Prevalence of anemia in adolescence girls of Arunachal Pradesh, India

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INTRODUCTION

Anaemia is a serious global public health problem that particularly affects young children and women. India continues to be affected by this serious health problem (Pal et al. 2014). As per the National Family Health Survey-4 (2015-2016) anaemia is widespread in India–58.6% of children, 53.2% of non-pregnant women and 50.4% of pregnant women were found to be anaemic. According to the survey, about 40% of women are mildly anaemic and 12% are moderately anaemic while 1.75% suffered from severe anaemia. The prevalence of underweight among 57 students was 6 (10.53%), while 44 (77.19%) had normal BMI, 2 (3.51%) had severely underweight and 5 (8.77%) were overweight. The prevalence of anaemia among underweight student was 8.77% and in student with normal BMI was 57.89% and overweight has prevalence of 8.77% and severely underweight has prevalence of 3.50%.

A cross-sectional descriptive study was carried out among the adolescent girls of Dera Natung Government College Itanagar, Arunachal Pradesh on 21st September 2019 to understand the prevalence of anaemia among adolescent college students. The study showed that only 19.29% students were normal and 80.70% were affected with various grade of anaemia condition. 24.56% subjects being mildly anaemic and 54.38% moderately anaemic while 1.75% suffered from severe anaemia. The prevalence of underweight among 57 students was 6 (10.53%), while 44 (77.19%) had normal BMI, 2 (3.51%) had severely underweight and 5 (8.77%) were overweight. The prevalence of anaemia among underweight student was 8.77% and in student with normal BMI was 57.89% and overweight has prevalence of 8.77% and severely underweight has prevalence of 3.50%.

KEYWORDS

Adolescent girl, Anaemia, Arunachal Pradesh, body mass index, haemoglobin

Abstract

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are particularly at high risk of malnutrition because of gender discrimination in distribution of, and access to, food within the family (Bhattacharya & Barua, 2013). Very often, in India, girls get married and pregnant even before the growth period is over, thus doubling the risk for anaemia (Upadhye et al. 2017). Besides, poor eating habits are a major public health concern among college and university students (Kannan and Ivan 2017, Singh et al., 2018). Similarly, Hanafi et al. (2013) noted ‘Faulty feeding habits could be attributed to the occurrence of iron deficiency anemia among young adults. The most prevalent habits accustomed in this age group include changing the main meals for snacks, skipping breakfast, reducing the intake of fruits and vegetables, and the increasing consumption of sodas and high calorie foods. These habits can result in iron deficiency and increase the risk of obesity’.

In this scenario, there is serious need to raise awareness of anaemia and anaemia-related health problems among adolescent girls. Since the large majority of adolescent girls are school and college goers, reaching them at an early impressionable age can lay a foundation for a better and healthy lifestyle. According to Sharma (2018:1) observed ‘The prevalence of anaemia decreases with schooling from 56% among women with no schooling to 49% among women with 12 or more years of schooling’. Kakkar et al. (2011: 38) wrote ‘Improving the target population’s knowledge and awareness may increase compliance’. Hence, necessary interventional measures such as health education to adolescent, about various personal and environmental hygiene practices and maintaining a good balanced diet could significantly alter the health status of the adolescent and the society in total (Kumar et al. 2019).

Unfortunately, no attempts have been done to understand the prevalence of anaemia among adolescent girls in Arunachal Pradesh. According to the National Family Health Survey-4 (2016), anaemia is a major health problem in Arunachal Pradesh, especially among women and children. The survey noted “Forty percent of women in Arunachal Pradesh have anaemia, including 32 percent with mild anaemia, 8 percent with moderate anaemia, and 1 percent with severe anaemia. Anaemia is particularly high for women who are breastfeeding, but anaemia exceeds 35 percent for every group of women except those who are pregnant and those belonging to “other” religions. The proportion of women having anaemia is particularly high among other backward classes and those who do not belong to scheduled castes, scheduled tribes, or other backward classes” (NFHS, 2016: 21). This raises an alarming question, how the state fails to contain anaemia in the state. This question however demands a further investigation. In the present study an attempt has been made to get a clear idea of the different degree of anaemia among college students of the Dera Natung Government College, district Papumpare, Itanagar - Arunachal Pradesh and to draw out its correlation with their height and haemoglobin, weight and haemoglobin and height and weight.

Arunachal (the Land of Dawn) is located in the extreme north-eastern corner of India. It is bordered by Bhutan on the west, China (Tibet) on the north and north-east, Myanmar on the east and south-east and the States of Assam and Nagaland to its south. The State has a territory of 83,743 square kilometer. It is the homeland for a large number of tribes that exhibit cultural heterogeneity in spite of having some common cultural and linguistic elements (Chaudhuri & Tayeng, 2015). Of the many communities, the more prominent ones (due to their numerical strength) are the Nyishi, Adi, Galo, Apatani, Mishmi, Tagin, Khampti, Khamiyang, Singpho, Tangsa, Nocte, Wangcho, Monpa, Sherdukpen, Aka, Bugun, Bangro, Yobin, Memba, Nah, Puroik, Meyor, Sartang and Miji.

Materials and Methods

The survey was conducted among 57 adolescent girls of the college. The study was conducted on
21st September 2019 as part of the Poshan Abhiyaan1 of Government of India at the Dera Natung Government College Itanagar, Arunachal Pradesh. The students under study were between the age group of 17-21 years. They came from different socio-economic, cultural background and geographical regions of the Arunachal Pradesh. The data were recorded in the proforma and privacy of data was strictly maintained to protect the physical, mental and social integrity of participants. Age, height, weight and haemoglobin were recorded. The blood sample was taken from them with sterile needles and blood haemoglobin level estimated as per Dacie and Lewis (1975). All subjects were assessed for the presence of anaemia using WHO criteria. Anaemia is established if the haemoglobin is below the cut off points as recommended by WHO (for adult males-13.0 gm/dl and for adult non-pregnant females-12.0 gm/dl). The observations were interpreted as per WHO criteria cut off directed by WHO which is given as below. Each student was directed for the measurement of height and weight to evaluate their nutritional status with the help of BMI according to cut off directed by WHO which is given below:

a) Measuring the prevalence rate of anaemia among college students using haemoglobin percentage as cut off value.

b) Comparing the nutritional status (Body Mass Index) with the prevalence of anaemia in college students.

C) finding the correlation between height and haemoglobin, weight and haemoglobin, and height and weight.

Table 1: Table showing the grade of BMI according to WHO

<table>
<thead>
<tr>
<th>Nutritional Status</th>
<th>BMI kg/m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severely Underweight</td>
<td>Less than 17.0</td>
</tr>
<tr>
<td>Underweight</td>
<td>17.0-18.5</td>
</tr>
<tr>
<td>Normal</td>
<td>18.5-24.9</td>
</tr>
<tr>
<td>Overweight</td>
<td>25.0-29.9</td>
</tr>
</tbody>
</table>

Table 2: Table showing the cutoff of anemia according to WHO

<table>
<thead>
<tr>
<th>Symptoms Severity</th>
<th>Haemoglobin Value (gm/dl)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severe Anaemic</td>
<td>&lt;8.0</td>
</tr>
<tr>
<td>Moderate Anaemic</td>
<td>8.0-10.9</td>
</tr>
<tr>
<td>Mild Anaemic</td>
<td>11.0-11.9</td>
</tr>
<tr>
<td>Normal</td>
<td>12-14</td>
</tr>
</tbody>
</table>

Results

Table 3: Distribution of anaemia among college students (as per WHO criteria)

<table>
<thead>
<tr>
<th>Symptoms severity</th>
<th>No. of students</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severely anaemic</td>
<td>1</td>
<td>1.75%</td>
</tr>
<tr>
<td>Moderate anaemic</td>
<td>31</td>
<td>54.38%</td>
</tr>
<tr>
<td>Mild anaemic</td>
<td>14</td>
<td>24.56%</td>
</tr>
<tr>
<td>Normal</td>
<td>11</td>
<td>19.29%</td>
</tr>
</tbody>
</table>

1 Poshan Abhiyaan is India’s flagship programme to improve nutritional outcomes for children, adolescents, pregnant women and lactating mothers by leveraging technology, a targeted approach and convergence. It was launched by Prime Minister Narendra Modi in March 2018.
In the present study, anaemia was observed in 46 (80.70%) students out of total 57 students. Anaemia was absent in the remaining 11 (19.29%) students. Mild anaemia was observed among 14 (24.56%) students, moderate anaemia in 31 (54.38%) and severe anaemia in only 1 (1.75%) student.

Table 4: Distribution of BMI among college students (as per WHO criteria)

<table>
<thead>
<tr>
<th>BMI</th>
<th>No. of students</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severely Underweight</td>
<td>2</td>
<td>3.51%</td>
</tr>
<tr>
<td>Underweight</td>
<td>6</td>
<td>10.53%</td>
</tr>
<tr>
<td>Normal</td>
<td>44</td>
<td>77.19%</td>
</tr>
<tr>
<td>Overweight</td>
<td>5</td>
<td>8.77%</td>
</tr>
<tr>
<td>Total</td>
<td>57</td>
<td>100%</td>
</tr>
</tbody>
</table>

According to the WHO standard of BMI, students are classified as severely underweight (BMI below 17.0), underweight (BMI 17.0-18.5), normal (BMI 18.5-24.99), and overweight (BMI greater than 25). The prevalence of underweight among 57 students was 6 (10.53%), while 44 (77.19%) had normal BMI, 2 (3.51%) had severely underweight and 5 (8.77%) were overweight (Table V).

Table 5: Prevalence of anaemia among students belonging to different nutritional level

<table>
<thead>
<tr>
<th>Anaemia</th>
<th>Underweight</th>
<th>Severely underweight</th>
<th>Normal</th>
<th>Overweight</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present</td>
<td>5 (8.77%)</td>
<td>2 (3.50%)</td>
<td>33 (57.89%)</td>
<td>5 (8.77%)</td>
<td>46 (80.70%)</td>
</tr>
<tr>
<td>Absent</td>
<td>1 (1.75%)</td>
<td>0 (0.00%)</td>
<td>10 (17.54%)</td>
<td>0 (0.00%)</td>
<td>11 (19.29%)</td>
</tr>
<tr>
<td>Total</td>
<td>6 (10.52%)</td>
<td>2 (3.50%)</td>
<td>44 (77.19%)</td>
<td>5 (8.77%)</td>
<td>57 (100%)</td>
</tr>
</tbody>
</table>

Cfr. Fig 1 (Correlation graph between haemoglobin and weight among students: r=0.04), Fig 2 (Correlation graph between haemoglobin and height among students: r=0.01) and Fig 3 (Correlation graph between weight and height among students: r=0.41)

After the analysis it was found that anaemia was more prevalent in student with normal weight. The prevalence of anaemia among underweight student was 8.77% and in student with normal BMI was 57.89% and overweight has prevalence of 8.77% and severely underweight has prevalence of 3.50%. As it is shown from the above calculation part that no correlation (r=0.04) is found between haemoglobin and weight of the students. When compared with height with haemoglobin there is no correlation is observed and the value of correlation is r=0.01. As it is shown in the table that there is correlation is (0.41) found between height and weight of the students.

Discussion

The present study shows that the prevalence of anemia was 80.70%. The present study revealed that anaemia is one of the biggest health problems among teenagers going to college. In the present study among the college students, there were moderate anaemia among 54.38% student followed by mild anaemia among 24.56% students but there was only 1.75% students having severe anaemia. Similar to our study, Sharma et al. (2018) who analyzed the data of NFHS-4 revealed that in India, “mild anaemia was significantly high among women of age 15-24 along with moderate anaemia in the same age group. Similarly, a study conducted by Shedole et al. (2017) on the prevalence of anaemia among urban and rural adolescent high school girls of Davangere, Karnataka found that the prevalence of mild, moderate and severe anaemia is 53.69%, 17.54% and 13.23%. A study carried out by Panyang
et al. (2018) on the prevalence of anemia among the women of the tea garden community of Assam also revealed a similar prevalence of severe anemia of 8.4% while moderate anemia accounts for 91.6%. A study by Goyal et al. (2015) on the prevalence of anemia among school adolescent girls in Haldwani, Nainital, found that 48.18% of adolescent girls were found to have a prevalence of mild, followed by moderate and severe anemia among the study population. Again, a similar study, carried out among 371 adolescent girls in schools of Haldwani, Uttarakhand by Goyal and Rawat (2018), concluded that nearly half of the schools going adolescent girls are still suffering from mild, moderate to severe anemia. A recent study by Kumar et al. (2019) on the prevalence of anemia among tribal school going children found that the presence of anemia was 11.21%. Among the identified cases of anemia all of them were of the moderate type and no cases of severe anemia were noted.

Apart from these studies, a number of studies were undertaken in many parts of India, for example, a study carried out among the tea tribe adolescent girls living in the Dibrugarh district of Assam in 2013 by Mahanta et al. (2015) discovered that anemia soared up to 96.3% among adolescent girls. Joshi and Kushawaha’s (2018) study on the prevalence & correlates of nutritional anemia among the adolescent girls of Uttarakhand revealed that 83.18% of them were anemic. Kakkar et al. (2011), who carried out their survey among the adolescent school girls of Bhopal, revealed a prevalence of anemia of 58.4% among the study participants. A study carried out among 300 adolescent girls in Nagpur in 2017 by Upadhye et al. (2017) discovered a high prevalence of anemic girls up to 90%. Deshpande et al.’s (2013) study on the prevalence of anemia in adolescent girls found that 60 percent were anemic, 18.4 percent mild, 41.3 percent moderate, and 0.4 percent suffered from severe anemia. A study carried out by Melwani et al. (2018) on the prevalence of anemia amongst adolescent girls residing in a selected slum of Bhopal city found that the overall prevalence of anemia among adolescent girls was 57.65%. However, in contrast to our study, a study conducted by Vihbute et al. (2019) on the prevalence and awareness of nutritional anemia among 300 female medical students in Karad, Maharashtra found that only 28.6% were suffering from anemia. Similarly, a study conducted by Patel et al. (2017) on the nutritional anemia status in adolescent girls in rural schools of Raipur, India revealed that 36.4% were found to be anemic. A study carried out by Atram et al. (2019) among 150 medical students on the prevalence of anemia, discovered that majority of students had a mild grade of anemia.

In the neighboring country of Nepal, a study carried out by Gautam et al. (2019) on the prevalence of anemia in women of reproductive age reveals that 41% of women aged 15–49 years were anemic. In Bangladesh, a study carried out by Mistry et al. (2017) on anemia among adolescent girls in Bangladesh revealed that as many as 51.6% of adolescent girls were suffering from a form of anemia. In Pakistan, a study carried out by Jamali et al. (2016) on the prevalence of Iron Deficiency Anaemia in school and college students of the District Shaheed Benazirabad, Sindh Province, Pakistan found that 43.1% of the students were anaemic. More recently, a study conducted by Hassan et al. (2017) on the prevalence of iron deficiency anemia in adolescent girls from low income communities in Lahore revealed that anemia was present in 68.8% of adolescent girls. A study carried out in Bhutan by Campbell et al. (2018) on the epidemiology of anemia in children, adolescent girls, and women of reproductive age revealed that in all groups, anaemia prevalence was high. A study carried out by Hettiarachchi et al. (2006) on the prevalence and severity of micronutrient deficiency among adolescents in Sri Lanka revealed that the prevalence of iron deficiency anemia (IDA) was 24.6% in males and 40.0% in females (overall 33.9% for the age group). As far as Myanmar is concerned, a study conducted by Htet et al. (2013) on the influence of vitamin A status on iron-deficiency anaemia in anaemic adolescent schoolgirls in Myanmar found out that 30% of anaemia cases were due to iron deficiency.
In the present study, it was found that anaemia is more prevalent among the students who have normal BMI. The prevalence of anaemia among underweight (BMI less than or equal to 18.5) was 8.77% and normal (BMI 18.85-24.99) of 57.89% and over weight (BMI more than or 25) have prevalence of 8.77%. A similar trend was observed in a study carried out by Agarwal et al. (2017) in their study of 344 medical and para medical students of the Rohilkhand Medical College and Hospital, Bareilly found the prevalence of anaemia among normal weight (31.92%) followed by underweight (27.02%), then in preobese (25.86%) while the least was among the obese (20.83%). A study conducted by Khan et al. (2018) on the undergraduate students of a medical college of Haryana also revealed that anaemia prevalence was significantly higher among underweight students (88.9%) compared to normal (54.2%) and overweight/obese (46%) students. Pandey and Singh’s (2013) study among medical students in a medical college, at Bilaspur, Chattisgarh, found that the prevalence of anemia among underweight (BMI below 18.5) was 60%, and normal (BMI 18.5 – 24.99) of 27.5% and overweight (BMI >25) have prevalence of 12.5%. A similar trend was reported by Pal et al. (2014) in their study of the prevalence of anaemia in relation to BMI among adult rural population of West Bengal, where the prevalence of anaemia was the lowest in the overweight and significantly higher prevalence was noted in normal groups and underweight group. This suggests that anemia prevalence decreases as the nutritional status of subject increases.

When we compared haemoglobin and weight of the students, we observed no correlation (r=0.04) between them. When compared height with haemoglobin, there is no correlation observed and the value of correlation is r=0.01. As it is shown in the fig. 3 that there is a correlation (0.41) found between height and weight of the students. Similar results were found in a study done by Chinchole and Najan (2017) as they found that there is no significant difference in the prevalence of anemia in different BMI groups. Saratha et al.’s (2010) study on the prevalence of Anaemia among young adult female students in a medical teaching institution in Pondicherry found that there was also no significant association between anaemia with height, weight and BMI. Joshi and Kushwaha’s (2018) study on the prevalence & correlates of nutritional anaemia among adolescent girls of Uttarakhand revealed no significant association between BMI and anaemia. Similarly a study conducted by Hanafi et al. (2013) on hemoglobin levels and body mass index among the preparatory year female students at Taibah University, Kingdom of Saudi Arabia found that there is no significant association between hemoglobin status (anemia) and BMI status among the studied population. Kannan and Achuthan (2017) noted that when grades of Body mass index were correlated with hemoglobin status, undernutrition showed a positive correlation and an inverse relationship in overweight and obese adolescent girls when age was controlled both in boys and girls, however none of the correlation showed significance to the levels of <0.05.

**Conclusion**

In the present study, the prevalence of anemia was found to be 80.70%. 24.56% subjects being mildly anaemic and 54.38% moderately anaemic while 1.75% suffered from severe anaemia. Most students had a mild grade of anaemia. BMI shows a higher prevalence of anaemia among the normal weight people, followed by over-weight and under-weight. There is no significant difference in the prevalence of anaemia in different groups of BMI. However, there is a correlation (0.41) found between height and weight of the students. However, further studies with a large sample size are needed to draw out the exact proportion of prevalence of anaemia, so that appropriate remedial measures can be taken.

Thus, this study highlights that adolescent college students are a vulnerable population and there is an urgent need for interventional programs at colleges. Most importantly, to reduce the level of
anaemia, frequent screening of the students for the presence of anemia and regular health checkups is mandatory in all the school and college students.

Recommendations

The general health of adolescent girls in Arunachal Pradesh still needs to be improved. The awareness regarding healthy eating habits and regular exercise has to be improved by conducting health education classes and awareness programs in colleges.

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Informed Consent
Informed consent was obtained from all individual participants included in the study.

Conflict Of Interest
The Authors declares that there is no conflict of interest.
References


Images

Fig 1: Correlation graph between haemoglobin and weight among students: $r=0.04$

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Fig 2: Correlation graph between haemoglobin and height among students: $r=0.01$
Fig 3: Correlation graph between weight and height among students: $r=0.41$