Scholars Journal of Applied Medical Sciences (SJAMS) ISSN 2320-6691 (Online)
Sch. J. App. Med. Sci., 2014; 2(1A):42-45 ISSN 2347-954X (Print)

(An International Publisher for Academic and Scientific Resources)
www.saspublishers.com DOI: 10.36347/sjams.2014.v02i01.008

**Research Article**

# Comparative Evaluation of Blood Picture of Anemic Adolescent Boys and Girls

**Dr. Viral Ishvarlal Champaneri[1*], Dr. Rajesh Kathrotia[2], Dr. G. K. Hathi[3], Dr. J. M. Harsoda[4]**
[1]2nd year resident doctor, [3]Professor,[4]Professor& Head Dept. Of Physiology, S.B.K.S.M.I. & R.C., Sumandeep Vidyapeeth University, At & Po Pipariya, TalukaWaghodia,Vadodara, Gujarat, India-391760
[2]Assistant professor, Dept. of Physiology, All India Institute Of Medical Sciences,VirbhadraMarg, Rishikesh, Uttarakhand, India -249201

***Corresponding author**
Dr. Viral Ishvarlal Champaneri
**Email:** drviralchampaneri@gmail.com

**Abstract:** Anaemia is the most commonly diagnosed clinical nutritional disorder in today`s world. Adolescence is à challenging and transition phase in a process of growth & development from a child to an adult. Many Indian studies have evaluated prevalence & type of anaemia but few data is available for the type of anaemia prevalent on the basis of Blood Indices, red blood cell distribution width (RDW) and very few studies on adolescent boys**.** The pressent study was conducted among 142 anaemic adolescent boys and girls. Detailed Blood Indicess with RDW were investigated and evaluated after history taking, physical examination and informed consent. MCV, MCH, MCHC is significantly reduced in girls compared to boys while RDW is increased in both sexes which suggests microcytic hypochromic type of anaemia. Anaemia is equally prevalent in both sexes though more severe in girls and it is of iron deficiency type of nutritiona lanaemia. Efforts should be made to improve nutritional status of both adolescent boys and girls through community awareness, nutrition education and supplementation programmes.
**Keywords:** Adolescents, Anaemia, MCV, MCHC, RDW

## INTRODUCTION

Anaemia is a condition in which the number of red blood cells or their oxygen-carrying capacity is insufficient to meet physiologic needs, which vary by age, sex, altitude, smoking, and pregnancy status.It is most commonly diagnosed disorder [1].According to W.H.O. it is one of the most important health problems throughout the world [2]. As per W.H.O. definition adolescent is a spanning ages between 10 to 19 years where maximum amount of physical, psychological & behavior changes take place [3]. It is a period of rapid growth & development because of this reason they are more likely to suffer from anaemia. Studies show that 20% and 50% of final height and weight attained during this adolescent period respectively [4].So it is the transition period. The prevalence of anaemia among adolescents in developing countries is 27% [5]. Many Indians studies have evaluated prevalence & type of anaemia on the basis of haemoglobin estimation, serumferritin level, anthropometric examination, socio-economic condition, nutrient intake, food habits &meal pattern but few data is available for the type of anaemia prevalent in adolescence that is microcytic hypochromic iron deficiency anaemia on the basis of Mean Corpuscular Volume (MCV), Mean Corpuscular Haemoglobin Concentration (MCHC) & Red cell Distribution Width (RDW). Most of the studies have been conducted on adolescent girls while adolescent boys are also more likely to suffer from nutritional anaemia due to change in life style, participation in sport, dieting, use of alcohol& cigarette smoking. So this study was conducted to analyze the absolute values of blood index and complete blood picture including Red Cell Distribution Width (RDW) of anaemic adolescents to find out type of anemia and severity in both sexes.

## MATERIALS AND METHODS

### Subjects and Study design

It was a cross-sectional study. The study was conducted originally in May-June 2012. Population was mixed i.e. urban and rural of western Vadodara. Sample was selected by purposive random sampling. For the selection of the study subjects, subjects were examined physically by the physician during the same period.

### Inclusion criteria

Age group: 10 to 19 years (adolescents) included.
Sex: Both the girls and boys included.

Criteria for anaemia among adolescents were accepted as haemoglobin value <12 gm/dl as per W.H.O. recommendations.

### Exclusion criteria

Subjects with thalassemia traits, having chronic illness, taking medications, having haematological and/or digestive complications were excluded after history taking, physical examination and appropriate investigations.

**Sample size**

Based on above criteria 142 anaemic adolescents were selected. Among which there were 99 girls and 43 boys.

**Ethics**

Informed consent was obtained from the legal representatives of the subjects.

**Measurement of haematological parameters**

From each subject, 5 ml of blood was collected by venipuncture in a tube containing anticoagulant EDTA (Ethylene Diamine Tetra Acetic Acid) during fasting in the morning hours. The blood sample was examined in the laboratory by using fully automated electronic cell counters. Complete blood count including RDW was measured.

**Statistical analysis and evaluation of haematological parameters**

All data were expressed as Mean ± Standard Deviation. The criteria of anaemia was accepted as Hb value below 12gm/dl & severity of anaemia was considered as per W.H.O. recommendations of haemoglobin levels to diagnose anaemia at sea level that is mild anaemia with value between 11.0 to11.9 gm/dl, moderate anaemia 8.0 to 10.9 gm/dl and severe anaemia as <8.0 gm/dl of blood [6, 7]. Mean of data was compared with the mean of normal standard value of all parameters [8]. Statistical analysis of the result according to sex was determined by using unpaired student's t-test using SPSS (Statistical package for social Sciences) version 20. $P<0.05$ was chosen as the level of significance.

**RESULTS AND DISCUSSION**

As shown in Table.1Mean Haemoglobin (P=0.14) and PCV (P=0.06) were not statistically different in boys and girls. However mean RBC count (P=0.001) was significantly higher in girls whereas Mean corpuscular volume (MCV) (P=0.019), Mean corpuscular hemoglobin (MCH) (P=0.008), Mean corpuscular haemoglobin concentration (MCHC) (P=0.006) were significantly reduced in girls when compared to boys. When compared with mean of normal standard range [8] in girls Hb and RBC count reduced 33% & 9% respectively while PCV, MCV, MCH were reduced in range of 20% to 27%. In boys mean Hb, RBC count and PCV were reduced 39%, 28% & 36% respectively.

**Table: 1 Hb, RBC count, packed cell volume & Blood Indices in anaemic adolescents.**

| Parameters | In Girls (n=99) Mean ± SD | Deviation (%) from standard range | In Boys (n=43) Mean ± SD | Deviation (%) from standard range |
|---|---|---|---|---|
| **Hb (gm%)** | 9.36±2.01 | 33.14% Decreased | 8.77±2.22 | 39.51% Decreased |
| **RBC (millions/cumm)** | 4.18±0.74 | 9.13% Decreased | 3.53±1.13*** | 27.95% Decreased |
| **PCV (%)** | 29.98±6.69 | 26.87% Decreased | 27.52±7.28 | 36% Decreased |
| **MCV (fl)** | 72.20±12.87 | 19.77% Decreased | 79.33±17.50* | 9.85% Decreased |
| **MCH (pg)** | 22.83±4.72 | 23.9% Decreased | 25.44±5.47** | 15.2% Decreased |
| **MCHC (gm/dl)** | 31.53±2.57 | 7.26% Decreased | 33.05±3.18** | 2.79% Decreased |

*P<0.05, **P<0.01, ***P<0.001 comparing boys with girls

**Table: 2 Total WBC, Platelets and RDW in anaemic adolescents girls and boys.**

| Parameters | In Girls (n=99) Mean ± SD | Deviation (%) from standard range | In Boys (n=43) Mean ± SD | Deviation (%) from standard range |
|---|---|---|---|---|
| **WBC (per cumm)** | 7656.70±3292.22 | 4.29% Normal | 8893.02±9068.71 | 11.16% Increased |
| **PLATELETS (per cumm)** | 284942.3 ± 139159.6 | 37.32% Increased | 246212.34 ± 14619.42 | 18.65% Increased |
| **RDW** | 51.7±5.69 | 13.62% Increased | 50.23±8.08 | 10.48% Increased |

Total WBC count was increased in males but not significantly different from females (P=0.14) and identical to normal standard range in females. RDW and Platelets were increased in both sexes and not statistically different between boys and girls as per Table 2.

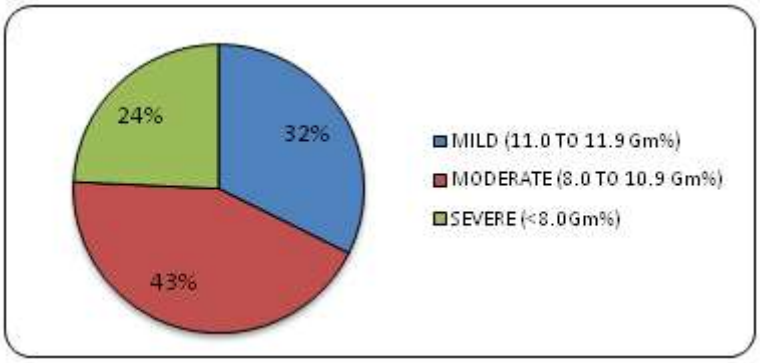


**Fig. 1: Prevalence of severity of anaemia in adolescent girls**

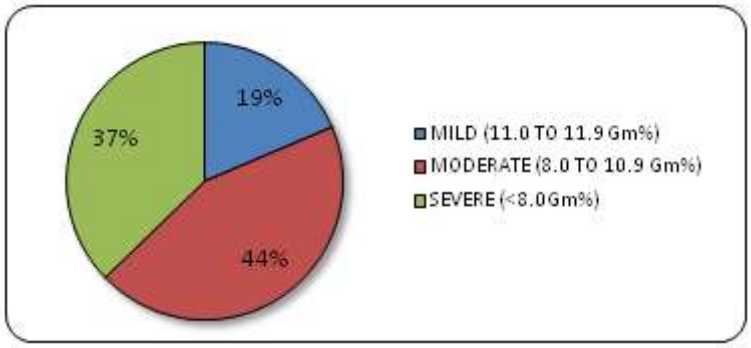


**Fig. 2: Prevalence of severity of anaemia in adolescent boys.**

As shown in Fig.1 32% adolescent girls suffer from mild anaemia where as 43% and 24% have moderate to severe anaemia respectively. Fig.2 shows 19% of adolescent boys had mild anaemia where as 44% & 37% suffered from moderate & severe anaemia respectively. Our results were comparable with other similar studies. One of the study, Palta A. reported that among 86 Indian girls 31(36%) suffered from mild anaemia, 46(53%) moderate anaemia and 9 (10%) with severe anaemia [9]. In other study by Kowsalya S et al. prevalence of anaemia in 100 adolescent girls showed 25% girls were mildly anaemic(10-12gm/dl),30% were moderately anaemic(7-10gm/dl) 10% were severely anaemic(<7.0gm/dl) [10] while Kaur I.P *et al.* when compared with category of anaemia as per National Institute Of Nutrition(1986) showed that 30% male subjects were moderately anaemic,12% were mild & 14% were marginally anaemic [11].

From the results it was seen that Hb, MCV, MCH & MCHC were reduced, RDW was increased in both the sexes. Reduced MCV & MCHC suggests iron deficiency type of nutritional anaemia. If anaemia is observed RDW test results proved useful with MCV to determine the causes of the anaemia. Mathematically RDW is coefficient of variation, i.e. RDW= (Standard Deviation of MCV / Mean of MCV)*100. From this formula RDW in girls was 17.83 CV% & 22.06 CV% in boys in our study which was on higher side compared to normal range 11 to 15 CV%. Iron deficiency anaemia usually presents with high RDW with low MCV and constitutes major anaemia during adolescent period due to accelerated development, hormonal changes, malnutrition and starting of menstrual periods in girls [12, 13].

## CONCLUSION

From our study results of complete haemogram of anaemic adolescents we concluded that most common anaemia among adolescent age group in both sexes is microcytic hypochromic type of anaemia. The most probable cause of which is nutritional iron deficiency. Adolescent children are major risk group of nutritional anaemia particularly iron deficiency anaemia. Diagnosis of anaemia is important in adolescent girls because their iron requirement increased dramatically as expansion of the total blood volume, lean body mass, and they enter the reproductive cycle soon after menarche. For the function of various organs iron is an essential element. Iron deficiency can lead to learning disability; imperceptibility and decline in academic excellence. Public & policy makers should do efforts to improve nutritional status of adolescents through community awareness, nutrition education and supplementation programmes. Haemoglobin levels should be checked time to time. It should be included in school syllabus

that jaggery, dried beans, green leafy vegetables are cheap and rich sources of iron content and eating foods containing vitamin C along with foods containing iron increase its absorption & one must eat them in adolescent age group.

**REFERENCES**


1. World Health Organization. Control of nutritional anaemia with special references to iron deficiency anaemia: Report of an IAEA/USAID/WHO joint meeting. Geneva: WHO; 1975, NO.580.
2. World Health Organization. National strategies for overcoming micronutrient malnutrition. Geneva: WHO; 1991.
3. World Health Organization. Programming for adolescent health and development. Geneva: WHO; 1996: 2.
4. Dimeglio G; Nutrition in adolescence. Pediatric Review, JAN 2000; 21(1): 32-33.
5. Dugdale M; Anemia. OstetGynecolClin North Am, 2001; 28(2): 363-381.
6. FAO, WHO, World Declaration and plan of action for Nutrition, International conference on nutrition. Rome: Food and Agriculture Organization of the United Nations; December 1992.
7. World Health Organization, UNICEF, UNU. Iron deficiency anaemia: assessment, prevention and control, a guide for program managers. Geneva: World Health Organization; 2001.
8. John P. Greer, John Foester, George M. Rodgers, FrixosParaskevas, BertilGlader, Doniel A. Arber, Robert T. Means, Jr; Wintrobe`s Clinical Hematology.12th edition, Walter Kluwer, Lippincott Williams & Wilkins, 2009.
9. Palta A; Haemoglobin and cardiovascular efficiency of adolescent girls. Indian Journal Of Nutrition and Dietetics, 2003; 40(9): 327-332.
10. Kowsalya S., Crassina A., Shimaray; Impact of supplementation of lotus stem (NelumbiamNelumbo) on the iron nutriture of adolescent girls (13-18 years) in Manipur. Indian Journal Of Nutrition and Dietetics, 2008; 45: 47-53.
11. Kaur I.P. and Kaur S; A comparision of nutritional profile and prevalence of anaemia among rural girls and boys. Journal of exercise science and physiotherapy, 2011; 7(1): 11-18.
12. Halterman JS, Kaczorowski JM, Aligne CA; Iron deficiency and cognitive achievement among school aged children and adolescents in U.S. Pediatrics, 2001; 107(6): 1381-1386.
13. Beard JL; Iron requirement in adolescent females. J. Nutr., 2000; 130(25): 440-442.