com
Received: 20-01-2017
Accepted: 21-02-2017

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Comparative study on growth pattern of 6–10 years rural and urban students

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Abstract
A cross-sectional study was conducted to compare the physical growth pattern amongst rural and urban students. Rural students were from Arambagh Sub-Division of Hooghly district and urban students were from Kalyani, Nadia, West Bengal, India. There aged between 6 to 10 years. A total of 122 rural subjects out of which 61were boys and rests were girls and 232 urban subjects out of which 119 were boys and rests were girls from three schools were selected as the subjects for the study. The anthropometric measurements like height and weight were taken. To find out the chronological age, height and weight used instruments and tools were School register, Stadiometer and Weighing machine. All statistical calculation was done by standard procedure. Independent t-test was used to find out the statistical significance of two group mean difference. The statistical calculations were completed using SPSS version 10. Statistical significance ware tested at 0.05 levels. Urban male students are taller in 7, 8 and 9-year group, heavier in 7,8,9 and 10 year group and B.M.I ware greater in 6,7,8 and 9 year group than the rural students. Urban female students are taller in 8 and 9-year group, heavier in 8, 9 and 10 year group and B.M.I ware greater in 6, 8, 9 and 10 year group than the rural students.

Keywords: Physical growth, height, weight

1. Introduction
Geographical and climatic conditions have a greater influence on the growth of human beings. It varies according to the nature of climate present in the region. The regional food habits and different living conditions are also important influential factors. Except from the geographical and climatic variety, India is a country of many different people belonging to different nature, different language, different customs and different food habit. There are a good number of studies which were conducted to know the different growth patterns of different people living in various parts in India. There are also huge number of studies which were conducted to know the influence of different internal and external factors on growth patterns. Good health and good nutrition are important factors in the child's growth and development. The better the health and nutrition, the larger the children tend to be, age for age, as compared with those whose nutrition and health is poor. Children who are immunized against disease during the early years of life grow larger than those who are not immunized (Whiting & Landauer, 1968) [8]. Socioeconomic status also influences and plays a dominant role in the growth and physical development of children. Children from different socio-economic classes within same community differ in their average body size at all ages, which is probably due to nutrition and environment (living) conditions. Height and weight of children may also be influenced by socio economic status of the children.

2. Methodology
To achieve the purpose of the study, 122 rural subjects out of 61were boys and rests were girls and 232 urban subjects out of 119 were boys and rests were girls from three schools were selected and there age ranged between 6 to 10 years. Rural students were from Arambagh Sub-Division of Hooghly district and urban students were from Kalyani, Nadia in West Bengal. Date of birth as evident from school register was used to calculate chronological age, Stadiometer was used for measuring body height, and weighing machine was used for measuring body weight. For calculating Body Mass Index (BMI) two physical parameters such as height (in meter) and weight (in kg) of the subjects were measured and

BMI were calculated with the help of the following formula, BMI = Weight in kg/height in metr^2. All statistical calculation was done by standard statistical procedure. The Mean of different variables were compared by using‘t’ test. Statistical significance was tested at 0.05 levels.

3. Results and discussion

Table 1: Distribution of Subjects of the Study

Student Group	Area	Number of Subjects according to Age				
		6 year	7 year	8 year	9 year	10 year
Male Student (N = 180)	Rural (N = 61)	10	14	10	15	12
	Urban (N = 119)	10	52	30	15	12
Female Student (N = 174)	Rural (N = 61)	6	15	20	9	11
	Urban (N = 113)	10	41	30	17	15

Table 2: Descriptive Statistics on height (m) of male students of urban and rural areas

Age Group	6 year Mean ±SD	7 year Mean ±SD	8 year Mean ±SD	9 year Mean ±SD	10 year Mean ±SD
Urban Area (N = 119)	1.10 ± 0.19 (N = 10)	1.29 ± 0.07 (N = 52)	1.31 ± 0.05 (N = 30)	1.36 ± 0.05 (N = 15)	1.30 ± 0.06 (N = 12)
Rural Area (N = 61)	1.14 ± 0.14 (N = 10)	1.18 ± 0.07 (N = 14)	1.20 ± 0.08 (N = 10)	1.25 ± 0.09 (N = 15)	1.32 ± 0.07 (N = 12)
t-ratio	0.65	2.86*	4.07*	4.15*	0.04

$t_{0.05}$ 18 = 2.10, $t_{0.05}$ 64 = 2.00, $t_{0.05}$ 38 = 2.02, $t_{0.05}$ 28 = 2.05, $t_{0.05}$ 22 = 2.07

Table – 2 represents the discipline statistics in the form of mean and SD of the male subjects of both areas. The height of the urban students’ 6-year group was 1.10 ± 0.19 m (Mean ± SD), 7 years – 1.29 ± 0.07 m, 8 -year 1.31 ± 0.05 m, 9-year – 1.36 ± 0.05 m and 10-year – 1.30 ± 0.06 m. In the rural area the height was for 6-year group 1.14 ± 0.14 m, 7 year – 1.18 ± 0.07 m, 8-year – 1.20 ± 0.08 m, 9-year 1.25 ± 0.09 m and 10-year – 1.32 ± 0.07 m. In seven, eight and nine year group the obtained t-ratio was 2.86, 4.07, and 4.15 which was statistically significant. In six and ten year group the obtained t-ratio 0.65 and 0.04 which was statistically not significant.

Table 3: Descriptive Statistics on height (m) of female students of urban and rural areas

Age Group	6 year Mean ±SD	7 year Mean ±SD	8 year Mean ±SD	9 year Mean ±SD	10 year Mean ±SD
Urban Area (N = 113)	1.11 ± 0.02 (N = 10)	1.22 ± 0.08 (N = 41)	1.26 ± 0.06 (N = 30)	1.32 ± 0.08 (N = 17)	1.33 ± 0.06 (N = 15)
Rural Area (N = 61)	1.14 ± 0.04 (N = 6)	1.19 ± 0.09 (N = 15)	1.20 ± 0.08 (N = 20)	1.23 ± 0.07 (N = 9)	1.30 ± 0.05 (N = 11)
t-ratio	2.03	1.21	3.03	2.85	1.35

$t_{0.05}$ 14 = 2.14, $t_{0.05}$ 54 = 2.00, $t_{0.05}$ 48 = 2.01, $t_{0.05}$ 24 = 2.06, $t_{0.05}$ 24 = 2.06

Table – 3 represents the descriptive statistics in the form of means and SD of the female subjects of both areas. The height of the urban students’ 6-year group was 1.11 ± 0.02 m, 7-year – 1.22 ± 0.08 m, 8-year – 1.26 ± 0.06 m, 9-year – 1.32 ± 0.08 m and 10-year – 1.33 ± 0.06 m. In the rural area the height was for 6-year group – 1.14 ± 0.04 m, 7-year – 1.19 ± 0.09 m, 8-year – 1.20 ± 0.08 m, 9-year – 1.23 ± 0.07 m and 10- year- 1.30 ± 0.05 m. In eight and nine year group the obtained t-ratio was 3.03 and 2.85 which was statistically significant. In six, seven and ten-year group the obtained t-ratio was 2.03, 1.21 and 1.35 which was statistically not significant.

Table 4: Description Statistics on weight (m) of male students of urban and rural areas

Age Group	6 year Mean ±SD	7 year Mean ±SD	8 year Mean ±SD	9 year Mean ±SD	10 year Mean ±SD
Urban Area (N = 119)	19.20±2.25 (N = 10)	24.90±6.87 (N = 52)	28.87±3.96 (N = 30)	32.40±7.78 (N = 15)	36.33±6.07 (N = 12)
Rural Area (N = 61)	17.10±2.08 (N = 10)	18.93±3.21 (N = 14)	20.90±5.40 (N = 10)	23.47±6.93 (N = 15)	28.33±4.46 (N = 12)
t-ratio	1.00	3.05	5.03	3.32	3.68

$t_{0.05}$ 18 = 2.10, $t_{0.05}$ 64 = 2.00, $t_{0.05}$ 38 = 2.02, $t_{0.05}$ 28 = 2.05, $t_{0.05}$ 22 = 2.07

Table – 4 represents the descriptive statistics in the form of mean and SD of the male subjects of both areas. The weight of the urban students’ 6-year group was 19.20 ± 2.25 kg, 7-year – 24.90 ± 6.87 kg, 8-year – 28.87 ± 3.96 kg, 9-year – 32.40 ± 7.78 kg and 10-year – 36.33 ± 6.07 kg. In the rural area the weight was for 6-year group – 17.10 ± 2.08 kg, 7-year – 18.93 ± 3.22 kg, 8-year – 20.90 ± 5.40 kg, 9-year – 23.47 ± 6.93 kg and 10-year – 28.33 ± 4.46 kg. In seven, eight, nine and ten-year age group the obtained t-ratio was 3.06, 5.03, 3.32and 3.68 which was statistically significant. In six-year group the obtained t-ratio 1.00 which was statistically not significant.

Table 5: Descriptive Statistic on weight (kg) of female students of urban and rural areas

Age Group	6 year Mean ±SD	7 year Mean ±SD	8 year Mean ±SD	9 year Mean ±SD	10 year Mean ±SD
Urban Area (N = 113)	18.30±1.16 (N = 10)	23.17±5.95 (N = 41)	25.50±4.75 (N = 30)	32.29±7.65 (N = 17)	33.00±5.57 (N = 15)
Rural Area (N = 61)	17.00±1.79 (N = 6)	20.47±6.20 (N = 15)	19.59±3.32 (N = 20)	19.89±3.59 (N = 9)	26.64±3.88 (N = 11)
t-ratio	1.78	1.49	4.90	4.57	3.25

$t_{0.05}$ 14 = 2.14, $t_{0.05}$ 54 = 2.00, $t_{0.05}$ 48 = 2.01, $t_{0.05}$ 24 = 2.06, $t_{0.05}$ 24 = 2.06

Table – 5 represents the descriptive statistics in the form of mean and SD of the female subjects of both areas. The weight of the urban student's 6-year group was 18.30 ± 1.16 kg, 7-year – 23.17 ± 5.95 kg, 8-year – 25.50 ± 4.75 kg, 9-year – 32.29 ± 7.65 and 10-year – 33.00 ± 5.57 kg. In the rural area the weight was for 6-year group – 17.00 ± 1.79 kg, 7-year – 20.47 ± 6.20 kg, 8-year – 19.50 ± 3.32 kg, 9-year – 19.89 ± 3.59 kg and 10-year – 26.64 ± 3.88 kg. In ight, nine and ten-year age group the obtained t-ratio was 4.90, 4.57, and 3.25 which was statistically significant. In six and seven year group the obtained t-ratio 1.78 and 1.49 which was statistically not significant.

Table 6: Descriptive Statistic on BMI (kg / $m^{2)}$ of male students of urban and rural areas

Age Group	6 year Mean ±SD	7 year Mean ±SD	8 year Mean ±SD	9 year Mean ±SD	10 year Mean ±SD
Urban Area (N = 119)	15.86±1.32 (N = 10)	16.04±3.53 (N = 52)	16.89±1.81 (N = 30)	17.39±3.25 (N = 15)	16.80±3.09 (N = 12)
Rural Area (N = 61)	13.11±1.43 (N = 10)	13.59±1.31 (N = 14)	14.32±3.13 (N = 10)	19.71±2.31 (N = 15)	16.72±1.36 (N = 12)
t-ratio	4.47	2.54	4.68	2.56	0.08

$t_{0.05}$ 18 = 2.10, $t_{0.05}$ 64 = 2.00, $t_{0.05}$ 38 = 2.02, $t_{0.05}$ 28 = 2.05, $t_{0.05}$ 22 = 2.07

Table – 6 represents the descriptive statistics in the form of means and SD of the male subjects of both areas. The BMI of the urban students' 6-year group was 15.86 ± 1.32 kg / m2, 7-year – 16.04 ± 3.53 kg / m2, 8-year 16.89 ± 1.81 kg / m2, 9-year – 17.39 ± 3.25 and 10-year – 16.80 ± 3.09. In the rural area the BMI was for 6-year group was 13.11 ± 1.43 kg / m2, 7-year – 13.59 ± 1.31 kg / m2, 8-year 14.32 ± 2.13 kg / m2, 9-year – 14.71 ± 2.43 kg / m2 and 10-year – 16.72 ± 1.36 kg / m2. In six, seven, eight and nine-year group the obtained t-ratio was 4.47, 2.54, 4.68, and 2.56 which was statistically significant. In ten-year group the obtained t-ratio was 0.08 which was statistically not significant.

Table 7: Descriptive Statistic on BMI (kg / $m^{2)}$ of female students of urban and rural areas

Age Group	6 year Mean ±SD	7 year Mean ±SD	8 year Mean ±SD	9 year Mean ±SD	10 year Mean ±SD
Urban Area (N = 113)	14.85±1.78 (N = 10)	15.28±2.66 (N = 41)	16.04±2.02 (N = 30)	18.27±3.22 (N = 17)	18.66±2.66 (N = 15)
Rural Area (N = 61)	13.17±0.78 (N = 6)	14.16±2.04 (N = 15)	13.41±1.21 (N = 20)	13.14±1.19 (N = 9)	15.76±1.44 (N = 11)
t-ratio	2.167	1.48	5.23	4.58	3.27

$t_{0.05}$ 14 = 2.14, $t_{0.05}$ 54 = 2.00, $t_{0.05}$ 48 = 2.01, $t_{0.05}$ 24 = 2.06, $t_{0.05}$ 24 = 2.06

Table – 7 represents the descriptive statistics in the form of means and SD of the female subjects of both areas. The BMI of the urban and rural students' areas 6-year group was 14.85 ± 1.78 kg / m^2, 7-year – 15.28 ± 2.66 kg / m^2, 8-year – 16.04 ± 2.02 kg / m^2, 9-year – 18.27 ± 3.22 kg / m^2 and 10-year – 18.66 ± 2.66 kg / m^2. In the In the rural area the BMI was for 6-year group 13.17 ± 0.78 kg / m^2, 7-year – 14.16 ± 2.04 kg / m^2, 8-year – 13.41 ± 1.21 kg / m^2, 9-year – 13.14 ± 1.19 kg / m^2 and 10-year – 15.76 ± 1.44 kg / m^2. In six, eight, nine and ten-year group the obtained t-ratio was 2.18, 5.23, 4.58, and 3.27 which was statistically significant. In seven-year group the obtained t-ratio 1.48 which was statistically not significant.

Conclusion

From the findings of the study the following conclusions were drawn on growth pattern of 6-10 years' urban and rural students. The conclusions were

- Urban male students are taller than the rural students in 7-year, 8-year and 9-year group.
- Urban female students are taller than the rural students of 8-year and 9-year groups.
- Urban male students are heavier than the rural students in 7-year, 8-year, 9-year and 10 year group.
- Urban female students are heavier than the rural students in 8-year, 9-year and 10 year Group.
- Urban male students' BMI is greater than the rural students, except 10-year group.
- Urban female students' BMI is greater than the rural students, except 7-year group.

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