Journal of Preventive Medicine and Holistic Health 2022;8(2):85–90

Content available at: https://www.ipinnovative.com/open-access-journals

Journal of Preventive Medicine and Holistic Health

Journal homepage: https://www.jpmhh.org/

Original Research Article

Prevalence of anaemia and factors influencing anaemia among school going adolscents in urban and rural area of a North Karnataka: A comparitive study

Sweta Sinha[1], Manjula S Patil[2,*], Sunanda Halki[2], Shubham Mohan Sharma[1]

[1]*Dept. of Community Medicine, Jaipur National University-Institute Of Medical Science and Research Centre, Jaipur, Rajasthan, India*
[2]*Dept. of Community Medicine, Belagavi Institute of Medical Sciences, Belagavi, Karnataka, India*

ARTICLE INFO

Article history:
Received 20-07-2022
Accepted 27-07-2022
Available online 30-01-2023

Keywords:
School
Adolescents
Rural and Urban
Anaemia
Malnutrition

ABSTRACT

Introduction: Adolescents are defined as the age group between 10-19 years according to WHO.[2] During adolescence; anaemia is prevalent in both girls and boys indicating that they need higher nutritional requirement for their rapid physical, mental growth and development.
Objective: To estimate the prevalence of anaemia and its associated factors among rural and urban school going adolescents in North Karnataka.
Materials and Methods: An observational study was conducted among the school going adolescents (10-19 years) studying in Government schools in rural and urban field practice area. All the Government schools were included in sampling frame and students were selected using simple random sampling technique. Anthropometric measurements and laboratory test were done. Haemoglobin estimation using Sahli's method. Data was entered in MS Excel and analysed using SPSS v22. Statistical measures used were percentage, chi square test as test of significance and was evaluated at 95% confidence level (p <0.05).
Results: Total prevalence of anaemia among adolescents was 80.28%, more in rural adolescents (88.88%) compared to urban (71.67%). Maximum prevalence was of moderate anaemia 193 (53.61%) more in rural 63.89% compared to urban area 43.33%.
Conclusion: Maximum prevalence was of moderate anaemia in both the areas which was more in girls compared to boys.

1. Introduction

The word adolescence comes from the Latin word 'adolescere' meaning to grow and to mature. Adolescents are defined as the age group between 10-19 years according to WHO.[1] At present the population of adolescent is 1.2 billion globally forming 18% of the total population. Around 243 million are living in India and consists of about 21% of Indian population.[2] Today every 5^{th} person in India is an adolescent.[3] Adolescence may be divided into three developmental stages-early adolescence- 10 to 13 years, middle adolescence- 14 to 16 years, late adolescence- 17 to 19 years.[4]

Adolescence is the transition period during which they gain up to 50% of their adult height and skeletal mass. Inadequate nutrition during adolescence can have serious consequences throughout reproductive years and beyond. Unmet nutritional needs lead to several public health problems such as stunted and retarded growth, impaired mental development, anaemia. Global prevalence of underweight among children and adolescent is 8.4% in girls and 12.4% in boys according to worldwide pooled analysis of study published in Lancet in 2017.[5] In India, it varies from 21.4% to 47.93% according to different

* *Corresponding author*.
E-mail address: shwetaa91@gmail.com (M. S. Patil).

https://doi.org/10.18231/j.jpmhh.2022.017

studies conducted across the country.[6] During adolescence, anaemia is prevalent in both girls and boys indicating that they need higher nutritional requirement for their rapid physical and mental growth and development. In our country, prevalence of iron deficiency anaemia reported to vary from 56% — 90.1%.[7] Globally, according to WHO, a total of 1.62 billion people is anaemic.[8] Every 9 out of 10 persons affected by anaemia live in developing world.[9,10] Anaemia adversely affects the attentiveness, memory and school performance, their school attendance. In adolescent girls, short stature that carries on into adulthood is associated with many concurrent and future adverse health and pregnancy outcomes like obstructed labour, post-partum haemorrhage, genital infection etc.

Anaemia adversely affects the attentiveness, memory, school performance and school attendance and menstruation problems in girls. Numerous studies have been conducted highlighting the anaemia among the adolescent girls. There is a scarcity of data on anaemia among boys compared to girls and rural urban difference of anaemia. Therefore, this study was conducted with the objective to estimate the prevalence of anaemia and its associated factors among rural and urban school going adolescents in North Karnataka.

2. Material and Methods

An observational study was conducted among the school going adolescents (10-19 years) studying in Government schools in rural and urban field practice area of Department of Community Medicine, BIMS, Belagavi. There are 13 schools in Uchagoan and 9 schools in Kashbag. All the Government schools were included in the sampling frame. The calculated sample size was 360 taking the prevalence of 19.44% in a previous Indian study with absolute error 5%, 10% response failure and 95% confidence interval.[11] Students from standard six to ten were taken in the study and they were selected using simple random sampling technique. A written permission from the authorities of all institutions was obtained prior to data collection. Consent from the study participant's parent/guardian was taken. A pre-designed semi-structured questionnaire was used to collect information regarding socio-demographic profile. Data was collected by using interview method. Anthropometric measurement and haemoglobin estimation were done. To measure weight, portable weighing machine with calibrated scale of 0.5kg was used and for height stadiometer. To measure hip and waist circumference calibrated measuring tape marked in centimetres was used. Body Mass Index (BMI) was calculated by the formula weight in kilograms divided by height in meter square.[12] The classification is made according to IAP guidelines. [Table 3] Waist Hip ratio[12] was calculated by using the formula

Waist Hip ratio= Waist circumference/Hip circumference

Waist-hip-ratio ≤ 1 for males was considered normal while waist-hip-ratio≤ 0.85 in females.

Haemoglobin estimation was done using Sahli's method. Under aseptic precautions, tip of the middle or ring finger was pricked using lancets needle and 20cumm (i.e. 0.02ml) of blood was drawn in haemoglobinometer pipette and was transferred into N/10 HCL graduated haemoglobinometer tube. Contents were mixed thoroughly and kept for 10 minutes for the maximum conversion of haemoglobin in blood to acid haematin. In drops distilled water was added in the tube to dilute it till the colour matched with that of the standard. The reading of the meniscus from the scale of the haemoglobinometer was read haemoglobin was expressed as grams per 100 ml of blood. Anaemia diagnosis was made as per WHO standard.[5] Study duration was from January 2018 to March 2019. Ethical clearance was obtained from institutional ethical committee of BIMS, Belagavi.

2.1. *Inclusion criteria*

1. Students of both sexes between 10-19 years age group
2. Willing to participate in the study

2.2. *Exclusion criteria*

Who did not give informed written consent

3. Statistical Analysis

Data entry was done in MS Excel and was analysed using SPSS v22 and MS Excel. Statistical measures used were percentage and chi square test as test of significance. The statistical significance was evaluated at 95% confidence level ($p < 0.05$) and results presented in tables.

4. Results

360 adolescents participated in the study i.e. 180 from rural and urban area respectively. Maximum participants 207(57.50%) were in middle adolescence phase (75.0%from rural and 40.0% from urban)**.** Compared to boys, girls were more in both the areas i.e. (59.44% rural and 63.99% urban). [Table 3] Total prevalence of anaemia among adolescents was 289 (80.28%) more in rural adolescents 160 (88.88%) compared to urban 129 (71.67%). Maximum prevalence was of moderate anaemia 193 (53.61%) more in rural 63.89% compared to urban area 43.33%. [Table 4] Among adolescent girls, mild anaemia was seen in 37.0% rural and 63.0% of urban, moderate anaemia more 57.2% in rural compared to urban 42.8% and there was a significant statistical association. [Table 5]. Out of 20 subjects of age group 10-12 years in rural area 7(35%) were mild anaemic,13 (65.0%) moderate. 13-15 years (mild 19.6%, moderate 80.4%), 16-17 years (mild 44.22%, moderate 55.8%) and it was statistically significant. In urban area in 10-12 years age (mild 33.3%,

Table 1: Classification of BMI according to IAP guidelines.

BMI	Categories
<18.5	Underweight
18.5-23	Normal
23-27	Overweight
>27	Obese

Table 2: Criteria for anaemia: WHO cut off values for assessing anaemia

Grades	Girls	Boys
Normal	≥12gm/dl	≥13gm/dl
Mild anaemia	<11.9 gm/dl to 11gm/dl	<12.9 to 11 gm/dl
Moderate anaemia	<10.9 gm/dl to 8gm/dl	<10.9 to 8 gm/dl
Severe anaemia	<8gm/dl	<8gm/dl

Table 3: Distribution of the study participants.

Socio-demographic characteristics		Rural N (%)	Urban N (%)	Total N (%)
Age (Adolescence phase)	Early	45(25.0%)	106 (58.89%)	151 (41.94%)
	Middle	135(75.0%)	72(40.0%)	207(57.50%)
	Late	0(0.00)	2(1.11%)	2(0.56%)
	Total	180	180	360
Gender	Boys	73 (40.56%)	65 (36.11%)	138 (38.33%)
	Girls	107 (59.44%)	115 (63.89%)	222 (61.67%)
	Total	180	180	360

Table 4: Prevalence of anaemia among adolescents.

	Rural			Urban			Total		
	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total
Mild	25 (34.25%)	20 (18.69%)	45 (25.0%)	17 (26.15%)	34 (29.57%)	51 (28.33%)	42 (30.43%)	54 (24.32%)	96 (26.67%)
Moderate	36 (49.32%)	79 (73.83%)	115 (63.89%)	19 (29.23%)	59 (51.30%)	78 (43.33%)	55 (39.86%)	138 (62.16%)	193 (53.61%)
Non-anaemic	12 (16.44%)	8 (7.48%)	20 (11.11%)	29 (44.61%)	22 (19.13%)	51 (28.33%)	41 (29.71%)	30 (13.51%)	71 (19.72%)
Total	73	107	180	65	115	180	138	222	360

Table 5: Association of severity of anaemia with gender.

Severity of anaemia	Girls			Chi square & p-value	Boys			Chi square & p-value
	Rural	Urban	Total		Rural	Urban	Total	
Mild	20 (37.0%)	34 (63.0%)	54 (100%)	12.790 & 0.002*	25 (59.5%)	17 (40.5%)	42 (100%)	13.408 & 0.001*
Moderate	79 (57.2%)	59 (42.8%)	138 (100%)		36 (65.5%)	19 (34.5%)	55 (100%)	
Non anaemic	8 (26.7%)	22 (73.3%)	30 (100%)		12 (29.3%)	29 (70.7%)	41 (100%)	
Total	107 (48.2%)	115 (51.8%)	222 (100%)		73 (52.9%)	65 (47.1%)	138 (100%)	

Table 6: Association of anaemia with age of study participants.

Age in Years	Rural Mild	Rural Moderate	Rural Total	Chi-square& p-value	Urban Mild	Urban Moderate	Urban Total	Chi- square & p- value
10-12	7 (35.0%)	13 (65.0%)	20 (100%)	9.452 & 0.009*	14 (33.3%)	28 (66.7%)	42 (100%)	1.715 & 0.424
13-15	19 (19.6%)	78 (80.4%)	97 (100%)		32 (41.0%)	46 (59.0%)	78 (100%)	
16-17	19 (44.2%)	24 (55.8%)	43 (100%)		5 (55.6%)	4 (44.4%)	9 (100%)	
Total	45 (28.1%)	115 (71.9%)	160 (100%)		51 (39.5%)	78 (60.5%)	12 (100%)	

Table 7: Distribution of adolescents according to IAP- BMI cut off.

BMICut off(kg/m^2)	Boys Rural N (%)	Boys Urban N (%)	Boys Total N (%)	Girls Rural N (%)	Girls Urban N (%)	Girls Total N (%)	Total Rural N (%)	Total Urban N (%)	Total Total N (%)
<18.5 Under-weight	61 (83.56%)	55 (84.62%)	132 (73.33%)	71 (66.36%)	82 (71.30%)	137 (76.11%)	132 (73.33%)	137 (76.11%)	269 (74.72%)
18.5-23 Normal	12 (16.44%)	7 (10.77%)	44 (24.44%)	32 (29.91%)	25 (21.74%)	32 (17.78%)	44 (24.44%)	32 (17.78%)	76 (21.11%)
23-27 Over-weight	0 (0.0)	2 (3.08%)	3 (1.67%)	3 (2.80%)	7 (6.09%)	9 (5.0%)	3 (1.67%)	9 (5.00%)	12 (3.33%)
>27 Obese	0 (0.0)	1 (1.54%)	1 (0.56%)	1 (0.93%)	1 (0.87%)	2 (1.11%)	1 (0.56%)	2 (1.11%)	3 (0.83%)
Total	73	65	180	107	115	180	180	180	360

Table 8: Prevalence of anaemia among malnourished adolescents.

Malnutrition	Rural Mild	Rural Moderate	Rural Non-anaemic	Rural Total	Urban Mild	Urban Moderate	Urban Non-anaemic	Urban Total
Under weight	36 (27.27%)	84 (63.63%)	12 (9.09%)	132	40 (29.20%)	61 (44.53%)	36 (26.28%)	137
Overweight	1 (3.33%)	2 (66.67%)	0	3	2 (22.22%)	5 (55.56%)	2 (22.22%)	9
Obese	0	1 (100%)	0	1	0	0	2 (100%)	2

moderate 66.7%), 13-15 years (mild 41.0%, moderate 59.0%), 16-17 years (mild 55.6%, moderate 44.4%) and it was not statistically significant. [Table 6]

According to IAP guidelines BMI categories, 269 (74.72%) of adolescents were underweight more from urban area 76.11% compared to rural 73.33% and higher in urban adolescent boys and girls (84.62% and 71.30%) compared to rural (83.56% and 66.36%) respectively. 76 (21.11%) were of normal BMI i.e. 24.44% in rural and 17.78% urban. 12 (3.33%) were in overweight category, higher in urban area 5.0% than rural 1.67% and obesity was found in 3 (0.83%) which was 1.11% in urban area compared to rural 0.56%. Overweight and obesity was more in urban area compared to rural area. [Table 7]

Among 132 underweight students in rural area, 27.27% had mild anaemia, 63.63% moderate and only 9.09% were non-anaemic whereas in urban area out of 137 underweight adolescents29.20% were mild anaemic, 44.53% moderate and 26.28% non-anaemic. Prevalence of anaemia was higher in rural underweight adolescents compared to urban. [Table 8]

5. Discussion

In the present observational study75.0% adolescents of rural and 40.0% of urban area were in middle adolescent phase followed by early adolescent phase. It was almost similar to Kansagara T et al. study in which majority 59.85% were in middle adolescent phase, but 34.78% in late and 5.37% in early adolescent phase.[13] Out of 360 study students,61.67% were girl participants and 38.33% were boys whereas in Dharmalingam A et al. study about two thirds were girls 67.9% and 54.72% were boys.[6] Our study finding was higher compared to Prayag A et al. study where prevalence in rural area was 52.7% compared to that of urban was 43% and 57% was seen among girls and 40.5% of boys were anaemic which was similar to our study.[14]

Mild type of anaemia among rural girls was 37.0% and 63.0% in urban, moderate anaemia in 57.2% rural and 42.8% urban and 26.7% from rural and 73.3% from urban were non-anaemic and there was a significant statistical association ($p < 0.05$).In a study by Goyal N et al. in Uttar Pradesh among girls in urban area mild to moderate anaemia was seen in 91.9%.[15] Yerpude P N et al. study in urban area among boys aged 10 to 19 years, the prevalence of anaemia was found to be 36.14%.[1,16] In a comparative study conducted by Rani S et al. in a South Indian city found the prevalence of anaemia 74.5% and 82.6% in rural and urban area respectively which was higher compared to our rural area finding.[8] In Rajaretnam T et al. in northern Karnataka found that among both girls and boys nearly a half in rural area and 25-30% in urban area were anaemic.[11]

In our study, according to IAP-BMI cut off category, 24.44% from rural and 17.7% from urban were in normal weight category. Underweight prevalence was 73.33% in rural and 76.11% in urban, overweight 1.67% rural and 5.0% urban, obesity 0.56% in rural and 1.11% in urban area. In Chudasama RK et al. according to IAP standards where prevalence of underweight was 3.4%, obesity 14%, overweight 19.1%.[17] In a study conducted by Elsabagh H M et al. found that 60.7% of the students were normal weight, 6.1% as obese and 1.9% underweight.[18] A study conducted by Rahman F et al. in Kanpur found 52.09% of prevalence of under nutrition among adolescent. Nearly 45.51% and 50.8% adolescents were undernourished in urban and rural areas respectively.[19] Underweight finding in our study was similar to Deshmukh PR et al. (75.3%), higher than Rao V G et (61.7%) Pal A et al. (48.78%) whereas less compared to Srinivasan K et al. (78.4%), whereas and.[10,20–22]

6. Conclusion

Anaemia was more prevalent in rural (88.88%) compared to urban (71.67%) and maximum prevalence was of moderate anaemia in both the areas which was more in girls compared to boys. A high prevalence of anaemia among the rural and urban girls was alarming looking to the grave consequences of anaemia.The association of anaemia with various other risk factors are also established, and there is a dire need to improve the nutrition of the adolescents. So, the present study highlights the need to develop pragmaticintervention programmes incorporating various strategies to improve dietary intake andbioavailability of iron; nutritional supplementation of iron and folic acid tablets and fortification of edible dietary items with iron for the adolescents.

7. Limitations of the study

The present study included only government schools. The results whatever obtained cannot be generalized to entire adolescent population of Khasbag and Uchagaon.

8. Recommendations

More factors and measures need to be identified irrespective of the socio-demographic factors. Detailed analysis like biochemical assessment (e.g. serum iron) would have given more complete picture of nutritional anaemia status of adolescents.

9. Source of Funding

No funding sources

10. Conflict of Interest

None declared

Acknowledgements

Authors gratefully acknowledge the participants, coordinators and Dr. R. G. Viveki, Head of the department of Community Medicine, BIMS, Belagavi for assistance and support.

References

1. Premkumar S, Ramanan PV, Lakshmi D, J. Rural Childhood Obesity - An Emerging Health Concern. *Indian J Endocrinol Metab*. 2019;23(3):289–292.
2. World Health Organization. 2019. Data on maternal, newborn, child and adolescent health. ; 2019. Available from: https://www.who.int.
3. World Health Organization. 2019. Child and Adolescents Health and Development. Available from: https://searo.who.in.
4. Unicef-2019. Adolescent statistics. . Available from: https://data.unicef.org.
5. Gomez L. Worldwide trend in body-mass index, underweight, overweight and obesity from 1975 to 2016: a pooled analysis of 2416 population-based measurement studies in 128.9 million children, adolescents and adults. . *Lancet*. 2017;340(10113):2627–42.
6. Dharmalingam A, Mena N, Raghupathy M. Cross sectional study on nutritional status and prevalence of anaemia in rural adolescents. *Int J Contemp Pediatr*. 2017;4(3):951–5.
7. National Family Health Survey-4 (2015-16). Ministry of Health and Family Welfare. 2017. . Available from: https://pib.gov.in..
8. Suryaprabha RS. Prevalence of anaemia and factors influencing anaemia in adolescent girls in urban and rural area of a South Indian city: A comparative study. *Int J Pharma Bio Sci*. 2013;4(4):1352–8.
9. Baliga SS, Naik VA, Mallapur MD. Nutritional status of adolescent girls residing in rural area: A community-based cross-sectional study. *J Sci Soc*. 2014;41(1):22–5.
10. Deshmukh PR, Gupta SS, Bharmade MS, Dongre AR, Maliye C, Kaur S. Nutritional status of adolescents in rural Wardha. *Indian J Pediatr*. 2006;73:139–80.
11. Rajaretnam T, Hallad SJ. Nutritional status of adolescents In Northern Karnataka. *India J Fam Welfare*. 2012;58(1):55–67.
12. Suryakantha AH. Community Medicine with Recent Advances. Jaypee Brothers Medical Publishers (P) Ltd; 2018.
13. Karasangra T, Parmar DV, Chauhan M, Dave P. A study on dietary intake among school going adolescent girls in rural and urban area of Jamnagar District. *Int J Med Sci Pub Health*. 2018;7(9):1–228.
14. Prayag A, Girija S, Mallapur M. A study of assessment of severity of anaemia among rural and urban children of Belgaum. *National J Commun Med*. 2016;7(8):708–11.
15. Goyal N, Rawat C, Jha SK. Prevalence of anaemia among school adolescent girls. *Indian J Commun Health*. 2015;27(03):390–401.

16. Yerpude PN, Jogdand KS. A cross sectional study of socio-demographic determinants of anaemia in adolescent boys of urban slum area in South India. *Int J Med Res Health Sci*. 2013;2(3). Available from: https://www.ijmrhs.com/abstract/a-cross-sectional-study-of-sociodemographic-determinants-of-anaemia-in-adolesecent-boys-of-urban-slum-area-in-south-indi-191.html.
17. Chudasama RK, Eshwar T, Thakrar D, Eshwar ST. Prevalence and Comparison of Obesity, Overweight, and Thinness by Different Growth Standards among Affluent Schoolchildren (8-18 Years) in Rajkot. *J Mahatma Gandhi Institute Med Sci*. 2017;22(2):99–104.
18. Elsabagh HM, Soliman FE, Hassan L. Perception and practices of healthy lifestyle in late adolescence and its impact on body mass index. *National J Commun Med*. 2016;7(4):311–9.
19. Rahman F, Tripathi VN. Nutritional status of adolescents in rural and urban area of Kanpur. *Int J Contempor Pediatr*. 2016;3(2):464–7.
20. Rao VG, Aggarwal MC, Yadav R, Das SK, Share LK, Boodly MK. Intestinal pararsite infections, anaemia and undernutrition among tribal adolescents of Madhya Pradesh. *Indian J*. 2003;28:26–9.
21. Pal A, Pari AK, Sinha A, Dhara PC. Prevalence of undernutrition and associated factors: A cross-sectional study among rural adolescents in West Bengal. *Int J Pediatr Adolescent Med*. 2017;4(1):9–18.
22. Shrinivasan K, Prabhu GR. A study of the nutritional status of the social welfare hostels in Tirupati. *Indian J Nutr Diab*. 2004;41(5). Available from: https://informaticsjournals.com/index.php/ijnd/article/view/6533.

Author biography

Sweta Sinha, Assistant Professor

Manjula S Patil, Assistant Professor

Sunanda Halki, Assistant Professor

Shubham Mohan Sharma, Associate Professor

Cite this article: Sinha S, Patil MS, Halki S, Sharma SM. Prevalence of anaemia and factors influencing anaemia among school going adolscents in urban and rural area of a North Karnataka: A comparitive study. *J Prev Med Holistic Health* 2022;8(2):85-90.