COMPARATIVE ANTHROPOMETRY BETWEEN SICKLING AND NONSICKLING INDIVIDUALS OF LOCAL POPULATION OF RAIPUR CITY OF CHHATTISGARH BY MEASURING BODY WEIGHT AND HEAD BREADTH

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ABSTRACT

Introduction: Studies on child growth and development have always occupied an important position in the scientific research curriculum and are of interest to the researchers of both Medical Science and Physical Anthropology all over the world. Sickle Cell Anemia (SCA) is a hereditary anemia, predominantly seen amongst various tribal populations of India. This problem decreases the amount of oxygen flowing to body tissues which affects growth and nutritional status of individuals.

Materials and Methods: In present study, 316 subjects of Raipur city 157 cases (sickling) and 159 controls (nonsickling) were taken and anthropometric measurements body weight and head breadth were obtained.

Result: After analysis of data of above parameters, we found cases weighed less than control except at the age of 21 for male where it was equal. At 25 years this difference was statistically highly significant in male; and at 12, 13 years in female.

Conclusion: On comparison mean value of various body measures body weight of cases were less than that of controls for both male and female, but in head breadth, enough variations were observed. Significant differences were observed in body weight.

KEYWORDS: Anthropometry, Sickle cell Anemia, Spreading Calliper.

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INTRODUCTION

Sickle Cell Anemia (SCA) is a hereditary anemia, predominantly seen amongst various tribal populations of India. Sickle gene is found all over the world, particularly amongst people originated/ migrated from Malaria endemic areas of Africa & Asia. According to one of the hypothesis, it is a natural mutation in Hemoglobin molecule to protect RBCs from malarial parasites by making them a little rigid, so that malarial parasites can't enter into RBCs [1,2].

SCA occurs due to inherited abnormal hemoglobin (Hb) gene, which produces Hb-S (Hb-Sickle). Due to the presence of Hb-S and because of its

abnormal characteristic, converts RBCs into rigidbrittle half moon (Sickle) shaped instead of soft round biconcave shape, which is the main cause of complication of Sickle Cell disease.

The fragile, sickle-shaped cells deliver less oxygen to the body's tissues. They can also get stuck more easily in small blood vessels, as well as break into pieces that can interrupt healthy blood flow. These problems decrease the amount of oxygen flowing to body tissues even more [1,2].

Sickle cell anemia is inherited from both parents. If we inherit the sickle cell gene from only one parent, we will have sickle cell trait. People with sickle cell trait do not have the symptoms of sickle cell anemia. Life span of RBC in SCD is less than 30 days instead of 90 to 120 days. Anemia results from the bone marrow's inability to produce enough blood cells to keep pace with the rate of destruction.

According to a study, prevalence of SCD in India is highest in the state of Chhattisgarh (23%) and highest for Kurmi (55%) and Teli (53%) caste which belong to backward castes [3].

This work is an attempt to study the growth status and anthropometric variation of Sickling individuals of Raipur city of Chhattisgarh state and compare them with non - sickling individuals of the same region.

MATERIALS AND METHODS

In the present study, data were collected from local population of Raipur Dist. during the months from October 2012 to July 2013 [4].

In order to study the physical growth and nutritional status of Sickling and Non-Sickling individuals, a simple schedule was prepared to record the different Anthropometric variables. Sickling cases taken in this study, were registered cases in Sickle Cell Unit of Pt.J.N.M. Medical College Raipur (C.G.). Sample size 316 [157 cases (sickling) + 159 controls (non-sickling)] according to inclusion and exclusion criteria.

Individuals were examined for the following Anthropometric measurement:

1. Body Weight

2. Head Breadth

The date were analysed, compared and interpreted by using the proper statistical methods.

Table 1: Body	weight in	Kg. In	Males
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	DISEASED MALE			CC	NTROL N			
Age	No.	Mean	S.D.	No.	Mean	S.D.	t-test	P value
10+	6	16.33	1.86	5	19.4	2.3	-2.4	0.04
11+	3	21.67	0.58	5	23.9	2.07	-2.27	0.07
12+	6	23.08	2.01	5	25.9	2.36	-2.11	0.07
13+	8	23.25	1.54	5	25.8	1.52	-2.93	0.02
14+	7	25.64	3.3	5	29.3	2.91	-2.03	0.07
15+	4	29	4.08	5	33.8	4.82	-1.62	0.15
16+	7	41.29	3.5	7	44.14	3.76	-1.47	0.17
17+	3	46.33	4.51	5	51.7	5.52	-1.5	0.19
18+	3	54.33	2.08	7	59	8.96	-1.3	0.23
19+	2	60.5	3.54	7	70	5.16	-3	0.08
20+	3	61.83	4.48	5	65.4	3.96	-1.14	0.32
21+	3	54.5	3.04	10	54.5	6.03	0	1
22+	3	48.67	7.37	5	55.6	7.7	-1.27	0.27
23+	4	59.5	4.2	6	62.33	3.78	-1.09	0.32
24+	4	59.88	3.38	4	69.13	7.55	-2.24	0.09
25+	5	60.6	2.33	3	68.5	2.29	-4.69	0.01
Total	71	39.02	16.85	89	47.94	17.68		

Table 2: Body weight in Kg. In females

				1				
Δσο	DISEASED FEMALE			CO	NTROL FE	t_test	D value	
750	No.	Mean	S.D.	No.	Mean	S.D.	1-1031	1 Value
10+	7	15.43	1.9	4	18.25	1.71	-2.53	0.04
11+	4	20	2.04	4	23.25	1.85	-1.85	0.13
12+	8	22	1.2	5	25.1	1.08	-4.12	0.01
13+	7	23.64	0.99	5	26.8	1.44	-3.75	0.01
14+	10	25.1	2.18	4	28.25	2.5	-2.21	0.08
15+	7	27.86	2.66	4	30.38	2.93	-1.42	0.21
16+	8	27.88	2.1	5	30.8	1.92	-2.57	0.03
17+	4	31.25	2.75	3	35.33	3.06	-1.82	0.14
18+	7	37.36	1.41	3	40.5	1.32	-3.38	0.03
19+	3	48.67	3.51	9	56.11	9.03	-2.05	0.07
20+	5	49.5	9.49	6	52.25	8.17	-0.51	0.62
21+	3	46.67	5.51	6	52.67	6.95	-1.41	0.22
22+	4	48.75	2.22	3	52	3	-1.58	0.2
23+	3	39.17	3.51	3	42.17	3.21	-1.09	0.34
24+	2	41.5	0.71	3	45	1.73	-3.13	0.06
25+	4	45.5	1.29	3	48	1.73	-2.1	0.11
Total	86	31.35	11.15	70	39.11	13.54		



Age in year



Fig. 3: Head Breadth (Male).





Table 3: Head Breadth in cm. In males.

Age	DISEASED MALE			CC	ONTROL N		Duralius	
	No.	Mean	S.D.	No.	Mean	S.D.	t-test	P value
10+	6	12.97	0.1	5	12.96	0.11	0.1	0.92
11+	3	13.03	0.15	5	13.1	0.16	-0.59	0.58
12+	6	13.28	0.12	5	13.26	0.11	0.33	0.75
13+	8	13.41	0.16	5	13.4	0.16	0.14	0.89
14+	7	13.66	0.11	5	13.64	0.11	0.26	0.8
15+	4	13.95	0.13	5	14	0.16	-0.52	0.62
16+	7	13.81	0.4	7	13.81	0.4	0	1
17+	3	14.07	0.25	5	14.02	0.19	0.28	0.8
18+	3	13.93	0.12	7	14.04	0.17	-1.18	0.28
19+	2	13.9	0.57	7	13.97	0.33	-0.17	0.89
20+	3	13.83	0.21	5	13.92	0.22	-0.56	0.6
21+	3	13	0.35	10	13.41	0.55	-1.54	0.18
22+	3	13.2	1.1	5	13.52	0.9	-0.43	0.69
23+	4	13.23	0.59	6	13.42	0.55	-0.52	0.62
24+	4	13.85	0.13	4	13.85	0.13	0	1
25+	5	13.74	0.32	3	13.8	0.36	-0.24	0.82
Total	71	13.53	0.46	89	13.63	0.48		-

Table 4: Head Breadth in cm. In females

A.c.o.	DISEASED FEMALE			CC	ONTROL FE	t tort	Duralura	
Age	No.	Mean	S.D.	No.	Mean	S.D.	i-test	P Value
10+	7	12.74	0.13	4	12.75	0.13	-0.09	0.93
11+	4	12.95	0.13	4	12.95	0.13	0.58	<mark>0</mark> .59
12+	8	13.39	0.08	5	13.38	0.08	0.22	<mark>0</mark> .83
13+	7	13.53	0.08	5	13.52	0.08	0.57	0.59
14+	10	13.71	0.07	4	13.7	0.08	0.21	0.84
15+	7	13.8	0.22	4	13.8	0.22	0	1
16+	8	13.73	0.13	5	13.72	0.13	0.07	0.95
17+	4	13.8	0.08	3	13.8	0.1	0	1
18+	7	13.93	0.05	3	13.93	0.06	-0.12	0.91
19+	3	13.1	0.17	9	13.13	0.31	-0.23	0.82
20+	5	13.02	0.43	6	13.02	0.39	0.01	0.99
21+	3	12.67	0.8	6	12.8	0.53	-0.26	0.81
22+	4	13.43	0.34	3	13.33	0.35	0.35	0.75
23+	3	12.73	1.08	3	12.73	1.08	0	1
24+	2	13.35	0.21	3	13.3	0.17	0.28	0.81
25+	4	13.48	0.21	3	13.47	0.25	0.05	0.97
Total	86	13.42	0.47	70	13.3	0.48		

Age in year Fig. 4: Head Breadth (Female).



Age in year





Fig. 6: Mearurement of Body Weight.



Inclusion Criteria

1. Individuals of local population of Raipur district of Chhattisgarh.

2. Age group 10 to 26 years.

3. Apparently healthy individuals for control and

4. Individuals suffering from Sickling who were registered in sickle cell unit of Pt. J.N.M.Medical College Raipur.

Exclusion Criteria

1. Individuals other than local population of Raipur district Chhattisgarh state.

2. Age less than 10 and more than 26 yrs.

Body Weight: Weighing was done with the subject wearing minimum clothes on a weighing machine [4]. The subject was asked to stand on the weighing machine and the weight recorded to the nearest of 0.5kg.

Instrument used: Portable Weighing Machine.

Head Breadth: [5-7] Maximum breadth in the transverse plane, wherever it occurs, Pressure was exerted to compress the tissue. (Fig.1)

Instrument used: Spreading Calliper.

RESULTS AND DISCUSSION

The result of analysis of 2 body measures of case (sickling) and control (non-sickling) individuals of Raipur city of Chhattisgarh, ranging from age 10+ to 25+ years are presented and each body measure is described with regard to mean, standard deviation and distance curve with the help of necessary tables and figures [4]. They are shown separately for males and females. Case and control differences are assessed for all body measures by using "t-test" and "p value".

Body Weight (Table No.1 & 2; Figure No. 1 & 2): When case and control males and female were compared, it was seen that the distance curve of body weight for case ran below the distance curve for control except at the age period of 21+(male) where it coincides with the control. For male difference is significant at the age periods of 10+, 13+ and 25+ (p value < 0.05) and highly significant at the age period of 25+ (p value 0.01). For female difference is significant at the age periods of 10+, 12+, 13+, 16+ and 17+ (p value < 0.05) and highly significant at the age periods of 12+ and 13+ (p value 0.01) [8].

Head Breadth (Table No. 3 & 4; Figure No. 3 & 4): The distance curve of head breadth (male) reveals that curve for case ran below the distance curve for control except at the age period of 10+, 12+, 13+, 14+ and 17+ where it is above and 16+, 24+ where it coincides but the difference is insignificant at all age periods (p value > 0.05) [8].

On comparison of case and control females, it was seen that the distance curve for case ran above the distance curve for except at the age period of 10+, 12+, 19+ and 21+ where it is below and at 11+, 15+, 17+, 18+, 20+, 23+ where it coincides but the difference is insignificant at all age periods (p value > 0.05) [8].

Assessment of differences in head breadth, by their direct measurements from the subjects of two groups was done to see if there are any facial changes in cases but almost no significant differences were observed.

From the above discussion, it may be tempting to state that the poor growth status of the cases & controls, as judged by body weight, in comparison to Indian standard may be due to the poor socio-economic condition. Apart from under-nutrition, sickling may be responsible for low weight. It is found significantly lower z scores for weight, height, arm circumference, and upper arm fat and muscle areas, delayed skeletal maturation delayed puberty, and poor nutritional status in children with SCD [9].

Growth represents a complex interaction of nutritional intake, absorption and requirements, all of which vary within and among populations. Nutritional requirements alone are complex function of body size, age, health and activity levels [10].

In study of effect of sickling on growth it is concluded that an average reduction in weight, height, sitting height, limb length in patients with sickling (SS) as compared to control [11]. Human growth is a dynamic changing process and is being influenced by heredity and environment. Genetic component and environment both contribute to attain final body structure. Certain factors like disease, proper diet, time, cultural pursuits, geographical conditions etc. have tremendous influence in the growth of a child [12].

CONCLUSION

On comparison mean value of various body measures body weight of sickling cases were less than that of controls for both male and female, but in head breadth, enough variations were observed. Significant differences were observed in body weight. It concludes that Sickling affects various body parameters adversely.

Conflicts of Interests: None

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