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The Prevalence of Anemia and Severity in Tribal Versus Non-Tribal School Going Children of Mysore District, India

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Abstract

Background: An estimated 30 per cent of the world's population is anaemic, with the global prevalence among 6-12 years children to be 36 percent. Anaemia prevalence is higher in developing countries than developed countries. *Objectives:* Our aim was to estimate haemoglobin levels in tribal and non-tribal school going children [5-10 years] of Mysore and to compare the prevalence and severity of anemia between them. *Study design and settings:* This is a cross sectional community based study. *Methods:* School going children aged 5-10 years belonging to the tribal (Jenukuruba) and non-tribal belt of H.D. Kote Taluk, Mysore, were included. The sample size was estimated to be a minimum of 457 in each group. Hemoglobin estimation, clinical examination and anemia grading was done in all. *Results:* Out of 497 Jenukuruba tribal children, 89.5% of them were diagnosed as anemic, while only 63.6% were anemic among the Non tribal children [p<0.0001]. The mean Hemoglobin of tribal children was 8.62g/dl while that of non-tribal children was 10.94g/dl [p<0.0001]. Prevalence of anaemia was more among the girls than boys in tribal children., whereas anemia was more among boys than in girls in non-tribal children. While 22.54% of tribal-children had severe anemia, only 2.8% were severely anemic among non-tribal children. There is a correlation between the BMI and Hemoglobin. *Conclusions:* The prevalence of anemia in the present study subjects was higher than the national prevalence. There is need to improve the nutritional status of the children. Good training should be provided for the health workers to detect pallor and to take appropriate action.

Keywords: Anemia; Tribal; Non Tribal; Jenukuruba; BMI.

Introduction

Tribal people in Karnataka constitutes 6.95% of the total population of the state [1]. The total number of tribal people recognized by the Government in Karnataka is about 42, 48,978 [1]. The population of *Jenu Kurubas* is 36,076 in Karnataka mostly living in the districts of Mysore, Kodagu, and Chamarajanagar [1]. Tribal populations have been neglected since many generations and along with this, associated poverty has left them in poor state of health. Many practices such as late initiation of breastfeeding, no feeding of colostrum, faulty weaning practices, lack of access to health services, illiteracy, unhygienic personal habits accounts for the poor health of the tribes [1]. In developing countries, as such anemia and malnutrition form major public health problems among the school age children [2]. An estimated 30 per cent of the world's population is anaemic, with the global prevalence of anaemia among 6-12 year old children to be 36 percent [3]. Anaemia is a nutritional problem and its prevalence is higher in developing countries than developed countries [4]. Unfortunately, despite efforts from the government and non-governmental organizations to take primary health care to these marginalized people, there has been a very limited number of studies reported on the health status of the tribal communities of the Karnataka State [1]. Therefore this study was undertaken to compare the prevalence and severity of anemia between tribal and non-tribal school going children.

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Material and Methods

This is a cross sectional community based exploratory study.Children aged between 5-10 years going to the primary school and belonging to the tribal (Jenukuruba) and non-tribal belt of H.D. Kote Taluk, Mysore, were included. Inorder to estimate sample size, the prevalence of anemia as reported by Prabhakar and Gangadhar were utilized [5]. Knowing that prevalence of anemia is 78%, with 95% confidence level and 5% allowable error, the required sample size was estimated to be a minimum of 457 in each group. About 500 children, each from the tribal and non-tribal population were selected randomly formed the study group. Consent was taken from the parents and school teachers. Tribal children belonging other than Jenukuruba tribes were excluded. Four Government tribal schools and four private schools were selected. The selection of schools was done by random sampling procedure (Lottery method). JSS university ethical committee clearance was taken. Hemoglobin estimation and relevant clinical examination were done in all students. The blood sample was obtained by finger prick and were analysed for hemoglobin estimation by Cyanmethaemoglobin method of Dacie and Lewis. Anemia grading was done according to Kraemer and Zimmermann as mild (10-11.5 g/dl), moderate (7-9.9 g/dl) and severe anemia (<7.0 g/dl) [6].

Statistics: Summary statistics was done by calculating proportions, Mean, Standard Deviation, Coefficient of Correlation. Inferential statistics was done by using the Chi-Square Test.

The Chi-Square test is used to find the association between two caterogical variables of interest, Independent-t Test. To compare the mean of two independent groups Pearson's correlation was used. The data entry was done in Microsoft excel sheet and all the statistical analyses was carried out using SPSS.13 software.

Results

In the Tribal group, 497 (247 male+250 female) children and in the non-tribal group 500 children (246 male+254 female), were studied. So, a total of 997 cases formed the study subjects [Table 1]. Out of 497 Jenukuruba tribal children, 89.5% of them were diagnosed as anemic, while only 63.6% were anemic among the Non tribal children [Table 2].

Among the tribal children, 22.54% of them had severe anemia (Hb<7g/dl), while only 2.8% were severely anemic among the non-tribal children. Moderate anemia was found in 58.55% of the tribal children as opposed to 26% among the non-tribal children. Mild anemia was detected in 8.45% of the tribal children when compared to 34.8% among the non-tribal children [Table 2].

Table 1: Age and gender wise distribution of tribal and non tribal children

		Tribal children Number (%) 497 (100)	Non tribal children Number (%) 500 (100)	p value
Age group in years	5--5.99	99(19.9)	97(19.4)	0.99
	6--6.99	100(20.1)	100(20.0)	
	7--7.99	98(19.7)	100(20.0)	
	8--8.99	100(20.1)	104(20.8)	
	9--9.99	100(20.1)	99(19.8)	
Gender	Male	247(49.7)	246(49.2)	0.99
	Female	250(50.3)	254(50.8)	

Table 2: Distribution of anemic children among tribal and non tribal children

		Tribal children Number (%)	Non tribal children Number (%)	p value
Anemia status	Mean Hb ±S D	8.62 ±1.97	10.94 ±1.98	<0.0001
	Not anemic	52(10.5)	182(36.4)	
	Anemic	445(89.5)	318(63.6)	<0.0001
According to Classification of anemia	Mild	42(8.45)	174(34.8)	
	Moderate	291(58.55)	130(26)	<0.0001
	Severe	112(22.54)	14(2.8)	
Anemia according to gender	Male	211(85.43)	169(68.70)	
	Female	234(93.60)	149(58.66)	<0.0001

The mean Hemoglobin of Tribal children was 8.62g/dl while that of non-tribal children was 10.94g/dl [p<0.0001]. Prevalence of anaemia was more among the girls than boys in tribal children. Whereas anemia was more among boys than in girls in non-tribal children [Table 2]. The difference in the prevalence of anemia between the tribal and non-tribal children according to gender and age specific groups is shown in the Table 3. The most common sign of anemia was pallor among both the tribals (61.22%) and the non tribals (33.6%). Other common findings among the tribal children were platynychia (55.1%), chelosis (51.22%), Koilonychia (47.55%), bald tongue (44.69%), glossitis (39.39%), and angular stomatitis (25.1%) which were less common among the non tribals [Table 4]. The mean BMI of Tribal children as 13.3 while the mean BMI of non-tribal children were 16.02. [p<0.0001]. There is a correlation between the two independent variables i.e. BMI and Hemoglobin [Graph 1].

Table 3: Distribution of anemic children according to age groups and gender

Age group in years	Anemia in males			Anemia in females		
	Tribal	Non tribal	p value	Tribal	Non tribal	p value
5-5.99	41(83.6)	32(68.09)	0.07	45(90)	30(60)	0.001
6-6.99	44(88)	28(56)	<0.0001	46(92)	20(40)	<0.0001
7-7.99	42(87.5)	35(70)	0.035	48(96)	22(44)	<0.0001
8-8.99	43(86)	32(64)	0.011	48(96)	35(64.8)	<0.0001
9-9.99	41(82)	42(85.7)	0.6	47(94)	42(84)	0.11
Total	211(85.4)	169(68.7)	<0.0001	234(93.6)	149(58.66)	<0.0001

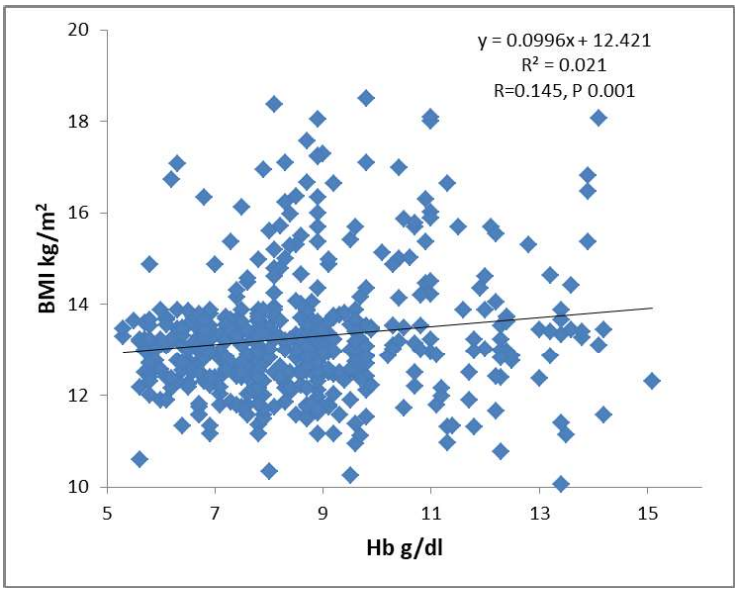
Table 4: Comparison of clinical signs between tribal and Non tribal children.

Clinical signs	Tribal children N=490*		Non tribal children N=500		P Value
	Number	%	Number	%	
Pallor	300	61.22	168	33.6	<0.0001
Glossitis	193	39.39	19	3.8	<0.0001
Gingivitis	32	6.53	0	0	<0.0001
Platynychia	270	55.10	100	20.0	<0.0001
Koilonychia	233	47.55	11	2.2	<0.0001
Bitot's spot	66	13.47	8	1.6	<0.0001
Cheliosis	251	51.22	140	28	<0.0001
Conjunctival Xerosis	124	25.31	110	22.0	0.2
Stomatitis	123	25.10	74	14.8	<0.0001
Bald tongue	219	44.69	74	14.8	<0.0001

*7 children were not co-operative

Table 5: Comparison of the present study with other similar studies in the tribal children

Similar tribal children studies		Anemia (%)	Common Gender	Mild (%)	Moderate (%)	Severe (%)
Vyas and Choudhry, 2005, 6-12 years, Rajasthan Tribes (8)		93.7	----------	0.6	60,	32.9
Rao and Vijay, 2006 6-11 Years, Bihar Tribes (2)		78	----------	----------	--------	----
Sahu et al, 2007, 5-14 years, Orissa Tribes (9)		99	No difference	35.2	59.4	5.4
Prabhakar and Gangadhar 2009, 6-10 years, Karnataka Tribes(5)		77.7	Girls	26.2	36.5	14.8
Kumar et al, 2013, 6-12 years Haryana Schedule caste (10)		85.72	Girls	51.12	33.84	0.75
Bhise et al,2013,8 to 16 years, Maharashtra Tribes(11)		77.10	Girls	42.9	28.1	6.1
Devi and Devi,2013, 6-12 years, Manipur Schedule caste (12)	Boys	64.20	Boys	37.79	16.97	9.59
	Girls	55.02		34.57	14.87	5.58
Prabhakar & Gangadhar,2016 6-10 years, Karnataka Tribes (7).		91.4	Girls	7.2	74.3	9.9
Present, 5-10 years, Karnataka Tribes [Jenukuruba]		89.5	Girls	8.45	58.5	22.5



Graph 1: Scatter plot showing correlation between BMI and Hemoglobin in tribal children.

Discussion

According to WHO, if the prevalence of anaemia is morethan 40% at the community level then the problem is of high magnitude [4]. Anemia is associated with impaired growth, delay in development, behavioral abnormalities and impair cognitive functions in infants and children [7]. In general, tribal populations are considered to be under-privileged in India and anemia is more common in these underprivileged tribal population than the general population [5,7].

An estimated 30 per cent of the world's population is anaemic, with the global prevalence of anaemia among 6-12 year old children to be 36 percent [3]. We observed anemia in 89.5% of Jenukuruba tribal children in the age group of 5-10 years which is comparable to most of other tribal children in the same age group in India [Table 5]. However, the prevalence of anemia in the present study subjects was higher than the national prevalence. Few studies have shown more prevalence than our study in tribal children like the studies from Rajasthan and Orissa [8,9]. In contrast few reported less prevalence like that from Scheduled Caste School Children of Manipur [12].

We detected anemia in 64% of non-tribal children between the age group of 5-10 years, which is similar to study done by Sethi et al. (66.4%) from Delhi [13]. However, Gomber et al. observed anemia in 41.8% of children aged 5-11 years from urban slums [3]. Verma et al. showed that the prevalence of anemia in the 5-15 years age group of urban school children in Punjab as 51.5% [14]. Study from South India observed the prevalence of anemia in 52.88% of children in the age group of 8-16 years [15].

Eventhough we detected anemia in the age group of 5-10 years, similar observations has been made in the preschool and adolescent tribal children also. Haemoglobin estimation showed that 92.40% of scheduled caste preschool children suffereing from anaemia [16]. Philip et al. detected anemia in 95.7% of tribal preschool children in Wayanad district of Kerala [17]. Anemia was detected in 55% scheduled caste preschool children of Amritsar and Faridkot districts of Punjab [18]. Anemia was observed in 70.5% of adolescent girls of Scheduled Caste community of Amritsar [19].

The present study revealed that majority of tribal children were moderately anemic (58.5%) and 22.5% were of severe grade. In most of the studies anemia observed was either moderate or mild variety [Table 5]. Severe anemia was found in 22.5% of our tribal children which is comparable to a study of tribal children from Rajasthan [8]. However study among Jenukuruba tribal children like ours revealed lower prevalence severe anemia(14.86%) in a study by Prabhakar and Gangadhar [5]. We observed anemia in male tribal children more than females which is similar to the observation made in other studies [Table 5]. Whereas the prevalence of anaemia was 64.20% for boys as against 55.02% of girls in tribes of Manipur [12].

We detected anemia by clinical examination (pallor) in 61.2% of tribal children. Clinical examination showed that 95.1 per cent children were anemic in a study of tribal children from Rajasthan [8]. Authors suggest that the clinical examination

can be used to assess anemia as it requires less time, money and energy [8]. Verma et al. found clinical pallor in 44% of total children, while 51.5% were anemic. They opined that clinical assessment of anemia form the tip of iceberg and the true state can be assessed by estimation of Hemoglobin concentration in the blood [14]. In the current study platynychia, koilonychias, cheliosis and glossitis were observed among tribal school children in significant number. A study from Rajasthan also detected flat and plate nails (24.3%), atrophic lingual papillae (12.4%) and koilonychia (44.3%) in their tribal children [8].

There is a correlation between BMI and Hemoglobinin our tribal children. Study among Soliga tribes observed that the prevalence of anemia was higher in low weight children when compared to normal BMI children. They noticed that 94.3% of children of normal BMI had anemia [7]. Study from South India also showed that 51.3% children with normal BMI were found to be anemic [15]. Anemia was not significantly varied with BMI in a study involving Maharashtra tribal children [11].

Prabakar and Gangadhar attributed mainly cereal-based diet and less awareness of nutritional diet as the cause of anemia in soliga children [7]. Study from tribes of Orissa found that 93.7% children were taking food with low bioavailability of iron (5-10%) [9]. Another study from Mysore concluded that the cause for high frequency of anaemia among the Jenukuruba tribal children may be due to dietary inadequacy of iron, lack of safe drinking water and poor knowledge on the part of the mother regarding nutritional requirement of the children [5]. Study from Delhi urban slums revealed that pure or mixed iron deficiency anemia as the commonest type of anaemia and was noted in 68.42 per cent of school children [3].

Anemia can lead to cognitive disabilities in children. Hence an intervention to cure and prevent anaemia should be started for school age tribal children [8]. Sahu et al. suggested that reorientation of primary health care functionaries to cover the children under NNAPP with the help of ICDS workers and school authorities [9]. However a study from Bangalore, South India revealed low anemia prevalence in school-aged children (13.6%) and they attributed possible effect of school health initiative programmes like deworming and vitamin A supplementation [20].

Conclusion

Majority of children in our study (both tribal and non-tribal) were anemic. However, anemia was more common in tribal children when compared to non-tribal children. Mean BMI values were significantly low in tribal children and there was a correlation between BMI and Hemoglobin. Probably many factors like less availability of iron rich foods, good nutritious food, poverty and illiteracy play a role as the cause. There is need to improve the nutritional status of the tribal children. This can be done by periodic screening, regular deworming, health education, iron supplementation and proper implementation of national health programmes. Good training should be provided for the health workers to detect pallor and to take appropriate action.

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