Correlation between various anthropometric parameters in school going children

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Abstract   Total 130 students of 12 to 14 years were examined (male 84 female 46) for various anthropological parameters like weight height, head circumference, chest circumference, abdominal circumference and hip breath. Height in male and female students showed steady increase from 12 to 14 years. But when males and females were compared in age group 12 and 13 females showed more height than male students. But in 14 years males had more height than females. ($p<0.05$). This was due to early puberty growth spurt in females. In all age group weight in females were more than males due to more accumulation of subcutaneous fat. Head circumference was statistically larger in males than females in 12 and 13 years age group. Chest circumferences in male students were significantly higher in all age groups. Abdominal circumferences were more in only 13 year age group in females. In all age group the hip breath were more in females than a male which is statistically significant due to accumulation of subcutaneous fat in the buttock region of females.
Keywords: anthropometry, correlation.

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INTRODUCTION

Children are considered as wealth of nation as they constitute one fifth of the population. Children in the age group of five to fourteen years are considered as school going children. Growth is the increase in size of various parts of the body.
 Development is the progressive acquisition of physical (Motor), Cognitive (thought) linguistic (communication) and social (emotional skill). Growth and development are age related. Biological, Social, Economical and Cultural factors influence the growth and development. The science of Anthropometry is an important tool for study of growth and development. Such studies are important as they provide determinants of nation's health. Mont Belli and in seventeenth century was first to measure linear dimensions of children of age group of one to eight years. Since then many workers have done anthropological measurements in various age groups. The present study was carried out in the school going children of both sexes between the age group of twelve to fourteen years. This group was selected as this is the adolescence or puberty group in which sudden increase in various dimensions of the body occur which is attributed to hormonal changes. The adolescent growth particularly in height occurs early in females as compared to males. So this study is important to correlate the anthropological dimensions with national and WHO standard so that good health will be achieved by future generation.

AIMS AND OBJECTIVE

To determine physical growth pattern of school children between the age group of twelve to fourteen years to determine sexual diamorphism by five anthropological parameters like height, weight, head circumference, chest circumference and abdominal circumference and Hip breath.

MATERIAL AND METHODS

Total of one thirty apparently healthy school children of both sexes (84 boys and 46 girls) of MGM Sanskar Vidyalaya Cidco Aurangabad were examined for various

parameters. The children were from middle socio-economic group.

Instruments used

1. Flexible steel measuring tape
2. Anthropometer
3. Pelvimeter
4. Sliding vernier caliper
5. Manual weighing machine.

Parameters Measured

1. Height
2. Weight
3. Head circumference
4. Chest Circumference
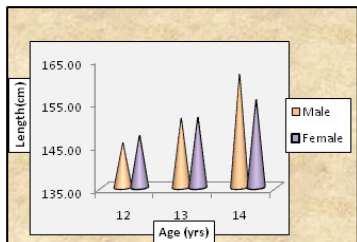5. Abdominal circumference
6. Hip breath

Statistical Analysis: After the analysis of the data following calculations were done.

1. Mean
2. Standard Deviation
3. T Test.

RESULTS

Table 1: Showing mean and S.D. of Height (cm) at different age groups

| Age Group	HEIGHT(cm)				t value	p value
	Male		Female			
	Mean	S.D.	Mean	S.D.		
12	145.37	6.16	147.05	8.35	0.61	0.551
13	151.13	8.03	151.28	6.89	0.08	0.937

Graph 1: Average Height

In table 1 and graph 1 it was observed that in the age group of 12 and 13 years the average height of female was more than male. But in the 14 years of age group the average height of male was more than the female (p<0.05). So this increase was statistically significant.

Table 2: Showing mean and S.D. of Weight (kg) at different age groups

| Age Group	WEIGHT(kg)				t value	p value
	Male		Female			
	Mean	S.D.	Mean	S.D.		
12	34.50	5.69	35.67	7.66	0.46	0.653
13	39.32	9.09	41.92	9.35	1.05	0.3
14	44.45	7.00	45.33	9.57	0.31	0.802
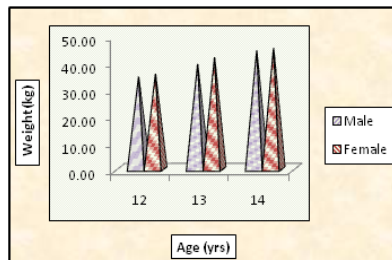
Graph 2: Average Weight

In Table 2 and Graph 2, it was observed that in all age groups the weight of the female was more than the male. In 13 years it was highest.

Table 3: Showing mean and S.D. Head Circumference (cm) at different age groups

| Age Group	Head Circumference (cm)				t value	p value
	Male		Female			
	Mean	S.D.	Mean	S.D.		
12	51.62	1.59	50.31	1.73	2.18	0.045
13	53.03	1.72	51.26	1.60	3.95	.000.
14	53.84	1.32	52.54	1.91	1.91	0.085
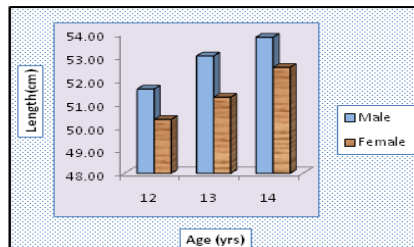
Graph 3: Head Circumference

From Table 3 and Graph 3, it was observed that the in the age group of 12 and 13 years the male had larger head circumference than female which was found to be statistically significant (p<0.05). But in the age group of 14 years there is little increase in the head circumference in male.

Table 4: Showing mean and S.D. of Chest Circumference (cm) of different age groups

| Age Group	Chest Circumference (cm)				t value	p value
	Male		Female			
	Mean	S.D.	Mean	S.D.		
12	66.99	5.34	62.83	5.56	2.1	0.05
13	71.20	7.91	66.34	6.63	2.45	0.016
14	74.24	6.22	67.60	6.18	2.85	0.014
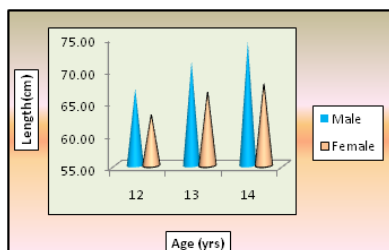
Graph 4: Chest Circumference

In Table 4 and Graph 4 it was observed that in all age group the chest circumference in male was more than the female and it was found to be statistically significant (p<0.05).

Table 5: Showing mean and S.D. of Abdominal Circumference (cm) of different age groups

| Abdomenol Circumference (cm)					t value	p value
Age Group	Male		Female			
	Mean	S.D.	Mean	S.D.		
12	62.06	6.40	61.24	7.68	0.33	0.76
13	64.60	8.76	66.72	8.87	0.9	0.375
14	66.93	7.82	65.97	9.38	0.31	0.783
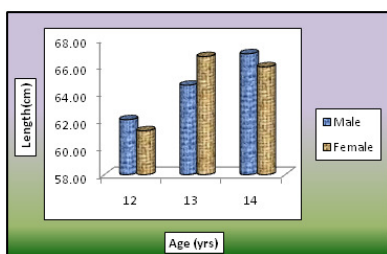
Graph 5: Abdominal Circumference

From Table 5 and Graph 5, it was observed that in 13 years of age group the abdominal circumference was more in female than male. While in the age group of 12 and 14 years the male had more measurements than females.

Table 6: Showing mean and S.D. of Hip Breath (cm) of different age groups

| Hip Breath (cm)					t value	p value
Age Group	Male		Female			
	Mean	S.D.	Mean	S.D.		
12	24.07	6.07	25.80	2.66	1.11	0.277
13	27.13	3.66	28.43	3.36	1.37	0.172
14	26.68	4.51	29.22	4.11	1.61	0.131
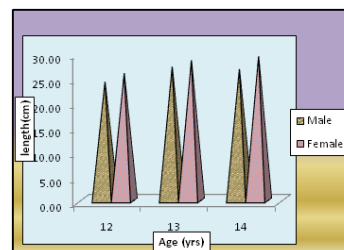
Graph 5: Hip Breath

From Table 6 and Graph 6 it was observed that in all age group there was statistical increase in the hip breath measurements in female than male.

DISCUSSION

Anthropometry proved an important tool for sex and personal identification in medico legal aspect. Various workers have done the study on various anthropological parameters like height, weight, head circumference, abdominal circumference, chest circumference and hip breath. Present study was done in age group of 12 to 14 years, because this is the period of maximum changes in the anthropological parameters due to onset of puberty.

Table 7: Comparative mean values of Height cm (MALE)

| Sr. No	Name of Study	12 yrs	13 yrs	14 yrs
1	D.K. Agarwal[8]	144.7	150.3	158
2	Saraswati Hanshal[1]	137.6	138.3	-
3	K. Anand[3]	135.9	143.8	152.61
4	G.K. Medhi[4]	136.01	142.4	147.5
5	Ashish Mukhopadhya[12]	138	145.51	153.9
6	Hazza M.[10]	140.9	147.5	153
7	Amuta[7]	138.1	143.1	146.19
8	Yao Yiling[9]	145.2	150.6	158.5
9	Prabeer Kumar[13]	132.1	-	-
10	Pushpa Bharati[11]	134.6	141.48	-
11	NCHS (from D.K. Agarwal)	135.5	140.9	147.8
12	WHO (from K. Anand)	135.9	143.8	152.61
13	Present study	145.37	151.13	161.39
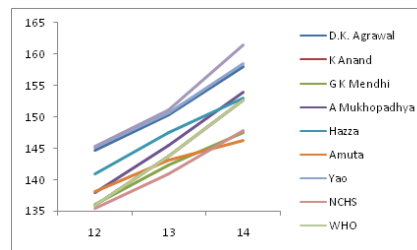
Graph 7

From table 7 and graph 7 it was observed that in all age groups the height of male students of the present study was more than the NCHS and WHO standard as well as that of the students of Saudi Arabia and Nigeria. It was also more than the students of the other regions of India. But it was almost equal to that of the students of Shanghai. This was due to improvement in the socio-economic

status of the present region. In the present study from 13 years the sudden increase in height as shown in the graph was due to adolescent growth spurt.

Table 8: Comparative mean values of Height cm (FEMALE)

| Sr. No	Name of Study	12 yrs	13 yrs	14 yrs
1	D.K. Agarwal[8]	146.7	151.4	153.6
2	Saraswati Hanshal[1]	138.2	141.1	-
3	Soumyajit Maiti[2]	139.5	143.6	145.4
4	K. Anand[3]	140.6	145.44	149.09
5	G.K. Medhi[4]	136.3	142.7	147.7
6	Ashish Mukhopadhya[12]	143.75	141.6	145.33
7	Amuta[7]	135.12	145.18	145.18
8	Yao Yiling[(9]	148.07	151.7	154.3
9	Prabeer Kumar[13]	134.6	-	-
10	Pushpa Bharati[11]	137.33	138.85	-
11	NCHS (from D.K. Agarwal)	138.7	144.6	147.0
12	WHO (from K. Anand)	140.6	145.44	149.09
13	Present study	147.05	151.28	155.38
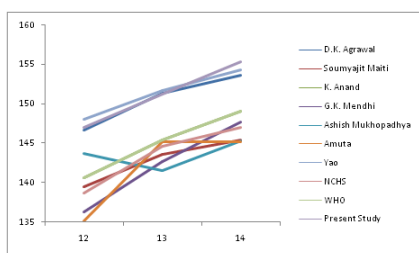
Graph 8

From table 8 and graph 8 it was observed that in all age groups the height of female students of the present study was more than the NCHS and WHO standard as well as that of the students of Saudi Arabia and Nigeria. It was also more than the students of the other regions of India. But it was almost equal to that of the students of Shanghai. This was due to improvement in the socio-economic status of the present region. In the present study there was a steady increase in height.

Table 9: Comparative mean values of Weight kg (MALE)

| Sr. No	Name of Study	12 yrs	13 yrs	14 yrs
1	D.K. Agarwal[8]	34.4	39.4	44.7
2	Saraswati Hanshal[1]	28.8	29.07	-
3	G.K. Mendhi[4]	28.52	32.6	35.95
4	Ashish Mukhopadhya[12]	30.89	34.88	38.79
5	Hazza M.[10]	35.3	39.7	47.8
6	Amuta[7]	28.62	32.7	39.1
7	Yao Yiling[9]	33.9	38.4	43.7
8	Prabeer Kumar[13]	27.08	-	-
9	Pushpa Bharati[11]	25.93	29.6	-
10	NCHS (from D.K. Agarwal)	27.6	31.2	35.2
11	Present study	34.5	39.32	44.75
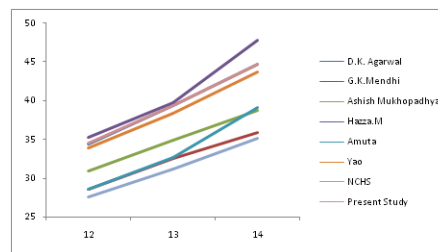
Graph 9

From table 9 and graph 9 it was observed that in all age groups the weight of male students of the present study was more than the NCHS standard as well as that of the students of Saudi Arabia, Shanghai and Nigeria. It was also more than the students of the other regions of India. This was due to improvement in the socio-economic status of the present region. In the present study there was a steady increase in weight.

Table 10: Comparative mean values of Weight kg (FEMALE)

| Sr. No	Name of Study	12 yrs	13 yrs	14 yrs
1	D.K. Agarwal[8]	38.7	42.6	45.7
2	Saraswati Hanshal[1]	26	30.5	-
3	Soumyajit Maiti[2]	30.35	33.83	35.73
4	G.K. Mendhi[4]	28.81	32.81	36
5	Ashish Mukhopadhya[12]	33.68	34.05	37.28
6	Amuta[7]	31.12	35.83	41.2
7	Yao Yiling[9]	35.85	39.57	42.9
8	Prabeer Kumar[13]	28.04	-	-
9	Pushpa Bharati[11]	25.15	27.8	-
10	NCHS (from D.K. Agarwal)	28.3	31.7	35.9
11	Present study	35.67	41.92	45.33
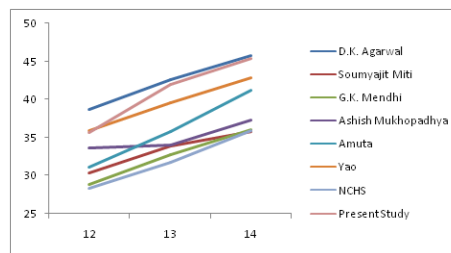
Graph 10

From table 10 and graph 10 it was observed that in all age groups the weight of female students of the present study was more than the NCHS standard as well as that of the students of Saudi Arabia, Shanghai and Nigeria. It was also more than the students of the other regions of India. This was due to improvement in the socio-economic status of the present region. In the present study there was a steady increase in weight.

Table 11: Comparative mean values of Head Circumference cm (MALE)

| Sr. No	Name of Study	12 yrs	13 yrs	14 yrs
1	D.K. Agarwal[8]	52.7	53.1	53.6
2	I.J.S. Bansal[14]	51.91	52.14	52.81
3	Present study	51.62	53.03	53.84
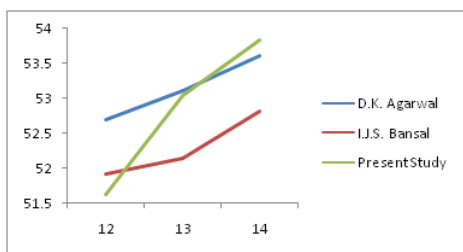
Graph 10

It was observed from table 10 and graph 10 that the head circumference of the male students in 12 years of group of the present study was less to that of the students of other regions of India. But in the age group of 13 it was more than I.J.S. Bansal and almost same to that of D.K. Agarwal. In 14 years it was more than the students of the other regions of India. In the present study there was a steady increase in head circumference.

Table 12: Comparative mean values of Head Circumference cm (FEMALE)

| Sr. No	Name of Study	12 yrs	13 yrs	14 yrs
1	D.K. Agarwal[8]	52.6	53	53.5
2	I.J.S. Bansal[14]	51.49	51.91	52.11
3	Present study	50.31	51.26	52.54
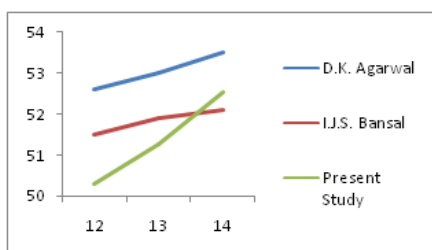
Graph 12

It was observed from table 12 and graph 12 that the head circumference of the female students in 12 and 13 years of age groups of the present study was less to that of the students of other regions of India. But in the age group of 14 years it was more than the study of I.J.S Bansal. In the present study there was a steady increase in the head circumference.

Table 13: Comparative mean values of Head Circumference cm (FEMALE)

| Sr. No	Name of Study	12 yrs	13 yrs	14 yrs
1	D.K. Agarwal[8]	65.6	68.1	70.8
2	Present study	66.99	71.2	74.24
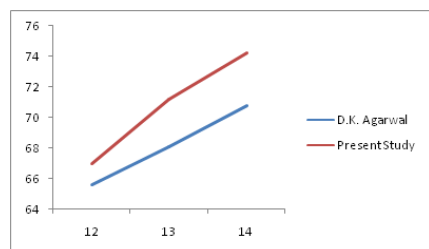
Graph 13

It was observed from table 13 and graph 13 that in all age groups the chest circumference of the male students was little more than the male students of other regions of India. This was due to the fact that the socio-economic status of the present area was better than other regions of India. In the present study there was a steady increase in chest circumference.

Table 14: Comparative mean values of Abdominal Circumference (MALE)

| Sr. No	Name of Study	12 yrs	13 yrs	14 yrs
1	PT Katzmarzyk[15]	65.8	66.5	69.7
2	Present study	62.6	64.6	66.93
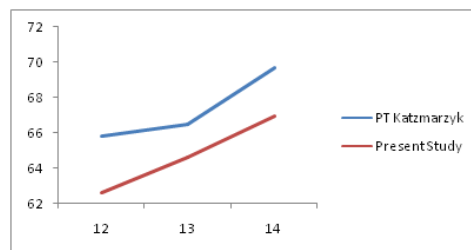
Graph 14

It was observed from table 8 and graph 8 that in all age groups the abdominal circumference of the male students of the present study was less than the male students of Canada. In the present study there was a steady increase in abdominal circumference.

Table 15: Comparative mean values of Abdominal Circumference (FEMALE)

| Sr. No	Name of Study	12 yrs	13 yrs	14 yrs
1	PT Katzmarzyk[15]	62.5	64.8	65.9
2	Present study	61.24	66.72	65.97
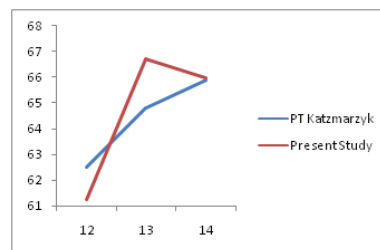
Graph 15

It was observed from table 15 graph 15 that in 12 years of age group the abdominal circumference of the female students of the present study was less than the Canadian students. In 13 years of age group it was more than the Canadian students. But in 14 years of age group it was almost equal to that of the female students of Canada.

Table 16: Comparative mean values of Hip Breath cm (MALE)

| Sr. No	Name of Study	12 yrs	13 yrs	14 yrs
1	Burdurlu[5]	29.3	30.9	31.4
2	Ehsanollah[6]	28.1	-	-
3	Present study	24.07	27.13	26.68
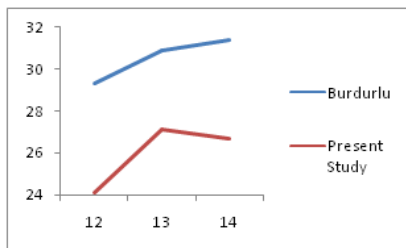
Graph 16

It was observed from table 16 and graph 16 that in all age groups the hip breath of the male students was less in the present study than Turkish students. But according to table in 12 years of age group the hip breadth of the male students of the present study was less than the Iranian students of 12 years of age group.

Table 17: Comparative mean values of Hip Breath cm (FEMALE)

'	Name of Study	12 yrs	13 yrs	14 yrs
1	Burdurlu[5]	28.9	29.3	31.4
2	Ehsanollah[6]	30.1	-	-
3	Present study	25.8	28.43	29.22
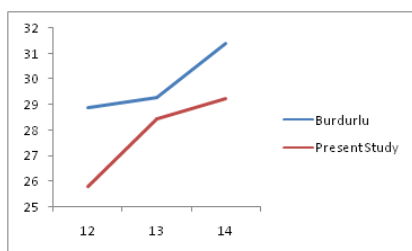
Graph 17

It was observed from table 17 and graph 17 that in all age groups the hip breath of the female students was less in the present study than Turkish students. But according to table in 12 years of age group the hip breadth of the female students of the present study was less than the Iranian students of 12 years of age group. In the present study from 12 to 13 years there was a sudden increase in hip breadth.

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