

Anaemia Prevalence and its Associated Variables among Tribal Population in India: A Review

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Abstract

Anaemia is a widespread health issue that is extremely common in both industrialized and developing nations. It is alarming to notice that anaemia exists in countries that are developing at all stages of life. Despite a variety of causes, tribal populations are highly susceptible to anaemia along with in comparison to urban centers, anemia is more common in rural regions. The key causes of anaemia in tribal people consist of low socioeconomic status, inadequate education, poor health and nutrition, and a lack of knowledge of nutrition. Several studies indicate anaemia is prominent among tribal people at every stage of life. Anaemia is more likely among elderly tribal people, even though it is more common in children, pregnant women, and women of reproductive age. According to studies, anaemia in tribal people is caused by a diet lacking in iron, vitamin C, folic acid, vitamin B12, and protein. Anaemia among tribal people can also be caused by environmental factors, such as infections like schistosomiasis,

hookworm, and other parasites that can cause excessive loss or competition for hematological resources. Anemia is a significant social issue in addition to a medical issue since it lowers earning potential and productivity at work.

Keywords: Tribal People; Anaemia; Nutritious Diet; Poverty.

Introduction

According to the census conducted in 2011, 10.43 crore people in the entire nation are tribal, making up 8.6% of the overall population. Of them, 89.97% reside in countryside and 10.03% in urban centers (Dolai *et al.*, 2021). The Indian Constitution was the first document to use the term “scheduled tribes. “Such tribes or tribal communities or parts of or groups within such tribes or tribal communities as are deemed under Article 342 to be Scheduled Tribes for the purposes of this constitution” according to Article 366 (25) defines scheduled tribes (Stiller *et al.*, 2020). The word “Adivasis,” which refers to a broad range of ethnic and tribal groups regarded as India’s original population, is frequently used to refer to these tribal people (Stiller *et al.*, 2020). There is a substantial disparity in the proportion of cases between Union Territories and States when it comes to the incidence rate of anaemia in India. The bulk of the tribal people lives in the country’s hilly and forested areas. 705 Scheduled tribes and 75 Particularly Vulnerable Tribal Groups (PVTGs) are recognized by the Indian Constitution. These tribes are dispersed in one Union Territory (UT) in India and eighteen states. The Scheduled Tribe comprises 52547215 females and 51998501 males. It has been proved that indigenous people are more prone to anaemia compare to general people (Sau *et al.*, 2022).

Anemia is extensively widespread in India and attack on all gender and age group (Sahu *et al.*, 2007). The six fundamental phases of the human life span are fetal, children, infants, adolescent, adult, and geriatric. In each of these phases, people experience daily, gradual, and ongoing changes (Devoto *et al.*, 2009). It may have been caused by a variety of circumstances. Patients with long-term inflammatory, infectious, or malignant illnesses such carcinoma, rheumatoid arthritis, kidney dysfunction, and cardiac failure are frequently

affected by anemia. Infections, genetic predispositions without chronic conditions, and vitamin deficiency are common causes of anemia(Khambalia *et al.*, 2011). As a result, anemia is significantly influenced by illnesses linked to water management, hygienic drinking water and sanitation. Anaemia was accelerated by lack of food, poverty, and low levels of bioavailable iron, especially in the post-weaning phase(Yu *et al.*, 2019).

Red blood cells include the metalloporphyrin hemoglobin (Hb), which is a bilateral gas exchanger that carries carbon dioxide from tissues to the lungs and oxygen from the lungs to the tissues. The World Health Organization (WHO) defines anemia as a condition whereby a person's ability to carry oxygen is inadequate compared to the demands of their body for proper physiology(DeMaeyer *et al.*, 1989). Every nation's development benefits from having healthy citizens. The healthcare system needs to make an attempt to reduce medical problems among tribal members and lower their susceptibility to falling back as a group(Rohisha *et al.*, 2019). A vital indication of poor health state, iron deficiency anemia is largely caused by inadequate nutrition. The increasing need for iron during growth and puberty in children and adolescents sets them at risk for iron deficiency anemia(Kamath *et al.*, 2013).According to Joshi (2011), the overall incidence of anemia reached 95.3%, especially in a group that includes tribal women (Joshi 2011). According to Jai Prabhakar and Gangadhar's 2009 study, 77.1% of the study sample had this condition(Prabhakar and Gangadhar 2009). According to De et al. (2006), the overall incidence of anemia was 53.7% in the state of Arunachal Pradesh, 57.45% in the state of Tripura and 59.82% in Assam indigenous groups (De *et al.*, 2006).

Maternal and neonatal mortality are mostly caused by anemia, and long-term anemia can result in additional organ damage such congestive heart failure. Anemia is a significant social issue in addition to a medical issue since it lowers earning potential and productivity at work. It's a vicious cycle where anemia causes poverty and poverty contributes to anemia. In comparison to urban centers, anemia is more common in

rural regions. In marginalized populations, including tribal populations, the frequency is still rising (Ismail *et al.*, 2017). A higher frequency of anemia among these tribal people may be caused by a number of reasons, including insecurity, low socioeconomic status, malnutrition, lack of education, undesirable cultural practices, lack knowledge of the disease, insufficient geographic connection, and a lack of medical personnel and activities. Because of corruption or a lack of understanding these disadvantaged groups gain the least from government initiatives (Ismail *et al.*, 2017; Panchal *et al.*, 2022; Stiller *et al.*, 2020).

Three main mechanisms can be explored to clarify the pathophysiology of anemia: the loss of blood, enhanced red blood cell breakdown, and decreased red blood cell synthesis. The main causes of chronic blood loss that results in anemia are bleeding disorders and helminthic infections. Red blood cell entrapment from diseases like malaria or structural defects in red blood cells like sickle cell anemia or thalassemia both results in an increase in red blood cell death (Chaparro and Suchdev 2019). Insufficient synthesis of red blood cells can be attributed to various factors such as elevated demand during pregnancy, ongoing infections, carcinomas, and prolonged inflammation that interfere with bone marrow function, or insufficient dietary intake or poor absorption of iron, vitamin A, folate, vitamin B12, or protein, which are crucial components for red blood cell formation (Ghosal *et al.*, 2023; Stauder *et al.*, 2018). Balgir (2006) documented that severe, moderate and mild anaemia were 0.6 to 2.3%, 7.4 to 13.6% and 30.7 to 48.2% respectively in tribal population in Orissa. It was also noted that female was more affected compared to male in anaemia.

1. Methodology

This review work focused on the overall anemia prevalence rate of tribal population in different parts of India. The strategy of this review discovers appropriate research on papers that have been published in India's different states on this topic. The electronic International Journal of Science searches the data on published literary works. The search terms were broad and general at first when it came to anemia, but they were

later filtered based on the purposes of the study. The following keywords were applied to find applicable published articles: micronutrients, WHO and UNICEF, India NFHS, state-by-state tribal, particularly susceptible tribal communities, their occurrence, variables, distribution, and incidence of anaemia.

Prevalence of anaemia in different stage of life in tribal population

Previous studies recorded that tribal people in all stage of life are affected by anaemia. Socio-demographic variables and nutritional deficiencies are main cause of anaemia in tribal population. In the present study, we discussed about anaemia among tribal population in different stage of life.

Children

A serious public health issue, anemia is excessively prevalent in countries that are developing across the globe. Additionally, anemia affects over 40% of children who are under five worldwide (Singh *et al.*, 2023). It has been estimated that 33% of school-age children worldwide experience anemia (Rani and Bandrapalli 2017). Several variables, including socioeconomic status, ecological, biological, and nutritional ones, have been linked to anemia in tribal children, as per studies. This anemia can then cause fetal mortality, poor cognitive function, delayed motor development, and a delay in completing school (Panchal *et al.*, 2022). The World Health Organization (WHO) reports that 1.62 billion individuals worldwide suffer from anemia, with 293 million preschoolers considered to have the highest prevalence of the disease (47.4%); a total of 89 million among those children are Indian. Tribe children are an especially vulnerable group because of a lack of development in society, higher lack of education, restrictive customs, minimal food and health protection, poor living conditions, and an elevated level of malnutrition (Kapoor and Dhall 2016). Hookworm infestation and malaria may cause anaemia among tribal children widely (Sahu *et al.*, 2007).

National Family Health Survey (NFHS-5) reported that the prevalence of any anemia (Hb<11 g/dl) in children aged 6-59 months in India was 67.1% (NFHS-5 2021). Panchalet al., (2022) conducted a cross-sectional study among 300 tribal children

age group of 6 months to 5 years in Santrampur village, Gujarat and of them 87.7% were anemic (Panchal *et al.*, 2022). Dolai *et al.*, (2021) conducted a cross-sectional study among 1010 tribal children age group of 5-13 years and showed that 46.34% of children were anemic overall. Out of all the children that were anemic, 47.65%, 51.93%, and 0.42% (n=2) reported mild, moderate, and severe anemia, accordingly (Dolai *et al.*, 2021). According to Prabhakar *et al.* (2016), children from the Soliga tribe in Karnataka had an overall incidence of anemia of 91.4% (Prabhakar and Gangadhar 2016). According to Sahu *et al.* (2007), 94% of children under the age of five in Orissa were found to be anemic, and 8.8% of them were classified as severely anemic. Nearly every child in the 5-14 age range was anemic; of these, 5.4% were extremely anemic and 59.4% were mildly anemic (Sahu *et al.*, 2007).

Women

According to the World Health Organization (WHO), adult anemia is defined as having hemoglobin (Hb) levels that are below 13.0 g/dl for men and less than 12.0 g/dl for non-pregnant females (Cappellini and Motta). Women during reproductive age of 15-49 years are more prone to anaemia due to their unique physiology such as menstruation, pregnancy, blood loss during childbirth compared to men. Anaemia in women of reproductive age affects the physical condition of the offspring as well as the mother. In populations devastated by anemia, this is one of the main causes of poverty and poor health throughout generations (Ghosal *et al.*, 2023; Tang *et al.*, 2022). Iron deficiency anaemia is extremely common during pregnancy. Anemia in pregnant women might result in premature babies along with a low weight at birth. Tribals are India's most disadvantaged ethnic population, and the actual prevalence and distribution of diseases among them is rarely published (Dwivedi *et al.*, 2023). According to the Demographic and Health Survey (DHS) report from 2005-06, India has a greater than normal incidence of anemia in women and children compared to other South East Asian countries. Anemia is a major cause of maternal mortality, with low hemoglobin concentration being the primary cause in most cases worldwide (Sau *et al.*, 2022). In Rajasthan's

district Sirohi, 85.7% of tribal women had anaemia, with an average hemoglobin measurement of 9.21 ± 1.3 g/dL across three indigenous-dominated blocks: Pindwara, Abu Road, and Sheoganj (Dwivedi *et al.*, 2023). According to Sharma and Ninama (2015) from the southern Rajasthan district of Banswara, there was a 90% total incidence of anemia, with 3.33 percent of women having a severe, 53.33 % having a moderate, and 33.33 % having mild anemia. Merely 10% of women do not have anemia (Sharma and Ninama 2015). Prevalence of anaemia among tribal women was 55.5% in Paschim Medinipur district of West Bengal, India (Choudhury *et al.*, 2014). Correa *et al.* (2017) also found that the overall incidence of anemia was 92.4%, with severe anemia observed in 6.9% of the tribal women participants (Corrêa *et al.*, 2017). In a study of the Trivandrum area of Kerala, it was also found that the prevalence of anemia among ethnic pregnant women accessing basic healthcare was 53.33%. The overall incidence of mild, moderate, and severe anemia had been 26.66%, 25%, and 1.66%, correspondingly (Ponny *et al.*, 2021). The prevalence of anemia among the tribal pregnant women attending primary health care in Trivandrum during the study tenure was 53.33%. The prevalence of mild, moderate and severe anemia was observed as 26.66%, 25% and 1.66% respectively (Ponny *et al.*, 2021). Kamath also documented that 55.9% of tribal women suffered from anaemia in Udupi Taluk, Karnataka (Kamath *et al.*, 2013).

Adolescence girls

Adolescence is the stage of life among childhood and adulthood. It is a distinct period of human development and a critical time for setting up conditions for optimal health. During a growth spurt, the rate of growth is very high. Adolescent health has received international attention during the last decade (Rao *et al.*, 2003). Adolescent girls are more susceptible to the sickness, and the adolescent group is especially exposed to dietary challenges in developing nations. Studies revealed that the most significant nutritional issue in emerging nations was adolescent anemia. When compared to other developing countries, India appears to have a greater prevalence of anemia among adolescent girls (Chandrakumari *et al.*, 2019).

Adolescent anemia has a negative impact on growth and development, infection resistance, cognitive growth, and efficiency at work. Adolescents with chronic malnutrition are more likely to experience undernourishment throughout adulthood and pregnancy, which increases the risk of low birthweight babies—a vicious cycle (Ragini Kulkarni *et al.*, 2019).

Mahanta *et al.*, (2014) was conducted a community based intervention study on tribal adolescent girls in Dibrugarh District, Assam and revealed prevalence of anaemia was 96.3% with median serum ferritin, 22.9 ng/ml (Mahanta *et al.*, 2014). Ragini Kulkarni *et al.*, (2019) also conducted a community-based cross-sectional study among 240 unmarried tribal adolescent girls in Palghar district of Maharashtra and 81.6% exhibited mild anaemia (Ragini Kulkarni *et al.*, 2019).

Elderly life

The aging process impairs and burdens the elderly, leading to an overall decline in their state of health. Even though they are physically incapacitated, the elderly are a valuable resource for any nation (Soren *et al.*, 2022). As the elderly are a significant group of people with several physical and mental health issues, their social and physical wellness has become a difficult challenge in India. Age-related alterations in bone marrow, limited absorption, and other altered metabolism result in inadequate hematopoietic blood cell formation and subsequent loss in hemoglobin, making elderly populations more prone to anaemia (Daniel *et al.*, 2023). Kerketta *et al.*, (2009) showed that 70% of males and 76.7% of females were severe anaemia among tribal of Langia Saora (LS) in Orissa. Geriatric anemia can have multiple causes, including nutritional, psychological issues or pathological factors (Kerketta *et al.*, 2009). Prevalence of anaemia among tribal elderly people was 66.7% in residents of Kannavam, Kannur, North Kerala (Ismail *et al.*, 2017).

Discussion

Perumal (2014) noticed that increasing marital age is a crucial preventive measure against anemia for rural pregnant women in India (Perumal 2014). Extensive awareness efforts

and educational initiatives by government departments and social groups may have had an impact on the indigenous community, reducing the frequency of teen marriages and pregnancies significantly (Bantebya *et al.*, 2014). Several studies have revealed that the frequency of anemia in tribal communities varies from 51% to 91.4% in different parts of India (Dolai *et al.*, 2021; Prabhakar Sc and mysore rajagopal 2017).

Although many elements are required for the synthesis of red blood cells and hemoglobin, iron deficiency is a prevalent cause of nutritional anaemia around the world. Folate deficiency, particularly in pregnant women, is a significant cause of anaemia. A lack of vitamin B12 can cause severe anaemia known as pernicious anaemia. Protein deficit may contribute to anemia in children suffering from severe protein energy malnutrition (Ifeanyi 2018). Intestinal infection by parasites is a major issue for children in rural or disadvantaged circumstances, leading to anaemia and inadequate nourishment. In children, intestinal parasite infections, particularly helminthiasis, can produce a variety of unfavorable health effects, including anemia (Yanola *et al.*, 2018). According to Chakma *et al.*, (2000), 50% of children in Madhya Pradesh having parasitic infections, with hookworms (16.3%) and lumbricoides (18.5%) being the most frequent (Chakma *et al.*, 2000). Anemia and other nutritional deficiencies have been found to be more common among indigenous societies, according to several studies (Leite *et al.*, 2013; Stiller *et al.*, 2020).

Nutritional deficiencies, genetic haemoglobin abnormalities, and infectious disease-related anaemia are more common in low- and middle-income nations (Panchal *et al.*, 2022). When the prevalence of anemia was studied according to age, it was found that the prevalence of anemia in above 10 years of age in adolescent girls was higher than that in boys. This may be connected to the physiological alterations that occur in boys throughout adolescence (the increase in testosterone) and the blood loss that occurs in females during menarche (Dolai *et al.*, 2021).

Anemia is a disease that can be eliminated by dietary changes, improvements in socioeconomic status, etc (Kamath *et al.*, 2013). The dietary approach has the potential for being an effective tool in preventing anemia prevalence. An essential water-soluble molecule that increases non-heme iron absorption by 20–25% is vitamin C (Sau *et al.*, 2022). A whole day's worth of food is cooked just once in many tribal households, resulting in two meals that can be as much as twelve hours apart. Additionally, it was found that nearly 93.7% of children who were consuming meals with low iron bioavailability, or 5–10%. This may happen because to reasons like availability, ignorance, and poverty (Sahu *et al.*, 2007). In these conditions, it is challenging to achieve the requirements for folic acid, iron, and ascorbic acid without supplementing with a high-quality source of these nutrients (Meshram *et al.*, 2012; Sau *et al.*, 2022). Iron, Folic acid and vitamin-C rich food must be included in the daily diet. Table 1 is iron containing food with decreasing order.

Table 1; Iron containing foodstuff with decreasing order (ICMR, 2017)

	Foodstuff	Scientific name	Iron (mg/100g edible portion)
1	Goat spleen	Capra aegagrus	51.41±17.21
2	Turmeric powder	Curcuma domestica	46.08±1.83
3	Beef spleen	Bostaurus	31.68±4.50
4	Pork spleen	Susscrofa	27.21±6.43
5	Pork liver	Susscrofa	20.74±7.24
6	Cumin seed	Cuminumcyminum	20.58±4.24
7	Coriander seeds	Coriandrumsativum	17.64±6.74
8	Asafoetida	Ferula assafoetida	15.68±4.51
9	Gingelly seeds black	Sesamumindicum	13.9±1.60
10	Mustard seeds	Brassica juncea	13.49±3.95
11	Pepper, black	Piper nigrum	11.91±3.48
12	Poultry chicken liver	Gallus gallus	9.92
13	Cloves	Syzygiumaromaticum	9.41
14	Amaranth seed black	Amaranthuscruentus	9.33

15	Tamarind, pulp	Tamarindusindicus	9.16±1.71
16	Horse gram Whole	Dolicusbiflorus	8.76±1.16
17	Curry leaves	Murray koenigii	8.67±0.09
18	Mint leaves	Menthaspicata	8.56±3.21
19	Soyabean brown	Glycine max	8.29±0.51
20	Lentil whole brown	Lens culinaris	7.57±0.67
21	Raisin dried black	Vistisvinifera	6.81±0.91
22	Bengal gram whole	Cicerarietinum	6.78±0.75
23	Bengal gram, dal	Cicerarietinum	6.08±0.27
24	Coriander leaves	Coriandrumsativum	5.30±1.55
25	Egg, poultry yolk boiled	Gallus gallus	4.92±0.33
26	Ragi	Eleusinecoracana	4.62±0.36
27	Puffed rice	Oryza sativa	4.55±1.03
28	Rice flakes	Oryza sativa	4.46±0.81
29	Wheat flour atta	Triticumaestivum	4.10±0.67

Conclusion

A high prevalence of anaemia among tribal population in different stage of life was observed. A lot of factors was impact on prevalence of anaemia among tribal population in various stage of life. These factors are lack of development in society, lack of education, restrictive customs, minimal food and health protection, poor living conditions, and an elevated level of malnutrition and poor health throughout generations. Successful approaches for preventing anemia include food supplements, health services, sanitary development, as well as nutrition and health programmes. Community health professionals, experts in nutrition, nurses, and policymakers may find this review most useful as a teaching tool and guide.

Data Availability

The information included in this systematic review is based on previously published research and databases that have been referenced. Upon reasonable request, the associated author provides the processed data.

Ethical Approval

Since the study's conclusions had already been known, the

authors of the systematic review did not require ethical approval.

Conflicts of Interest

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