

Prevalence of Sickle Cell Disorder and Anaemia in Tribal School Students from Central India

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ABSTRACT

Background: Tribal health is matter of concern in India. The problem of anaemia is very rampant in this population. All the health problem in tribals are complicated by presence of Sickle Cell Disorders which has a presence in tribal communities of Central India. These problems are severe in tribal children. So this study was undertaken in Residential Tribal schools.

Objectives: (1) To find prevalence of Sickle Cell Disorders in Residential Tribal School students (2) To find the prevalence of anaemia in them (3) To study their nutritional status with reference to above findings

Material and Methods: The study was conducted in July-August 2009 in 908 students studying in two different Residential Tribal Schools in Central India. Every individual was screened for Sickle Cell Disorder by performing solubility test on finger prick sample of blood. Those subjects found positive on screening were subjected to Hb electrophoresis. Hb estimation was

done by Cynmethaemoglobin method. Other information was recorded on pretested pro forma by trained investigators. Data was analyzed by appropriate statistical methods.

Results: Sickle Cell Disorder was present in 6.28% of study subjects. (7.99% in boys and 2.20% in girls) Prevalence of anaemia was 89.75%. (28.31% mild, 29.40% moderate, 32.04% severe anaemia) In boys, 87.69% students were anaemic while in girls 91.91% students were anaemic. All subjects with sickle cell disorder were anaemic.

Conclusions: Sickle Cell disorders has wide spread presence in different tribes of Central India. Problem of anaemia is long lasting and severe and is more in case of girls.

Keywords: Tribal health, Maharashtra, School health, Hb status, nutrition, Hereditary blood disorders

Introduction

Schools are sacred because they provide an environment for learning skills and for development of intelligence that can be utilised by students to achieve their goals in life. It is also observed that, “to learn effectively, children need good health”. Health is key factor for school entry, as well as continued participation and attainment in school. If we fail to nurture the health of school children there can be immense destabilizing effects on political, social and economic system.¹

In Maharashtra (a progressive state in India), Residential Tribal Schools are mainly for the students belonging to Schedule Tribes. These are either Government schools or private schools aided by the government. Most of these schools are located in tribal areas of the state. There is provision of admission of non tribal students but these non tribal students are not entitled for the benefits provided to tribal students. In a class of 50 students there should be at least 40 Scheduled Tribe (ST) students. These schools are governed by the Department of Tribal development through various Divisional Integrated Tribal Development Projects located across the state.² The present study was carried out in an Integrated Tribal Development Project, Nagpur, Central India.

Objectives

- To find prevalence of Sickle Cell Disorders in Residential Tribal School students
- To find the prevalence of anaemia in them
- To study their nutritional status with reference to above findings

Material and Methods

Duration of study: July to December 2009

Study Setting: 1) School No.1, Belda, District-Nagpur

2) School No.2, Bandra, District-Nagpur

(Both are the Residential Tribal Schools.)

Study Design: Cross sectional study

There are 14 *tehsils* (administrative division below district level) in the Nagpur district. The *tehsil* under study (Ramtek) was selected by purposive sampling. There are four aided and two government tribal schools located in this *tehsil*. Two Residential Tribal Schools for the study were also selected by purposive sampling.

Necessary approval was obtained from the Institutional Ethics Committee of Government Medical College, Nagpur, INDIA.

Methodology

Sample size

It was determined based on the prevalence of Severe Anaemia in 100 study subjects enrolled in the pilot study. The formula-³

$$N = z^2 \times p \times (1-p)/d^2$$

Where $z=1.96$, $p=0.34$ (%prevalence of severe anaemia in pilot study),

$d=10\%$ of p i. e. 0.034 (acceptable margin of error)

Thus, $N=746$

Main Study:

There were total 509 students in School No.1, *Belda* and 430 students in School No.2, *Bandra*. Out of them 499 (98.04%) students from *Belda* and 409 (95.12%) students from *Bandra* school were included in the study. The remaining 32 students were not included in the study as they were absent from the school during the data collection period and could not be contacted

even after 3 informed attempts. Thus out of total 939 students on roll in these two schools, 908 (96.7%) students formed the study group.

Height and weight of students were recorded by following standard procedures. Body Mass Index (BMI) of every individual was calculated.

Investigations

Every student was subjected to haemoglobin estimation for diagnosis of anaemia and Solubility test as the screening test for the Sickle Cell Disorder. Those who were positive on Solubility test were subjected to Hb electrophoresis to determine the Hb pattern.

Compilation of the data and the analysis was done to draw conclusions.

Statistical Analysis

Chi square test, t test, proportion and percentage were used as statistical methods for analysis of data. Statistical soft wares used for the analysis of the data were:- Epi Info, SPSS.

Observations/Results

Table 1 shows that, prevalence of anaemia in the study subjects was found to be 89.75%. The prevalence of anaemia among males was found to be (87.69%) in comparison to (91.91%) in the females and this difference was found to be statistically significant. ($\chi^2=4.40$, $df=1$, $p=0.03$).

Table 2 shows, out of total 908 study subjects 850 (93.61%) were found to be negative while 58 (6.39%) were found to be positive on the Solubility test for the screening of Sickle Cell Disorders. While considering the said distribution in males, it was found that 38 out of the 463 males (8.21%) were positive for the solubility test while 20 out of 445 (4.49%) females were positive for the sickle cell disorders. ($\chi^2=5.23$, $p=0.02$)

Table 3 shows, distribution of 58 study subjects (who have shown positive solubility test) according to pattern of Hb after electrophoresis. It was found that 1 out of them (1.72%) was having the normal type of the Hb pattern i.e. AA and he was a male student. In all 2 (3.45%) of the study subjects were having SS type of Hb pattern i.e. they were having the sickle cell disease and both of them were males. Remaining 55 study subjects were having AS type of the Hb pattern i.e. they were having Sickle Cell Trait. Out of these 55 study subjects, 35 were males and the remaining 20 were females. Thus in the combined sample SS:AS ratio was 1:27.5.

Table 4 shows that out of total 815 study subjects who were anaemic, 638 (78.28%) were having normal nutritional status while 177 (21.72%) were having thinness. While out of 93 study subjects who were non anaemic, all 93 (100%) were having normal nutritional status and none was having thinness. Thus proportion of having thinness was significantly more among the anaemic school children as compared to non anaemic school children. ($p<0.001$)

Table 5 shows that out of 57 school children suffering from Sickle Cell Disorder, 44 (77.19%) were having normal nutritional status (BMI $\geq -2SD$) and 13 (22.81%) were having thinness (BMI $< -2SD$). While out of the 851 school children without Sickle Cell Disorder, 687

(80.73%) were having normal nutritional status and 164 (19.27%) were having thinness. Thus the proportion of school children having thinness were more among those suffering from Sickle Cell Disorder but it was not found to be statistically significant. ($\chi^2=0.43$, $df=1$, $p=0.5$)

Discussion

The high prevalence of severe anaemia in Residential Tribal School children is indicative of long standing problem of anaemia. In females 37.75% were severely anaemic as compared to 26.57% of the males. This is indicative of more seriousness of the problem as far as female students are concerned but very high proportion of severe anaemia in male students is also alarming.

The findings of Rao VG *et al.* (1998) and Chakma T *at al.* are almost similar to findings of present study.^{4,5} Ghosh K *et al.* (2002) has found little lower prevalence of anaemia in *Bhil* and *Pawara* tribes in Maharashtra but they too reported the higher prevalence of anaemia in females as compared to males.⁶ Vyas S *et al.* (2005) has reported 32.9% prevalence of severe anaemia.⁷

Deshmukh PR *et al.* (2006) has reported that out of total samples found positive on Solubility test, 94.4% were having HbAS pattern while 5.6% had HbSS pattern.⁸ Their findings are nearly similar to present study findings. On the basis of Hb electrophoresis, Balgir RS (2005) has found 29.8% cases of HbAS and 7.5% cases of HbSS in the studied sample.⁹ High proportion of HbSS in this study can be explained on the basis of hospital based study setting used by him. Although the proportion of Sickle Cell disorder in other caste was found to be on higher side in this study, less number of study participants belonging to the other castes can't be ignored. Prevalence of Sickle Cell disorder in *Gond* tribal people of Chhindwada district of Madhya Pradesh was found to be 4% by Gupta RB *et al.* (2006).¹⁰ It is quite comparable to findings of present study. Deshmukh PR *et al.* (2006) has also reported presence of Sickle cell disorders in many castes and tribes of Central India.⁸

Prevalence of thinness was more in male students (about 23%) as compared to female students (about 16%). None of the females was obese as compared to 0.86% Of the male students. Laxmaiah A *et al.* (2007) reported 21.3% prevalence of thinness in boys as compared to 44.6% in girls.¹¹ Maliye CH *et al.* (2010) has reported that 57% of the studied girls were having BMI less than 5th percentile which was indicative of thinness.¹² Medhi GK *et al.* (2007) has reported more prevalence of thinness among boys (59.5%) than the girls (41.3%).¹³

Conclusion

- 1) The prevalence of anaemia in the study subjects was very high. The prevalence of anaemia was higher in female students as compared to males.
- 2) Prevalence of Sickle Cell disorders was more in boys as compared to girls in concerned tribal schools.
- 3) Thinness was more common in anaemic study subjects.

IRB Permission:

Before starting the study, necessary ethical clearance was obtained from the Institutional Ethics Committee, Government Medical College, Nagpur, INDIA. Pin-440003.

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Conflict of Interest: None

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Table 1: Gender-wise distribution of study subjects according to degree of Anaemia

Degree of Anaemia	Gender				Total	
	Male		Female			
	No.	%	No.	%	No.	%
Severe	123	26.57	168	37.75	291	32.04
Moderate	114	24.62	153	34.39	267	29.40
Mild	169	36.50	088	19.77	257	28.31
No Anaemia	057	12.31	036	08.09	093	10.25
Total	463	100.00	445	100.00	908	100.00

$\chi^2=4.40$, $df=1$, $p=0.03$

Table 2: Gender-wise distribution of study subjects as per the results of Solubility Test for the diagnosis of Sickle Cell Disorder

Solubility Test	Gender				Total	
	Male		Female			
	No.	%	No.	%	No.	%
Positive	038	08.21	020	4.49	058	06.39
Negative	425	91.79	425	95.51	850	93.61
Total	463	100.00	445	100.00	908	100.00

$\chi^2=5.23$, $df=1$, $p=0.02$

Table 3: Gender-wise distribution of study subjects as per the results of Hb Electrophoresis for the diagnosis of Sickle Cell Disorder

Hb Pattern	Gender				Total	
	Male		Female			
	No.	%	No.	%	No.	%
AA	01	02.64	00	00.00	01	01.72
AS	35	92.10	20	100.00	55	94.83
SS	02	05.26	00	00.00	02	03.45
Total	38	100.00	20	100.00	58	100.00

Table 4: Relationship of Nutritional Status between Anaemic and Non anaemic study subjects

Anaemia	Nutritional Status				Total	
	Normal		Thinness			
	No.	%	No.	%	No.	%
Present	638	78.28	177	21.72	815	100.00
Absent	093	100.00	000	00.00	093	100.00
Total	731	80.51	177	19.49	908	100.00

Normal=BMI \geq -2SD, Thinness=BMI<-2SD

Fisher Exact test **p<0.001** HS

Table 5: Relationship of Nutritional Status between Sickle Cell Disorder patients and other study subjects

Sickle Cell Disorder	Nutritional Status				Total	
	Normal		Thinness			
	No.	%	No.	%	No.	%
Present	044	77.19	013	22.81	057	100.00
Absent	687	80.73	164	19.27	851	100.00
Total	731	80.51	177	19.49	908	100.00

Normal=BMI \geq -2SD, Thinness=BMI<-2SD

$\chi^2=0.43$, p=0.5 NS