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STUDY OF GROWTH PATTERN OF SICKLE CELL PATIENTS IN CENTRAL INDIA REGION

Ashish V.Radke¹, Sonali Khanapurkar¹, Prathamesh H Kamble¹, L.S. Kanzode²

¹Dept. of Anatomy, B.J.Medical college, Pune

²Dept. of Anatomy, Indira Gandhi Govt. Medical College, Nagpur

E-mail of Corresponding Author: dr.prathamesh81@gmail.com

ABSTRACT

We carried out an anthropometric study of 150 sickle cell patients from the central India region, in the age group of 5-20 years, to study the different growth patterns. Height and weight of cases were measured and compared with the normal healthy control of the same age group from the same region. We found that height and weight of the cases was significantly lower than controls. These parameters were found to be significantly lower in sickle cell anemia (SS) cases compared to sickle cell trait (AS) cases. From the above study we can conclude that in sickle cell disease growth and development of the patient is significantly affected and the patients of sickle cell anemia (SS) are affected more compared to sickle cell trait cases (AS).

Key Words: Sickle cell disease, anthropometry, growth and development.

INTRODUCTION

Sickle cell disease is important hemoglobinopathy, affecting structure, function or production of hemoglobin¹. It is an inherited disorder having high prevalence in central India, characterized by production of defective hemoglobin¹ in which there is mutation of beta gene leading to substitution of valine for glutamic acid. This leads to production of abnormal globin chain causing sickle cell disease³. It has two varieties i.e. sickle cell trait (AS) and sickle cell anemia (SS)³. Sickle cell disease affects almost all systems of the body causing impairment in various anthropometric measurements like height, weight etc. It also affects normal growth and development of the individuals⁴.

The study of anthropometric measurements in sickle cell disease patients has been carried out by many workers outside India, on small sample size. Though sickle cell disease cause major burden to the society in India, there is paucity of data on physical growth and development of sickle cell disease children in India and available data is also not much informative.

Taking into consideration the above scenario, present study was carried out with the aims and objectives of: -

1. To study the growth pattern in sickle cell trait (AS) & sickle cell anemia (SS) cases.
2. To compare it with normal subject.

MATERIAL AND METHODS

We studied 150 diagnosed cases of sickle cell disease in the age of 5-20 years during June 2008 to June 2010 who attended sickle cell O.P.D. or admitted in medicine and pediatric wards of the institute. They belonged to central India region including

mainly vidharbha, Madhya Pradesh. Their diagnosis was confirmed by peripheral blood smear and electrophoresis. Those patients having any skeletal deformity, any other chronic illness and pregnant females were excluded from study. Control group for this study consisted of 150 normal, healthy subjects, chosen randomly from the schools of the same region of same age group.

The written informed consent was obtained from all the participants. Each participant was assessed for:-

1. Height: - Standing height was measured with an anthropometer, with the subject standing erect, heels together and line of vision directed horizontally and recorded in centimeters up to accuracy of 0.1cm⁵.

2. Weight: - Weight of subject was measured with simple weighing machine without foot ware, measuring in kilograms with accuracy up to 100 grams. The zero was adjusted before taking weight⁵.

All variables were presented as mean \pm SD and comparison was carried out using unpaired t – test. P value less than 0.05 was considered as statistically significant.

RESULTS

Table I show the distribution of cases and controls in the study. 150 cases and controls were studied. Cases were further sub-grouped into 82 AS and 68 SS cases. Anthropometric measurements were taken from the cases and controls, findings are depicted in table II and III.

Average height of total male and female sickle cell disease AS+SS group, SS group and AS group was significantly lower than controls. Mean height of male cases of sickle cell disease (AS+SS) sickle cell anemia (SS) and sickle cell trait (AS) was significantly lower than control males. Similarly, female (F) sickle cell disease (AS+SS), sickle cell anemia (SS) and sickle cell trait (AS) had significantly lower

height than control females. (Table II) These findings are depicted in graph I.

Similarly, average weight of total male and female sickle cell disease AS+SS group, SS group and AS group was significantly lower than controls. Mean weight of male cases of sickle cell disease (AS+SS) sickle cell anemia (SS) and sickle cell trait (AS) was significantly lower than control males. Similarly, female (F) sickle cell disease (AS+SS), sickle cell anemia (SS) and sickle cell trait (AS) had significantly lower weight than control females. (Table III) These findings are depicted in graph II.

DISCUSSION

In India sickle cell disease is prevalent, especially in tribal regions and prevalence rate varies from 0- 40 % in different population groups. There is high prevalence of sickle cell disease in central India mainly among the mahar community⁶.

The first parameter, height was significantly lower in cases than in control, also it was lower in sickle cell anemia (SS) cases compared to that of sickle cell trait (AS) cases and higher in males as compared to females. This parameter was previously studied by Winsor T. (1944)⁷, Whitten CF (1961)⁸, Jimenez CT (1965)⁹, Ascroft MT (1972)¹⁰, Kate B.R. (1977)¹¹, Cepeda ML (2000)⁴, Mukherjee MB (2004)², Rhodes M (2009)¹². Different workers found the different mean value of height. This might be due to different age group, and different population they studied but all these workers found significant decrease of height in cases than in control except that of Rhodes M (2009)¹². Findings in present study also show the similar results.

Similarly, weight was significantly lower in cases than in control, also it was lower in sickle cell anemia (SS) cases compared to that of sickle cell trait (AS) cases and higher in males as compared to females.

The same parameter is studied by various authors. The value of weight obtained by other authors is shown in the table V. Different workers found the different mean value of weight. This might be due to different age group, and different population they studied but all of them found significant decrease in weight of cases than in control except that of Rhodes M (2009)¹²

Thus, Impairment in growth and development was more in sickle cell anemia (SS) cases compared to sickle cell trait cases. This difference is due to percentage of hemoglobin affected in these two categories. Similarly the height and weight measurements are more in males than in females, which can be explained with their general body make up and the genetic constitution. Sickle cell disease is a disease affecting almost all the systems of the body including normal growth and development. In sickle cell disease normal R.B.C. changes their shape to sickle shape causing lack of oxygen to normal tissue, hampering the normal growth and development¹³. The low growth can also be due to the inadequate food intake because of poor appetite mainly during vasoocclusive crisis². Some authors suggested that increased energy expenditure, in addition to anemia is also a factor affecting the growth in children of sickle cell disease¹².

CONCLUSION

In present study height and weight of cases are found significantly less in cases than in control and are less in sickle cell anemia (SS) patients than in sickle cell trait (AS) patients. From this we can conclude that the growth and development of the patient is delayed in patients of Sickle cell disease and more significantly in sickle cell anemia (SS) patients. Previously anthropometric studies in sickle cell disease patients were carried out by many workers but most of

the studies were done on the small sample size and outside India. Present study is important in these aspects as it was done on large population, considering the population from region where sickle cell disease is most prevalent. The present study can be made useful for screening of patients with sickle cell disease. Similarly in such patients of sickle cell disease, counseling for marriageable couples can prevent the occurrence in their next generation and thereby it can help to decrease the overall incidence and prevalence of sickle cell disease.

Also, the present study suggest that there is further need for full scale investigation of longitudinal aspects of growth and quantitative assessment of protein and calorie intake of children with sickle cell disease for the exact reasoning of decrease in growth and development.

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Table No. I: - Distribution of cases and control

Distribution of cases			
Subgroup	Males	Females	Total
AS	35	31	66
SS	47	37	84
Total	82	68	150
Distribution of controls			
	75	75	150

Table no II: - Comparison of height in sickle cell disease cases and control

Types of Cases.	Cases (mean \pm SD)	Control (mean \pm SD)	p- Value.
For Male and female subjects			
AS+SS	129.48 \pm 17.49	138.38 \pm 19.42	0.0000*
SS	128.22 \pm 16.48	138.38 \pm 19.42	0.0001*
AS	129.58 \pm 18.36	138.38 \pm 19.42	0.0019*
For male subjects			
AS+SS	129.91 \pm 17.34	139.53 \pm 20.79	0.0013*
SS	129.65 \pm 16.00	139.53 \pm 20.79	0.0063*
AS	130.25 \pm 19.22	139.53 \pm 20.79	0.0278*
For female subjects			
AS+SS	127.25 \pm 17.38	137.27 \pm 18.03	0.0012*
SS	126.40 \pm 17.38	137.27 \pm 18.03	0.0030*
AS	128.71 \pm 17.63	137.27 \pm 18.03	0.0274*

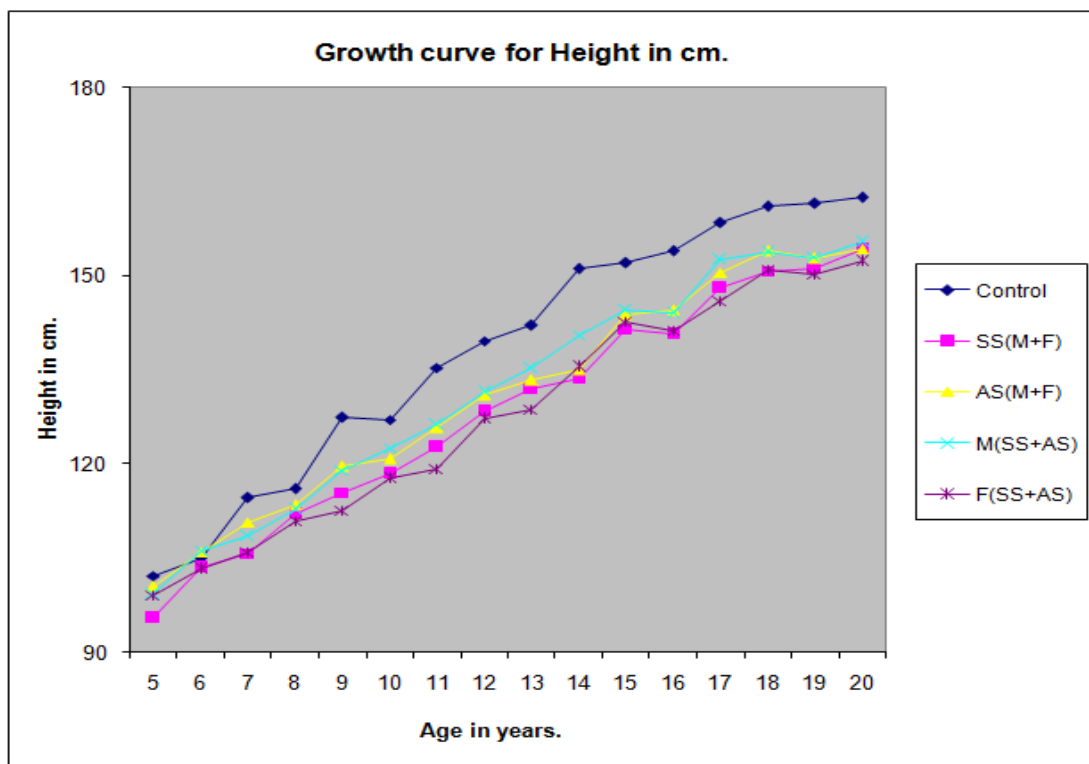
(* significant difference)

Table no III :- Comparison of weight in sickle cell disease cases and control

Types of Cases.	Mean Value of Cases.	Mean Value of Control.	p- Value.
For male and female combined			
AS+SS	26.32 \pm 9.89	31.33 \pm 12.31	0.0001*
SS	25.91 \pm 9.68	31.33 \pm 12.31	0.0015*
AS	26.98 \pm 10.15	31.33 \pm 12.31	0.0232*
For males			
AS+SS	27.69 \pm 10.22	33.26 \pm 12.08	0.0021*
SS	27.68 \pm 9.84	33.26 \pm 12.08	0.0088*
AS	27.71 \pm 10.85	33.26 \pm 12.08	0.0224*
For females			
AS+SS	24.67 \pm 9.50	29.85 \pm 12.37	0.0061*
SS	24.48 \pm 10.85	29.85 \pm 12.37	0.0264*
AS	24.90 \pm 7.82	29.85 \pm 12.37	0.0416*

(* significant difference)

Graph I Showing Height in various groups according to their ages



Graph 2 Showing weight in various groups according to their ages

