# Prevalence of anemia amongst adolescents in Nepal: a community based study in rural and urban areas of Morang District

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## ABSTRACT

Adolescence covers 10-19 years of human age and is the transition period of life. In Nepal around 23 percent population are in this age group. A cross sectional community based study was carried out in Morang district to determine prevalence and distribution of anemia in terms of age, sex and locations (urban and rural) among adolescent population. Sahli method was used to determine the hemoglobin level. Three hundred and eight adolescents (127 urban, 181 rural in terms of location and 151 male, 157 female in terms of sex) participated in the study. The overall prevalence of iron deficiency anemia among adolescent population was 65.6% with the distribution of rural 62.4%, urban 70.0%, male 52.3% and female 78.3%. Sufficiency or deficiency of iron makes the living of adolescents different as it affects their growth requirement and cognitive performance. Iron reserve in female result better reproductive outcome. In Nepal, iron deficiency anemia among male adolescent has not been documented yet and this study reports more than half of them are found anemic which warrant further study.

**Keywords:** Adolescent, prevalence, anemia, urban, rural, Nepal.

## INTRODUCTION

Adolescence is a transition from dependent childhood to independent and responsible adulthood. The World Health Organization (WHO) defined adolescents as the population of 10 to 19 years of age.[1] Out of estimated 27 million population[2] in Nepal around 23 percent are adolescents.[3] This is the period when an individual's social relation expands from a family to wider community and its members. Peers, social surrounding and other adults come to play most important roles in this period. It is a cross road in life when choices and decisions made become crucial for the future of an individual. Adolescents learn and adopt new knowledge and practices more easily and generally these are long lasting with impact on next generation. This is an important aspect with respect to program and impact of nutrition intervention.

Anemia is one of the most prevalent conditions in the world and iron deficiency is the most common cause for it among all the others. A WHO report shows that 52.0% of pregnant and around 35.0-40.0% of women are anemic in developing countries due to iron deficiency.[4] The situation in Nepal is more severe where 36.0% age 15-49, 42.0% pregnant and 40.0% lactating women are reported anemic.[5] A few studies carried out among adolescent girls in Nepal reported that prevalence ranges from 42 to 60.0%.[6-9] However, these studies did not include male adolescent population. In addition, very little is known about the status of iron deficiency anemia among adolescents of urban inhabitants. In the recent years, it becomes more important due to the fact that migration from rural to unplanned urban town is increasing and the general observation is that the health and nutrition status is similar to the rural areas if not worst. Anemia among adolescents, in addition to similar impact to the other age groups, is important due to the reasons: (1) it covers large group of population, (2) Iron reserve subsequently helps adolescent girls for better reproductive outcome and (3) Deficiency and sufficiency of iron cause difference in performance as well as education achievement of both sexes.[10-13] Therefore, it is important to identify prevalence of anemia among adolescent including male population which can be corrected with cost effective interventions. This will prevent illnesses and disability during the most productive age of life.

This study was conceived and designed with the objective to determine prevalence and distribution of anemia in terms of age, sex, urban and rural locations among adolescent population.

## METHODS AND STUDY POPULATION

This is a cross sectional study, conducted in Morang district in Bikram Sambat 2058-59. Ward 5, 7 and 15 of Biratnagar Sub-Metropolitan town were selected for urban areas where Jhorahat, Baijanathpur and Lakhantari

**Table-1:** Distribution of population studied and prevalence of anemia

| Location | Age group | Sex | Percentages of adolescent with Hb < 12 gm% |
|---|---|---|---|
| Urban: Municipality | 10-14 (N= 35 | Male (N=14) | 71.4 |
| | | Female (N=21) | 85.7 |
| | Total (N=38) | | 73.7 |
| | 15-19 (N= 92 | Male (N=49) | 51.0 |
| | | Female (N=43) | 83.7 |
| | Total (N=92 | | 66.3 |
| | Grand Total (N=127) | Male (N=63) | 55.6 |
| | | Female (N=64) | 84.4 |
| | | Male and female (N=127) | 70.0 |
| Rural: Village | 10-14 (N= 78) | Male (N=42) | 64.3 |
| | | Female (N=36) | 77.8 |
| | Total (N=78) | | 70.5 |
| | 15-19 (N=103) | Male (N=46) | 37.0 |
| | | Female (N=57) | 71.9 |
| | Total (N=103) | 56.3 | |
| | Grand total Total (N= 181) | Male (N=88) | 50.0 |
| | | Female (N=93) | 74.2 |
| | | Male and female (N=181) | 62.4 |
| Grand total (N= 308) | | Male (N=151) | 52.3 |
| | | Female(N=157) | 78.3 |
| | | Male and female (N=308) | 65.6 |

Village Development committees were selected for rural areas. A total of 127 and 181 adolescents from urban and rural areas participated in the study respectively. The headquarter of Morang district, Biratnagar Sub-Metropolitan town, is the second largest industrial town of the country. The altitude of the study areas is range from 225 to 250 meters from the sea level.

For hemoglobin measurement, blood was drawn by finger prick with lancet after sterilization of the site with 70.0% alcohol. The hemoglobin test was done by using Sahli haemometer. The color comparison was done in the natural light. The procedure was followed as per operating instruction provided by Marienfeld Laboratory Glassware. With each subject verbal consent was taken before drawing blood sample. The test was done on the spot at the field. The result was shared with the participants and appropriate advice was provided to those having hemoglobin value below normal level. World Health Organization's Guideline was used for interpretation and classification of anemia.[14] The altitude correction factors has not been used in this study since the areas fall below 1,000 meters height from the see level.[15]

## RESULTS

The total sample size of the study was 308 adolescents. The mean and median age of the studied population is 14.95 and 15 years respectively and standard deviation from mean is 2.24. The mean hemoglobin is 11.7 gm% and median is 11.9 gm% with standard deviation of 1.2. Table-1 shows the distribution by location, age and sex of studied population. The total male and female population was 151 and 157 respectively.

The overall prevalence of anemia among adolescents (male, female, urban and rural combined) was found very high with 65.6%. Among female adolescents, more than 25.0% (78.3%) higher than male (52.3) counter part. Difference between rural and urban found strikingly

**Table-2:** Distribution of hemoglobin among Hill migrants and Tarain adolescent population

| Origin | Normal Hb | Mild anemia | Moderate anemia | Severe anemia | Total |
|---|---|---|---|---|---|
| | Hb = or > 12 gm% | Hb <11.9-10 gm% | Hb 9.9-7 gm% | Hb > 7 | Total |
| Tarai (N=182) | 49.5 | 46.7 | 3.8 | 0 | 100 |
| Hill (N=126) | 46.0 | 50.8 | 3..2 | 0 | 100 |
| Total | 48.0 | 48.4 | 3.6 | 0 | 100 |

difference. Fifty one percentage of the male adolescents in the urban area and 37% of the same in the rural area were anemic. Similarly, 83.7% and 71.9% of female adolescents were found anemic in urban and rural areas respectively. Table-1 shows that prevalence of anemia among males was found higher in the age group of 10-14 years with 64.3 in rural and 71.4 in urban area. In the same age group, 85.7% of the female adolescents in the urban and 77.8% of the same in the rural areas were found anemic. In the age group of 15-19 the prevalence is slightly lower in both sexes (urban: males 51% and females 83.7%; rural: males 37.0% and females 71.9%). It indicates that with the increase in age, there is some improvement in the prevalence of anemia among adolescents.

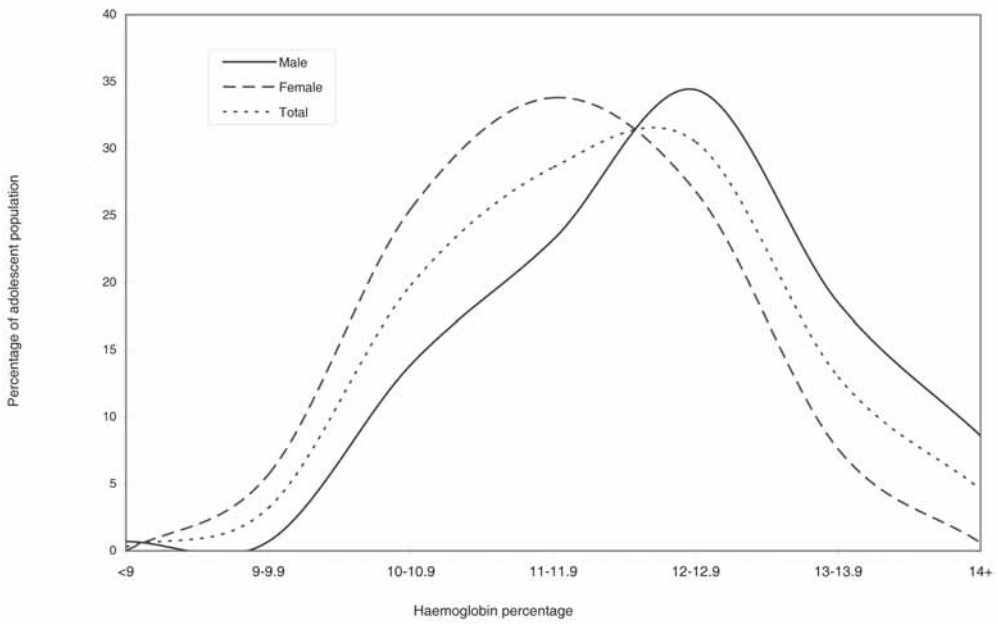
In the study areas, there are two distinct groups of population by origin. One is Hill migrants and the other is Indigenous Tarain population. Table-2 shows that only 48% of the population studied were found with normal level of hemoglobin. Hill migrants are found to have slight higher prevalence than the indigenous Tarain population. The study did not find a single case with severe anemia. The number of mild anemic adolescent is found almost equal to the number with normal hemoglobin level among the people studied.

The Fig. 1 shows adolescent population distribution in relation to the level of hemoglobin. The male curve is more towards right indicating that more male adolescent population have normal hemoglobin than female population. The female curve is more towards the left and total (male and female) curve is in the middle. This shows that more female population have lower hemoglobin level than that of male adolescent population.

## DISCUSSIONS

Nutritional anemia is common all over and there are around one billion iron deficient people in the world.[16] There are very few studies on the prevalence of anemia among adolescents in comparison to other groups like women and children in the world and it is the case in Nepal too. Study among male adolescents is virtually non-existence in Nepal. Because of its impact on cognitive, physical growth and development as well as other protective and promotive health reasons, study on the status of anemia among males is also important. It is important due to not only sizeable population that is equal to married women of reproductive age group but also because investing in this age group is cost effective and lasting impact to the next generation. Therefore, it becomes imperative to give immediate attention to adolescents to address their nutritional need.

**Fig. 1.** Distribution of hemoglobin among adolescent population



Sahli's method for estimating hemoglobin is not as accurate as other available methods. However, in the context of our field setting and limited resource, it is the best alternative in comparison to only physical examination. The accuracy depends on level of hemoglobin and sensitivity and specificity is 64%, 70-100% in severe anemia.[17] This method is widely used in Nepal at peripheral health facilities as well as community based study.[18]

A high prevalence of iron deficiency anemia was found among adolescents. When prevalence of iron deficiency anemia becomes more than 20.0% in a population, WHO classifies it as public health problem. In this study, prevalence of 2.5 and almost 4 times higher than that of WHO cut-off point percentages among male and female adolescents respectively. Since the first study by Adams et al in 1972, anemia remains a problem throughout the country in all ages and both sexes. However, a higher incidence is reported among children and women of reproductive age, especially pregnant mothers. Anemia decreases the resistance to infections as well as decreases work capacity. In pregnant women, it increases the risk of intrauterine growth retardation and the risk of pre-term delivery. Similarly, in children it increases the risk of impaired cognition.[10-12, 13,19] Considering the magnitude of anemia, there should be a multi-sectoral community-based approach for the prevention and control of anemia in Nepal. Strategies should include improvement in dietary intake of iron, food fortification, integration with other development programs and control of parasitic infestation and other chronic infections. A study reported from remote hilly areas that there is slightly better nutritional status of children having negative stool for intestinal parasites than those having positive stool for intestinal parasites.[18] Similar findings have been reported from other studies.[20,21] One of the previous studies has shown a significant association between low level of vitamin A level and intestinal helminthiasis among school age children in a *Kagati Gaun* (village) just outside of Katmandu Valley.[22] Anemia in Nepal might be attributed to high prevalence of intestinal parasites particularly those associated with blood loss like hookworm, *Trichuris trichiura* and others.

Periodic deworming and oral iron supplementation are primary courses for prevention and cure of anemia as immediate measures. In the Nepali context, strategies to reach large sections of the women, children, and adolescent population are only possible through community based health workers like Female Community Health Volunteers. The most appropriate strategies would be integrated community and school based approach to reach adolescent population for prevention and control of iron deficiency anemia in Nepal.

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