Prevalence of anemia among reproductive-age females in the Tharu tribe of the Indo–Nepal border region

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ABSTRACT

Background: India shares the largest number of anemia patients globally. Anemia in reproductive-age female, affects not only the maternal mortality and morbidity but inversely affect the pregnancy outcome also. Tribals in India are geographically isolated and most of them belong to very low socio-economic status. Regarding Tharu tribes, to date, there is no study to find the prevalence of anemia in this community. Aim: We aim to find the prevalence of anemia in the reproductive-age female of the Tharu community. Additionally, we also accessed the severity and possible causes of anemia. Materials and Methods: A total of 440 reproductive age females from the Tharu community were recruited in this study from Tharu predominant Tulsiapur tehsil of Balrampur district on 8 December 2019. CBC of each sample was performed by a 3-part basic hematology analyzer. Results: The mean (SD) hemoglobin level of the study group observed was 11.11 (±1.96) gm/dl with a median value of 11.3 gm/dl. Prevalence of anemia was noted in 283 (64.32%) participants. Amongst the anemic subjects, mild, moderate, and severe anemia was noted in 33.57%, 57.24%, and 9.19%, respectively. Microcytic, normocytic, and macrocytic anemia was noted in 53.00%, 44.88%, and 2.12%, respectively. Conclusion: The high prevalence of mild and moderate anemia in reproductive-age women is a matter of concern and should be dealt with priority. Community-based screening for hemoglobinopathies is also needed to evaluate the actual cause of anemia.

Keywords: Anemia, anemia prevalence, reproductive age females, Tharu community, Tharu Tribe, tribal health scenario

Introduction

Anemia is a major global health problem that affects more than 800 million women and young children worldwide. According to the World Health Organization (WHO), 38% of pregnant women and 29% of all women are anemic worldwide.¹ India shares the largest number of anemia patients globally and it is estimated that 57% of women of the reproductive age group in India are anemic.² Socio-economic status and its correlation with the prevalence of anemia are well-established worldwide, but in India studies suggested that the prevalence of anemia is high among all women cutting social class and location.³ The tribal population in India is 8.6% according to the 2011 census and most of them belong to lower socio-economic status. The Tharu tribe is the most popular indigenous tribe of India and Nepal and is commonly found in the Terai region of the Indo–Nepal border.⁴ Different studies from India and Nepal also suggested a higher incidence of hemoglobinopathies especially beta-thalassemia and sickle cell anemia in the Tharu population.⁵,⁶ For the prevention of anemia, the Ministry of Health and Family Welfare had started the National Anemia Prophylaxis Program way back in 1970 and revised it in 2011 as the National Iron Plus Initiative focusing especially on menstruating women and children. Despite these programs, the prevalence of anemia in the tribal population remains very high and ranges from 55.73% in Arunachal Pradesh

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The objective of this study is to estimate the prevalence and severity of anemia in the reproductive-age female of the Tharu tribe.

## Methods

It was a cross-sectional study and planned in the department of clinical hematology at King George’s Medical University after getting ethical committee approval. According to Census 2001, Tharu is the most populous tribe in Uttar Pradesh and mainly concentrated in Khiri, Balrampur, and Behraich districts. Why mega health check-up camp was organized at Tulsipur Tehsil of Balrampur district on 08 December 2019 in association with the Seema Jagran Manch and National Medicos Organization, Awadh Zone. Information’s regarding this camp was send through the village panchayat and specifically target the Tharu dominant villages of the Balrampur district. A proper health check-up was performed of the general population and a blood sample of 440 Tharu tribal women of reproductive age group was collected.

Primarily subjects were categorized into two groups, non-anemic and anemic. Then the anemic group was further sub-categorized into mild, moderate, and severe anemia according to the age and sex-specific criteria for anemia given by the WHO. Subjects with less than 12 gm/dl hemoglobin levels were labeled as anemic and hemoglobin level 10–11.9 gm/dl, 8–9.9 gm/dl, and value less than 8 gm/dl were classified as having mild, moderate, and severe anemia, respectively.

Data about their socio-economic status, habitats, and dietary habits were also collected to correlate with the possible causes of anemia in these subjects.

### Sample collection

2 ml of the blood sample in the ethylenediaminetetraacetic Acid (EDTA) vials were collected through ante-cubital veins with adequate aseptic measures after getting informed consent from all adult individual subjects. In the case of minors, consent was taken from legally authorized representatives. A complete blood count of each sample was performed using Medonic M-series M32, a 3-part basic hematology analyzer.

## Results

All study subjects included in this study were from the reproductive age group (16–49 years). The mean age (SD) of the subjects was 30.53 (±7.80) years with a median age of 30 years. About three fourth (74.54%) of the subjects were between 20 and 40 years of age. The mean (SD) hemoglobin level observed was 11.11 (±1.96) gm/dl with a median value of 11.3 gm/dl.

WHO defined anemia was noted in 283 (64.32%) participants while 157 (36.68%) subjects were non-anemic. Figure 1 shows the distribution of anemia of study participants. Amongst the anemic subjects, 95 (33.57%) subjects had mild anemia while 162 (57.24%) had moderate anemia. Severe anemia was noted in 9.19% of all anemic subjects. Figure 2 shows the severity of anemia amongst the anemic participants.

To broadly evaluate the cause of anemia, the anemic subjects were further classified according to the mean corpuscular volume (MCV) values. Amongst the anemic subjects, 150 (53.00%) showed microcytic anemia while 127 (44.88%) showed normocytic anemia, and only 6 (2.12%) of the subjects had macrocytic anemia. Table 1 shows the distribution of anemic subjects according to MCV.

Our all subjects were forest dwellers, belonged to lower socio-economic status. All subjects were meat-eaters due to their tradition.

## Discussion

Tribals in India constitute 8.6% of the total population and they are economically most disadvantaged groups mainly living in dense forests and hilly areas. The health scenario of tribal is very poor, not only because of their lower socio-economic status and remote locations but shyness to contact the community for health services also plays a major role.

India has taken a giant leap in reducing the prevalence of anemia in children and pregnant women from 2005–2006 to 2015–2016, but the scenario of non-pregnant females remains the same despite the revised NIPA program in 2011 which has a special focus on

| Table 1: Distribution of anaemic participants (Hb<12gm) according to MCV |
|-----------------------------|-----------------------------|
|                            | n  | %       |
| Normocytic Anaemia (80-100 fl) | 127 | 44.88   |
| Microcytic Anaemia (<80 fl)   | 150 | 53.00   |
| Macrocytic Anaemia (>100 fl)  | 6   | 2.12    |

Figure 1: Distribution of anemia of study participants
this group also. According to NFHS-3 (2005–2006), prevalence of anemia in reproductive females in the schedule tribes was 68.5% that considerably decreased over one decade and decreased to 59.8%.[12] District fact sheet (NFHS-5, 2020-21) of Balrampur recorded 53.7% prevalence rate of anemia in rural reproductive age females.[9] In our study, results show 64.32% prevalence of anemia in reproductive females in the Tharu tribe which is slightly higher than the national and local average of that specific group. Our study also supports the statement of the WHO, according to which anemia is a major public health issue and should be addressed on a priority basis. There was no significant socio-economic, dietary, cultural, or environmental variation noted in anemic versus non-anemic subgroups because all were forest-dwelling meat-eaters belonged to lower socio-economic strata. A study by Kamath R, et al.[10] in 2013 revealed 55.9% anemia prevalence in the reproductive female of Karnataka that was comparable to our study. A study done by Madhusnata De showed similar results. They took samples of tribals from Assam, Arunachal Pradesh, and Tripura, and their results were 59.82%, 53.77%, and 57.45% respectively.[13] B M Shrinivasa et al.[14] in Kerala and Prabhakar SC, et al.[15] in Karnataka reported 96.5% and 91.4% prevalence rate of anemia in reproductive females and children, respectively, that was substantially higher than any other study and NFHS-4 data. A recent study was done by I.K. Rohisha[16] in Kerala also showed a very high prevalence (89%) of anemia in tribal women.

According to the NFHS-4 data, the prevalence of mild, moderate, and severe anemia in reproductive age anemic schedule tribe females was 72.95%, 24.87%, and 2.17%.[12] Our study shows very different results. It shows 33.57% of subjects with mild anemia which is almost half of the above data, while cases with moderate and severe anemia are 57.24% and 9.19%, respectively, which is much higher than the NFHS-4 data. So the prevalence of the moderate and severe types of anemia is much higher in Tharu reproductive age females as compared to the national average.

In our study, 53% of the subjects of the anemic group showed microcytic anemia. The most common cause of microcytic anemia is iron-deficiency anemia (IDA) with other causes includes thalassemia and chronic inflammation.[16] The prevalence of parasitic infestations in rural women of the Terai region is also very high (92.32%) due to the unavailability of safe drinking water, open-air defecation, the habit of moving barefoot, poor socio-economic condition, poor sanitation, sandy soil, and warm humid climate.[17] In our study, all subjects were forest dwellers and belong to lower socio-economic status. That might be the possible cause of IDA along with other commoner causes. A recent study in the Tharu tribe suggested a very high prevalence of beta-thalassemia and hemoglobin E (Hb E) disease, a study was done by Neetu Nigam et al.[9] showed the prevalence of beta-thalassemia trait 12.98% and HbE trait 7.50% in the Tharu population is quite higher than the normal population. So along with iron deficiency anemia, beta-thalassemia and Hb E disease should also be responsible for the microcytic anemia in the Tharu tribe.

Normocytic anemia was reported in 44.88% of subjects. The common cause of normocytic anemia includes chronic inflammation, auto-immune disorders, renal insufficiency, hemodilution, marrow infiltration, and marrow failure. Sometimes mixed deficiency of both iron and vitamin B12 or Folic acid can present with normocytic MCV values.[18] Different studies also showed a higher incidence of sickle cell anemia in the Rana and Chowdhary sub-groups of the Tharu tribe.[10] Further, more extensive studies should be planned including all the possible laboratory tests to find out specific causes of normocytic normochromic anemia in this population.

Only 2.12% of anemic subjects showed macrocytic anemia in our study. The most common causes of macrocytic anemia are vitamin B12 and folate deficiency, mainly seen in strict vegetarian (vegan) individuals.[19] The low prevalence of macrocytic anemia can be justified by their food habits as all of our subjects were traditionally meat-eaters.

The study was conducted in a population which is difficult to reach and not many such surveys have been done earlier. This study will provide basic information about the prevalence and possible causes of anemia in the reproductive age group of Tharu women. This will help the concerned authorities to make a better plan to reduce or eradicate the anemia in Tharu women.

Conclusion

We have observed that 64.32% of Tharu women of the reproductive age group are anemic which is higher than the national average. The high prevalence of moderate and mild anemia in Tharu community reproductive age females is a matter of concern and addressed on a priority basis. Prevalence of higher microcytic and normocytic anemia, especially when we already know the higher prevalence of beta-thalassemia, sickle cell anemia along with worm infestations due to climate conditions and unavailability of safe drinking water in this community is a very important finding and should be looked for the actual etiology behind these findings.

However further study with a large sample size along with HPLC for hemoglobinopathies, serum ferritin level, serum vitamin B12,
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folate level, and stool examination is required to find out the specific causes of anemia in these tribals.

**Take home message**
The women of the Tharu tribe have a higher prevalence of anemia than the general population.

Amongst the anemic population, the number of women suffering from microcytic and normocytic anemia is the highest.

The causes of anemia should be confirmed by serum iron profile, stool examination, and specifically hemoglobin electrophoresis.

A comprehensive policy should be made accordingly to reduce the prevalence of anemia in the Tharu population.

**Declaration of participants consents**
The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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**Conflicts of interest**
There are no conflicts of interest.

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