*R*esearch *A*rticle

PREVALENCE OF ANEMIA AND EPIDEMIOLOGICAL CORRELATES AMONG SCHOOL GOING ADOLESCENT BOYS OF VALLABH VIDYANAGAR (GUJARAT)

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ARTICLE INFO

ABSTRACT

Objective: To study the prevalence of anemia among adolescent boys and correlate the socio-demographic profile with the prevalence.

Materials and Method: Cross sectional population (N=500) for the study purpose was taken from schools of Vallabh Vidyanagar. The hemogram reports were assessed by the automated Hematology analyzer from a reputed pathological laboratory of Vallabh Vidyanagar. The statistical analysis was done using the SPSS 15.0 version for windows.

Results: About 31.4 % were mildly anemic, 4% were moderately anemic and only 1.6% were severely anemic. In bivariate analysis factors like source of drinking water, symptoms like headache, dizziness etc. type of beverage consumption, consumption of Vit-C rich foods and use of iron supplements showed a significant association (P≤0.05) with anemia. While multiple logistic regression analysis suggested that age (OR=0.719, CI = 0.567-0.911), type of accommodation (OR=3.782, CI=1.255-11.397), source of drinking water (hand-pump), pallor of eyes and pale nails were the most important predictors of anemia.

Conclusion: Anemia remains to be a silent monster irrespective of the gender. Awareness programme and educating the adolescents may help to combat the devil bothering the whole world particularly under developed and developing countries.

INTRODUCTION

Anemia is a global public health problem affecting both developing and developed countries with major consequences for human health as well as social and economic development (WHO, 2006). Anemia is defined as a pathological process in which hemoglobin concentration in red cells is abnormally low, considering variations as to age, gender, sea – level altitude, as a result of several situations such as chronic infections, heredity blood conditions, deficiency of one or more nutrients that are necessary for formation of hemoglobin (Queiroz and Torres, 2000). In 2008 World Health Organization (WHO) estimated anemia prevalence among men to be 12.7% which acquires to be approximately 260 million all over the world (WHO, 2008). Jain *et al*. (2011) documented the prevalence of anemia among adolescent boys in Meerut as 42.8%, with 23% of the boys having moderate to severe anemia. In another study Champaneri *et al*. (2014) investigated the comparative blood picture of anemic adolescent boys and girls of rural and urban parts of Vadodara in which results revealed that 19% were mildly anemic, 44% were moderately anemic and 37% were severely anemic. Looking at the paucity of information of anemia among adolescent boys the present study was carried out to study the prevalence and the epidemiological correlates of nutritional anemia among adolescent boys in Vallabh Vidyanagar, Gujarat.

MATERIALS AND METHODS

The study was carried out during the period of November-2011 to March 2012. For the purpose of finding the prevalence of anemia among adolescent boys, all the schools of Vallabh Vidyanagar were enlisted, thereafter adolescent boys of age group 13 – 19 years (N=500) were included in the study, written consent was taken from the authority of the respective schools of the respondents. Pre-tested questionnaire was given to the subjects which included general information, dietary information, signs and symptoms of anemia felt by the respondents, anemia awareness among adolescents and the information on frequency of consumption of iron rich foods was collected by using food frequency method.

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Height, weight and Hemogram were estimated in the "Devasya" pathological laboratory of VallabhVidyanagar. The analysis was done by using fully automated *Haematology Analyzer (Sysmex poch-100i)*. Univariate, Bivariate and Multivariate logistic regression analysis was carried out using SPSS 15.0 version for windows.

RESULTS

Among the 500 adolescent boys studied, 63% were non-anemic, 31.4 % were mildly anemic, 4% were moderately anemic and only 1.6% were severely anemic (Table – 1).

Table 1. Anemia in adolescents boys according to WHO classification

Grading of Anemia (gm/dl)	No. of Adolescents (%)
Normal (≥13)	315 (63)
Mild (11-12.9)	157 (31.4)
Moderate (8-10.9)	20 (4)
Severe (< 8)	8 (1.6)
Total	500 (100)

From the bivariate analysis (Table – 2) it was observed that respondents whose mother acquired education till elementary school, had high prevalence of anemia (63.6%) as compared to other respondents with mother's education till graduation (38.3%), post-graduation (37.5%) and high school (32.9%).

Among the anemic subjects 18.8% complained of headache while 15.8% non-anemic subjects complained of the same. Dizziness was found in 4.2% non-anemic subjects and 4.4% anemic subjects. Decreased physical activity and pins and needles in toes was found equally in 3.2% non-anemic subjects while 4.2% and 4%, respectively was found in anemic subjects. Pallor of eye was prevalent in non-anemic (0.4%) and anemic (5%) adolescents. Pale nails were observed among 0.2% non-anemic and 14.6% anemic respondents. Non-anemic respondents did not have white or pale tongue while 8% anemic adolescents were found with the white or pale tongue (Table – 3). In the present study BMI (Body Mass Index), MUAC (Mid Upper Arm Circumference), WHR (Waist To Hip Ratio), RBC (Red Blood Cells), HCT (Haematocrit Value), MCH (Mean Corpuscular Hemoglobin) and MCHC (Mean Corpuscular Hemoglobin Concentration) are independent variables with dependent variable (Hb). From all variables HCT, MCHC, RBC and MCH showed a positive and significant relationship (P≤0.05) with Hb (R^2= 0.941, F=1500, P=0.00). It means that any increase in HCT, MCHC, RBC and MCH would show an increase in Hb (Table – 4). Excluded variables are BMI, MUAC and WHR. 94% of Hb is explained by HCT, MCHC, RBC and MCH, from it is apparent that all the variables have significant difference (P≤0.05) and the below equation can be derived:

$$Hb = -8.305 + 0.489 * HCT + 0.429 * MCHC - 1.352 * RBC - 0.217 * MCH$$

Table 2. Association of anemia among adolescent boys by socio demographic profile

	Total	Anemic Cases	Prevalence (%)	χ^2	df	Significance
Mother's Education						
Elementary	44 (8.8%)	28	63.6%	15.792**	3	0.001
High School	325 (65%)	107	32.9%			
Graduate	107 (21.4%)	41	38.3%			
Post Graduate	24 (4.8%)	9	37.5%			
Total	500 (100%)	185	37%			
Beverage Consumption						
Milk	258 (51.6%)	92	35.6%	10.241*	4	0.037
Tea	189 (37.8%)	66	34.9%			
Coffee	17 (3.4%)	5	29.4%			
Health Drink	11 (2.2%)	6	54.5%			
Others	25 (5%)	16	64%			
Total	500 (100%)	185	37%			
Consumption of Vit-C Foods						
Fruits	403 (80.6%)	139	34.5%	5.609*	1	0.018
Vegetables	97 (19.4%)	46	47.4%			
Total	500 (100%)	185	37%			

Significant difference (P≤0.05) was observed between anemia and mother's education of adolescents. Father's education did not show a significant relationship with the prevalence of anemia. According to data, high prevalence was observed among adolescents consuming other type of beverages (64%) which includes carbonated and non-carbonated soft drinks, adolescents consuming health drinks had prevalence of 54.5%, milk and tea consuming adolescents had almost equal prevalence of 35.6% and 34.9%, respectively.

The prevalence of anemia among adolescent boys who consumed vegetables as a source of Vit-C was more (47.4%) than those who consumed fruits as a source (34.5%). Significant relationship (P≤0.05) of anemia and headache, dizziness, decreased physical activity and pins and needles in toes was found.

Multiple logistic regression model suggested that age (OR=0.719, CI = 0.567-0.911), type of accommodation (OR=3.782, CI=1.255-11.397), and hand pump as a source of drinking water (OR=0.427, CI=0.186-0.977), pallor of eyes (OR=55.508, CI=1.185-2599.696) and pale nails (OR=0.011, CI=0.001-0.128) were important determinants of anemia. Common tap, tube-well as a source of drinking water and other epidemiological characteristics did not contribute with anemia significantly.

DISCUSSION

Anemia is the most common nutrient deficiency today prevalent worldwide in almost each age group. Bhoite and Iyer (2011) reported that nearly 25% of the boys studied were mildly anemic, 30.9% were moderately anemic and 42.3% were severely anemic in rural area of Vadodara.

Table 3. Chi-square relation of anemia with signs and symptoms and clinical symptoms

	Non-Anemic	Anemic	Total	χ^2	df	Significance
Headache						
yes	94 (18.8%)	79 (15.8%)	173 (34.6%)	8.52*	1	0.005
no	221 (44.2%)	106 (21.2%)	327 (65.4%)			
total	315 (63%)	185 (37%)	500 (100%)			
Dizziness						
yes	21 (4.2%)	22 (4.4%)	43 (8.6%)	4.048*	1	0.049
no	294 (58.8%)	163 (32.6%)	457 (91.4%)			
total	315 (63%)	185 (37%)	500 (100%)			
Decreased physical activity						
yes	16 (3.2%)	21 (4.2%)	37 (7.4%)	6.691*	1	0.013
no	299 (59.8%)	164 (32.8%)	463 (92.6%)			
total	315 (63%)	185 (37%)	500 (100%)			
Pins and needles in toes						
yes	16 (3.2%)	20 (4%)	36 (7.2%)	5.73*	1	0.02
no	299 (59.8%)	165 (33%)	464 (92.8%)			
total	315 (63%)	185 (37%)	500 (100%)			
Pallor of eye						
yes	2 (0.4%)	25 (5%)	27 (5.4%)	37.841**	1	0
no	313 (62.6%)	160 (32%)	473 (94.6%)			
total	315 (63%)	185 (37%)	500 (100%)			
Pale nails						
yes	1 (0.2%)	73 (14.6%)	74 (14.8%)	141.611**	1	0
no	314 (62.8%)	112 (22.4%)	426 (85.2%)			
total	315 (63%)	185 (37%)	500 (100%)			
White, pale, glazed tongue						
yes	0 (0%)	40 (8%)	40 (8%)	74.031**	1	0
no	315 (63%)	145 (29%)	460 (92%)			
total	315 (63%)	185 (37%)	500 (100%)			

* indicates significant difference (P≤0.05)

Table 4. Relationship of Hb with different variables

			Regression		
Variable	R^2	Adjusted R^2	F-value	Coefficient constant	t-value
Hb (Constant)	0.941	0.941	1500**	-8.305	-21.136
HCT				0.489	20.772
MCHC				0.429	11.569
RBC				-1.352	-7.027
MCH				-0.217	-5.427

** indicates significant difference (P≤0.05)

Table 5. Multivariate Logistic regression analysis

							95% C.I.	
Variables	β	S.E	Wald	df	Sig.	O.R.	Lower	Upper
Age	-0.331	0.121	7.480	1	0.006	0.719	0.567	0.911
Type of Accommodation (2) Others	1.330	0.563	5.587	1	0.018	3.782	1.255	11.397
Source of water (2) handpump	-0.852	0.423	4.063	1	0.044	0.427	0.186	0.977
Clinical Symptom Pallor of eyes	4.017	1.963	4.188	1	0.041	55.508	1.185	2,599.696
Clinical Symptom Pale nails	-4.476	1.236	13.112	1	0.000	0.011	0.001	0.128
Constant	3.833	2.167	3.131	1	0.077	46.217	-	-

Muzammil *et al* (2010) studied the prevalence of anemia among adolescent boys in Dehradun, they reported that prevalence of anemia was 37.4%. In the present study a bit contrary results were obtained with only 1.6% severely anemic adolescent boys. Nguyen *et al* (2006) reported that 60.8% prevalence of anemia was found among children whose mothers did not obtain any formal education. Similar results were observed in the present investigation also as the mothers were not acquainted with the type of food adolescents needed. Davidson *et al* (1975) stated that in anemic condition the O_2 in blood is insufficient to meet, this need for O_2 is related to physical activity, thus decreased physical activity and fatigue are prominently observed. Goel and Gupta (2007) studied the prevalence of anemia among adolescents of urban hilly community of Shimla and reported that signs and symptoms like headache, fatigue, vision blurring and dyspnoea showed a significant relation with anemia. From the present study also similar results were obtained except for dyspnoea and fatigue significant difference was not obtained. Siddharam *et al* (2011) studied anemia adolescent girls in Hassan district, Karnataka. They reported that clinical symptoms of pallor were highly significant. The results are consistent with the present study. This may be attributed to the fact that due to reduction in Hb concentration as well as total RBC concentration the color factor decreases and the paleness becomes prominent in anemic persons. The most sensitive regions include eyes, palm, tongue and nails. Kaur *et al*. (2006) studied the epidemiological correlates of nutritional anemia in adolescent girls.

They reported that risk factors like history of worm infestation, vegetarian diet, age and history of heavy menstrual bleeding were important determinants among adolescent girls. While in the present investigation source of drinking water, age and type of accommodation acted as important determinants as there might be an issue with the hygiene and sanitation conditions in the surrounding environment of the residence amongst adolescent boys.

Conclusion

Conclusively, mild anemia was more prevalent as compared to other categorical grading of anemia among the adolescent boys. The findings of this study leads to the conclusion beyond doubt that food based approach will serve as an effective strategy to reduce the incidence of anemia among adolescent boys, promote health and well-being and ensure global nutrition security.

Acknowledgement

REFERENCES

Bhoite Rachana, Iyer Uma. 2011. Magnitude of malnutrition and iron deficiency anemia among rural school children: An appraisal. *Asian Journal of Experimental and Biological Sciences,* 2: 354-361.

Davidson Stanley, Passmore R., Brock, J.F. and Truswell, A.S. 1975. Human Nutrition and Dietetics. Longman group limited.

Dr. Champaneri, V. I., Dr. Kathrotia Rajesh, Dr. Hathi, G.K. and Dr. Harsoda, J.M. 2014. Comparative evaluation of blood picture of anemic adolescent boys and girls. *Scholars Journal of Applied Medical Sciences,* 2(1A): 42-45.

Goel, S. and Gupta, B.P. 2007. Low anemia prevalence among adolescents of an urban hilly community. *Indian Journal of Community Medicine*, 1: 67-68.

Jain, T., Chopra, H., Mohan, Y. and Rao, S. 2011. Prevalence of anemia and its relation to socio-demographic factors: cross-sectional study among adolescent boys in Urban Meerut, India. *Biology and Medicine,* 3: 1-5.

Kaur, S., Deshmukh, P.R., Garg, B.S. 2006. Epidemiological correlates of nutritional anemia in adolescent girls of rural Wardha. *Indian Journal of Community Medicine,* 31: 255-258.

Muzammil, K., Kishore, S. and Semwal, S. 2010. Common nutritional deficiencies of adolescents in Dehradun. *Indian Journal of Scientific Research,* 1: 77-80.

Nguyen Phuong, Nguyen Khan, Nguyen Tam, Bern Caryn *et al*. Risk factors for anemia in Vietnam. Southeast Asian Journal of Tropical Medicinal Public Health 2006; 37: 1-11.

Queiroz, S., Torres, M. 2000. Iron deficiency anemia in children. *Jornal de Pediatria*,76: S298 – S304.

Siddharam, S.M., Venketesh, G.M. and Thejeshwari, H.L. 2011. A study on anemia among adolescent girls in rural area of Hassan district, Karnataka, South India. *International Journal of Biological Medicine and Research,* 2: 922-924.

World Health Organization. 2006. Global Database on Anemia: Global Prevalence of Anemia 1993-2005. Geneva: Switzerland.

World Health Organization. 2008. Worldwide prevalence of anemia 1993-2005. WHO Global database on Anemia.

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