

# HEMOGLOBIN CONTENT AND PREVALENCE OF ANAEMIA AMONG YANADI TRIBAL PRESCHOOL CHILDREN

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## Abstract

The Ministry of Health and Family Welfare (MoHFW) released the findings of the fifth round of the NFHS-5 in December 2020. The fifth round was conducted in 2019–2020. The startling finding that has to be addressed is the rise in child malnutrition indicators, including underweight, stunting, wasting, and child mortality under five years of age. Among the many nutritional problems, reducing childhood anaemia in India continues to be a difficult issue despite significant efforts made by the Indian government and the public and private welfare sectors. According to data from India's National Family Health Survey (NFHS) conducted in 2005–06, over 80% of children aged 12 to 23 months and 69.5% of children under five were identified as anaemic. Despite steps on the National Anaemia Control Programme and steady economic development, the 2015 Demographic Survey data showed a smaller drop, only going from 11% to 58.5 %. According to Onyeneho et al. (2019), the survey results indicated that the current iron and nutrition supplementation programmes are insufficient. This may necessitate the use of a comprehensive integrated approach that combines intervention strategies focused on food fortification, minimising maternal anaemia, and income-generating measures to alleviate poverty. The ultimate goal is to improve nutrition and health status.

Keyword: Anaemia, Malnutrition, Maternal anaemia, Nutrition supplementation.

## INTRODUCTION

One of the main issues with public health in developing nations like India is micronutrient insufficiency. Green leafy vegetables (GLV) have been shown in numerous studies to be a potentially high source of micronutrients like iron, magnesium,  $\beta$ -carotene, and others. Around the world, most individuals are ingesting comparatively fewer nutrients than the daily recommended allotment. A larger discrepancy has been found between the recommended and actual consumption of green leafy vegetables, with developing nations like India having the largest discrepancy. India is the second-largest producer of GLV and veggies after China, yet there is a dearth of information about the health advantages of GLV among the general people.

Because Indian cooking methods mostly prioritise taste and convenience over nutrient retention. Over the last ten years, efforts have been made to strengthen the nutrition perspective through programmes like the UN's SUN (Scaling Up Nutrition) secretariat, the World Health Assembly's adoption in 2012 of the 2025 global targets pertaining to the nutrition of mothers, infants, and young children, and the 2015 Sustainable Development Goals, which place a strong emphasis on the goal of ending all forms of malnutrition for all people by 2030. With a focus on mother and child care, India is working to implement all feasible measures in light of the global targets set to minimize malnutrition and micronutrient deficiencies including anemia (Jarapala, 2017).

The main public health issue is the high incidence of anaemia in preschool-aged Indian children. The main contributing variables that have been identified thus far are anaemia, which can lead to low iron reserves in the offspring of anemia-stricken mothers;

iron and folate deficiencies resulting from inadequate diet; and parasite infections, particularly in regions where malaria is prevalent. The 1970s saw the start of an intervention strategy that focused on treating malaria, treating early diagnosis, and preventing hookworm infestation in preschool-aged children.

## REVIEW OF LITERATURE

Berhanu. G. et.al. (2023) Malnutrition, which is becoming a bigger problem in most developing countries, including Ethiopia, is one of the most common causes of children's poor physical and mental development. In the past, undernutrition concerns in children were identified by using distinct anthropometric parameters. But in these studies, the effect of every explanatory variable on a single answer category was not taken into account. The nutritional status of primary school kids was found to be influenced by a single composite index of anthropometric measures in this study.

One of the primary causes of children's delayed physical and mental development is malnutrition, which is a serious problem in the majority of underdeveloped countries [D.C. Clark et al., 2020]. Stunted growth and problems with children's mental and intellectual development are associated with malnutrition [N.S. Scrimshaw, 1998]. Due to the population's diminished psychological and physical capacity, the high prevalence of malnutrition also jeopardises future economic growth [I.A. Adedjei et al., 2018].

According to Ali et al. (2022), undernutrition is a serious public health issue, especially for young people. The weight is heavier in poorer nations. When there is one or more of the following, undernutrition is taken into consideration: underweight, wasting,

or stunting. A decreased physical capacity for work, a lower intellectual quotient, an increased risk of sickness and mortality, and cognitive impairment are only a few of the long-term repercussions of undernutrition in childhood. When compared to children who are not malnourished, undernourished children may also have low cognitive scores, a high absence rate, and a high rate of class repetition. The purpose of this study was to evaluate undernutrition and the factors that contribute to it in primary school students attending public and private schools in Gondar, Northwest Ethiopia.

## METHODOLOGY

Chronic undernutrition has a larger negative effect on the health of the mother and child because of a lack of awareness about dietary inadequacies and the resulting malnourishment of children as well as an increased incidence of anaemia. Since they are the future citizens and the cornerstones of the country's progress, children must be carefully protected from an early age in order to shape them into successful citizens. An attempt was undertaken to assess the nutritional and health condition of the preschool-aged Yanadi children attending the tribal Anganwadi centres in this particular environment.

By obtaining the hemoglobin levels of the Anganwadi children using secondary data obtained from the medical staff at several medical camps, the severity of anaemia was assessed. Based on WHO criteria, they were categorized as normal, mild, moderate, and severe anaemic.

## RESULTS AND DISCUSSION

The high frequency of anaemia, which is on the rise in both industrialized and developing nations, particularly in women and children, has raised concerns for the health of the world recently. In order to screen the preschoolers from the designated tribal communities for varying degrees of anemia, the hemoglobin content of the group was examined as a criterion under biochemical assessment.

### 4.1. Mean hemoglobin levels

The hemoglobin level measurements from the preschoolers who were chosen were analysed, and the mean values for boys and girls as well as the overall mean for the various age groups that were chosen were computed. Table No. 1 displays the findings of the t-test, which was used to examine the differences between boys and girls.

**Table No. 1: Mean hemoglobin levels among boys and girls in three different age groups**

Variable	Mean± SD (g/dL)					
	Age group (in years)	Boys	Girls	T-Value	P-Value	Total
Hemoglobin	3-4	10.2±1.51	9.5±1.69	2.5911	0.0106*	9.8±1.63
	4-5	10.6±1.41	10.1±1.42	1.9935	0.0483 *	10.3±1.43
	5-6	10.8±1.11	10.4±1.48	1.7683	0.0794 <sup>NS</sup>	10.6±1.32
	Total	10.5±1.38	10.0±1.57	3.5869	0.0004**	10.3±1.50

**Note:** <sup>NS</sup> @ Not significant; \*\* @ 0.05 level \* @ 0.01 level

The results presented in Table 1 suggest that both boys and girls with young ages of 3 to 4 years old have mean hemoglobin levels that appear to be low. The observed mean results for males (10.2 g/dL) and girls (9.5 g/dL) indicate mild and moderate levels of anaemia, respectively. A range of 10-10.9 g/dL is considered mild anaemia, and 7-9.9 g/dL is considered moderate level anaemia, according to reference values of anemia based on hemoglobin levels for children under five. These standard references indicated that both boys' (10.6 g/dL) and girls' (10.1 g/dL) mean hemoglobin values in the 4 to 5 year age group appeared to be in the range of mild anaemia condition.

When defining the anaemia in the age group of 5 to 11 years with the range of 8 to 10.9 g/dL as moderate level, the reference values with somewhat higher cut-off values were observed. As a result, both boys' and girls' mean hemoglobin levels in the 5–6 age range (10.8 g/dL and 10.4 g/dL) fell into the category of mild anaemia. When the age of the preschool tribe members climbed to over five years old, the observed mean values of anaemia at a moderate level indicated that the hemoglobin levels among them needed to be improved.

Total mean hemoglobin levels were found to be lowest in the 3–4 year old age group (9.8±1.63 g/dL), and they grew as the age group aged, with an approximate increase of 10.4 ±1.43 g/dL in 4–5 years and 10.6±1.32 g/dL in 5–6 years. Whatever the differences, all three of the selected age groups of the indigenous preschool children had total mean hemoglobin levels recorded at a moderate degree of anaemia. In the end, the mean hemoglobin value was 10.3±1.50 g/dL for the entire study group and 10.5±1.38 g/dL for the tribal boys and girls (10.0±1.57 g/dL) underwent moderate anaemia.

In every age group, girls had comparatively lower mean hemoglobin levels than boys; hence, even among tribal preschool boys, their mean hemoglobin content was lower than that of girls. In the first and second age groups, the statistical inference results revealed significant differences at the five percent level; however, in the third age group, the difference was not significant. With tribal boys having a higher mean hemoglobin content than tribal girls, the overall mean differences showed a highly significant difference at the 1% level.

The frequency of anaemia among preschool-aged tribal children in Gujarat's Santrampur village was assessed by Panchal et al. in 2022. The overall study sample's mean hemoglobin level was 9.49 ± 1.47 g/dL, whereas the mean hemoglobin levels in boys and girls were 9.39 ± 1.59 g/dL and 9.58 ± 1.34 g/dL, respectively. With more than 10g/dL, the mean hemoglobin values in the current study appeared to be better in both boys and girls. However, compared to the indigenous preschool children, the current data showed that the boys in the tribal preschool had better hemoglobin values.

### 4.2. Prevalence of anaemia

Based on the accepted reference values of hemoglobin contents, the prevalence of anaemia was described as belonging to three categories: mild, moderate, and severe. As a result, the sample was divided up and shown as the distribution of boys, girls, and the entire research group in terms of frequency and percentage. The interpretation of the results was indicated in Table No. 2.

Table No 2: Frequency and per cent distribution of boys and girls based on WHO classification of anaemia based on hemoglobin content

Indicator	WHO Classification of anaemia	Boys(n=200)		Girls(n=200)		Total(N=400)	
		Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Anaemia	Non-anaemia 3-5 y: ≥ 11 g/dl 5-6 y: ≥ 11.5 g/dl	46	23.0	35	17.5	81	20.3
	Mild 3-5 y:10-10.9 g/dl 5-6 y:11-11.4 g/dl	108	54.0	95	47.5	203	50.8
	Moderate 3-5 y:7-9.9 g/dl 5-6 y:8-10.9 g/dl	34	17.0	43	21.5	77	19.3
	iv)Severe 3-5 y:<7 g/dl 5-6 y:<8 g/dl	12	6.0	27	13.5	39	9.8
	Overall anaemia (ii+iii+iv)	154	77.0	165	82.5	319	79.8
	Total	200	100.0	200	100.0	400	100.0

Anaemia affected girls at a much greater rate (79.8%) than boys (77.0%), according to data from Table 2. It found that more boys (47.5%) than girls (50.8%) had the mild low severity condition. Female tribal members were found to have greater incidences of moderate and severe anaemia than male tribal members. 17.0 percent for boys and 21.5% for girls was the level of moderate anaemia, according to the findings. Also, compared to boys (6.0%), girls (13.5%) were more likely to have a severe anaemia condition. The results of the current study show that, on average, boys performed better than girls, with 17.5% of boys and 23.0% of girls being non-anaemic. Approximately 20.3% of the preschool-aged tribal children in the entire sample had a total incidence of not being anaemic. Thus, with an overall frequency of 79.8% with varying degrees of anaemia, the overall anaemic state appeared to be more common in females (82.5%) than in boys (77.0%). Around half of the children (50.8%) who participated in the current experiment had mild anaemia, followed by moderate anaemia (19.3%), and the least amount (9.8%) had severe anaemia.

The frequency of anaemia was found to be greater in the age group of 1 to 3 years (91%) compared to 4 to 5 years (74.6%) in a study by Arlappa et al. 2010 on the prevalence of anaemia among preschool-aged children in rural West Bengal. Anaemia was found to be prevalent in preschool-aged children at the Mananthavady ICDS block in Kerala. According to Arjun et al.'s 2018 assessment, 47% of non-tribal children and 88% of tribal children were anaemic. Even though there have been numerous policies and plans in place for a long time, the prevalence of anaemia has remained more than 70% throughout India and much of Asia, making these countries significant sufferers. It is necessary to make corrections to the same trend of increased incidence levels of anaemia that was identified in this experiment. This section covered the age-wise prevalence of anaemia in boys and girls, taking into account varying degrees of anaemia. Table No. 3 showed the frequency and percent distribution of anaemia along with incidence values that were particular to age and gender.

Table No 3: Frequency and per cent distribution of boys and girls in different age groups based on WHO Z-score classification of BMI for age

Indicator	WHO Classification of anemia	Frequency (Percentage)					
		3-4 Years		4-5 Years		5-6 Years	
		Girls	Boys	Boys	Girls	Boys	Girls
Anemia	Non-anemia 3-5 y: ≥ 11 5-6 y: ≥ 11.5	9 (13.4)	13 (19.4)	21 (31.3)	11 (16.4)	12 (18.2)	15 (22.7)
	Mild 3-5 y:10-10.9 5-6 y:11-11.4	28 (41.8)	39 (58.2)	31 (46.3)	36 (53.7)	38 (57.6)	31 (47.0)
	Moderate 3-5 y:7-9.9 5-6 y:8-10.9	18 (26.9)	9 (13.4)	11 (16.4)	14 (20.9)	14 (21.2)	11 (16.7)

Indicator	WHO Classification of anemia	Frequency (Percentage)					
		3-4 Years		4-5 Years		5-6 Years	
		Girls	Boys	Boys	Girls	Boys	Girls
iv) Severe 3-5 y:<7 5-6 y:<8		12 (17.9)	6 (9.0)	4 (6.0)	6 (9.0)	2 (3.0)	9 (13.6)
Overall anemia (ii+iii+iv)		58 (86.6)	54 (80.6)	46 (68.7)	56 (83.6)	54 (81.8)	51 (77.3)
<b>Total</b>		<b>67</b> <b>(100.0)</b>	<b>67</b> <b>(100.0)</b>	<b>67</b> <b>(100.0)</b>	<b>67</b> <b>(100.0)</b>	<b>66</b> <b>(100.0)</b>	<b>66</b> <b>(100.0)</b>

**Note:** Values within parentheses indicate per cent values

The distribution of non-anaemic normal children showed that the age range of 4 to 5 years (31.3%) had the highest percentage of boys, about one-third. In contrast, almost one-fourth, or 22.7%, of girls in the 5–6 age range were found to be non-anemic, which appeared to be better than boys in the same age group, when only 18.2% were classified as non-anemic. Within the early age group of 3 to 4 years, there was a relatively low percentage of normal children; the percentage was larger in boys (19.4%) than in girls (13.4%). Comparing females in the 4–5 age group to their boys counterparts, whose age group had the highest percentage of non-anaemic as previously reported, there were significantly fewer girls—about 16.4%—in this age group indicated as non-anaemic. The results of the current study indicated that boys were superior to girls, regardless of the overall disparities.

The majority of the preschool-aged tribal children under study had moderate anaemia, with a higher prevalence among those aged 3 to 4 (58.2%) and 5 to 6 (57.6%). In the second age group of 4 to 5 years, over half of the tribal girls (53.7%) had moderate anaemia, while the percentage of males (46.3%) in the same age group had lower levels of anaemia than girls. The minimal percentage of anaemia, which was around 41.8%, was seen in young females (3–4 years old). Overall findings showed that males had a larger frequency of mild anaemia than girls, most likely as a result of girls being more likely to suffer from higher degrees of moderate and severe anaemia.

The age group of 4 to 5 years old (20.9%) had the highest frequency of moderate anaemia, followed by boys aged 5 to 6 years (21.2%) and girls aged 3 to 4 years (26.9%). Boys between the ages of three and four had the lowest prevalence of mild anaemia (13.4%). Approximately comparable proportions of 4 to 5 year old boys (16.4%) and 5 to 6 year old females (16.7%) had a reduced incidence of mild anaemia. It was shown that preschool-age tribal girls were more likely than other girls to suffer from a moderate case of anaemia. This is most likely because the nourishment that these girls were receiving did not keep up with their developing needs after the age of three.

Girls in all three age groups had a greater risk of severe anaemia than boys in the same age group. According to the data from the girls, nearly one-tenth of those aged four to five years (9.0%), as well as more than one-tenth in the first (17.9%) and third age groups (13.6%), had severe anaemia. Boys had a lower prevalence, with the incidence gradually decreasing with age (9.0, 6.0, and 3.0 percent, respectively).

Panchal et al. (2022) investigated the nutritional status of tribal preschool children in Santrampur, Gujarat. The frequency of anaemia among tribal pre-school children was determined to be approximately 87.7%. The prevalence of anaemia was found to

be 88.5 percent in boys and 86.8 percent in girls, with no significant difference between the two genders. Most of the children evaluated had a greater incidence of moderate anaemia. The current findings were likewise consistent with the trend of data showing a comparatively greater prevalence of anaemia among tribal preschool children, with the highest frequency of mild anaemia. However, in the current study, a little lower prevalence of approximately 77.3 percent was recorded, and girls exhibited higher anaemic levels than boys.

The current study indicated a high frequency of anaemia among the indigenous preschool children tested. The current situation needed to be remedied by implementing a particular programme at the state level to control the prevalence of anaemia among preschoolers. Anaemia is one of the most serious health issues in children, and the current therapeutic strategy, which focuses solely on iron and folic supplements, may be insufficient to address the issue.

The major challenge for policymakers and programmers was to discover appropriate specific intervention measures to reduce the risk of anaemia among indigenous preschool children, particularly those living in remote locations. State governments should focus on efforts to increase service quality and raise maternal awareness through nutritional education for the benefit of their children's health. Proper monitoring and assessment of existing nutrition intervention programmes such as ICDS, as well as directing the programmes towards success in eliminating many nutritional deficiencies, have been identified as important challenges in promoting healthy children.

## SUMMARY AND CONCLUSION:

- Hemoglobin content predicts normal, mild, moderate, and severe anaemia levels according to WHO categorization.
- The average hemoglobin content of tribal preschool children was 10.3 g/dL, with slightly higher levels in boys (10.5 g/dL) than girls (10.0 g/dL) but no significant difference.
- More than three-quarters of tribal preschool children (79.8%) had some degree of anaemia, with girls (82.5%) having a greater frequency than boys (77%).

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