Prevalence of Anaemia by Evaluating Various Haematological Parameters in Medical Students

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Abstract: _Objective_: _To find out the prevalence of anaemia in medical students by evaluating their Haemoglobin content, PCV/hct, TRBC count and Absolute Indices._ _Methods_: _The present work has been undertaken on 150 cases between age group of 18 to 24 years. Two ml blood was taken from ante-cubital vein by vene-puncture by using 24-guage needle under aseptic conditions using a disposable syringe. This blood was poured in EDTA vials and was used for the haematological investigation._ _Summary_: _The present study was undertaken in 150 medical students, which included 93 males and 57 females. The entire series was subjected to haematological investigation for anaemia prevalence._ _Conclusion_: _The overall prevalence of anaemia in our study was found to be 9.3%. But since the anaemic subjects were exclusively females it can also be concluded that the prevalence was zero percent in males and 24.56% in females._

Keywords: Prevalence, Anaemia, Haematological parameters, Medical students

1. Introduction

Anaemia of various types affect large population groups in most of the developing countries. Therefore, it is reasonable to believe that anaemia impairs health and working capacity leading to mental, physical and economical loss. Anaemia is one of the major problems of medical practice in our country. Prevalence of anaemia in our country has been reported as being as low as 0.8% to 97.7% in various population. WHO sponsored studies indicate that anaemia is considered to be the late manifestation of nutritional deficiency believed to be result of malnutrition, chronic blood loss with particular attention to the relative roles of dietary deficiency such as iron, folic acid, vitamin B-12 in the pathogenesis of anaemia. In our country as reported by WHO and FAO dietary analysis of food consumed by anaemic person indicate that intake of iron is within recommended allowance but widespread anaemia is associated with less absorption and assimilation of iron or excessive losses. Anaemia due to iron deficiency is associated with many disabilities including learning capabilities. It is very essential that the exact prevalence of anaemia be studied. The present study aims at finding the same among medical students.

2. Prevalence

Iron deficiency is widespread throughout the world. It afflicts persons of all ages and economic groups, although it is more common among the very young, among those on poor diets and among women. Indeed, the worldwide prevalence of iron deficiency anaemia is such as to rank it among the commonest chronic maladies of humankind. Data of the WHO show that anaemia due principally to iron deficiency, affects approximately 30% of the world's population, or about 1.3 billion persons, and that approximately 43% of preschool children, 51% of pregnant women and 37% of school age children are anaemic. In parts of the world where there is a high frequency of intestinal helminthiasis and the population subsists on an iron poor diet, iron deficiency may be almost the norm. The screening procedure used most often is simple blood haemoglobin determination. In such surveys, the usual procedure is to set a cut-off value on the basis of data from a normal population; values falling below the cut-off point are considered abnormal. The WHO cut-off points are are 14gm/dl for adult men; 12gm/dl for adult women. The cut-off points are likely a bit too high and therefore the prevalence of anaemia has been exaggerated. Improved cut-off values of 11.7gm/dl in women and 13.2gm/dl in men are more reasonable. According to data from NHANES II (National Health And Nutrition Examination Surveys) in the United States Anaemia as defined with the improved cut-off points was noted in about 3% of adult men and in 4 to 6% of adult women. NHANES II was performed from 1976 to 1980 which involved the use of sampling techniques that allowed extrapolation of the data to the United States population as a whole, such variables as age, gender, race, geographic area and socio-economic status were considered. In women the disorder occurs most frequently during the reproductive years, where as in men the prevalence is relatively high in adolescence and low during young adulthood, it increases thereafter with advancing age.

3. Materials & Methods

The present work has been undertaken on 150 cases between age group of 18 to 24 years, with the object to study the haemoglobin, TRBC, PCV, Absolute Indices (MCV, MCH and MCHC) in medical students of AIMSSKS medical college Bhopal between November 2016 to April 2017. Institutional ethics committee permission was obtained. Each case was first subjected to a careful clinical examination to exclude the possibility of any systematic disorder, diseases or deficiency.

The following investigation were undertaken:
1) Hemoglobin by cyanmeth method spectrophotometrically.
2) TRBC by haemocytometer(Improved Neubaeurs chamber)

3) PCV/Hct by centrifugation Wintrobe method @ 3000 rpm for 30minutes.
4) Absolute Indices derived by calculation with standard formulas.

The cyanmethemoglobin technique is the method of choice selected by the International Committee for Standardization in Hematology(ICSH).

Collection of Sample

Two ml of blood was taken from ante-cubital vein by venepuncture by 24-guage needle under aseptic conditions using a disposable syringe. This blood was poured in EDTA vials and was used for the haematological investigation as already mentioned.

Equipments

1. Drabkin's solution for haemoglobin estimation
2. Photoelectric Colorimeter
3. Improved Neubaeur's Chamber
4. Automated Pipettes(5 & 20micro lt), tips, tissue paper
5. EDTA vials
6. Spirit swabs, disposable syringes
7. Test Tubes
8. Micro glass Slides
9. Field A and B stain
10. Methanol
11. Cover slip
12. Microscope –Light
13. Winrobe's tube
14. Centrifuge Machine
15. Incubator
16. Distilled Water

Precaution

1) Hemolysis interferes with the test as the RBC's have a very high iron content.
2) All glassware being used for the test were first rinsed with 1% or 0.1 N HCL and then with good quality deionised water before use.

Statistical analysis of the entire series, males and females was done. There mean values, standard error, t-values and p-values were calculated according to standard formula.
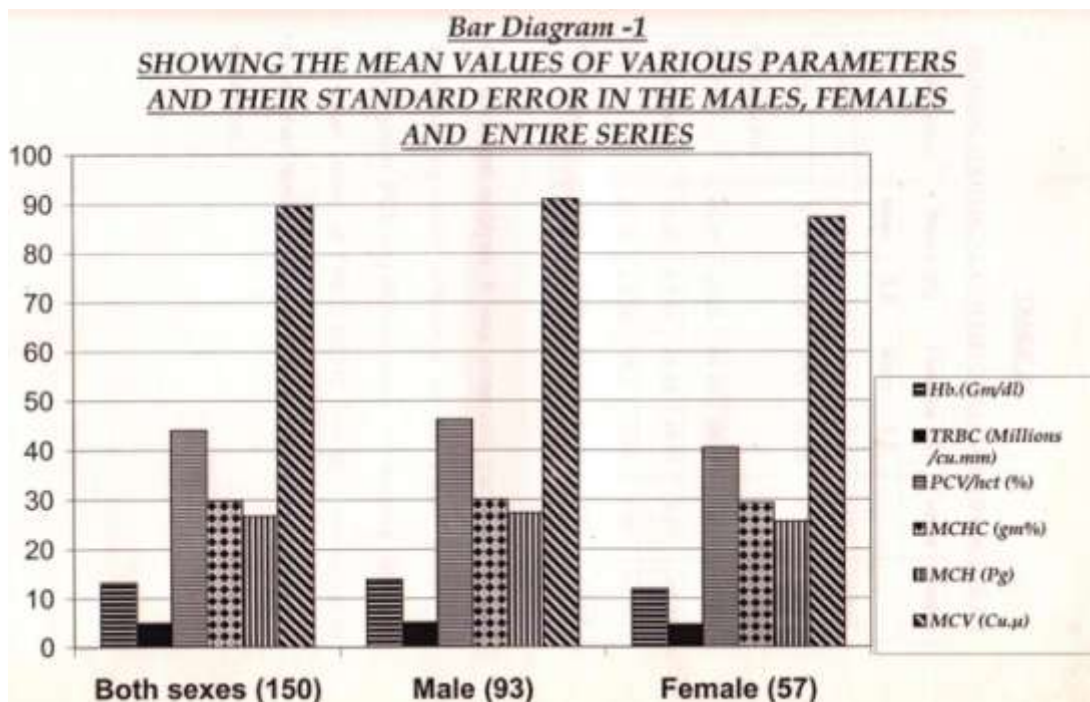
4. Observations

The present study was conducted on 150 medical students of which 93 were males and 57 were females. All the students were investigated for their anaemia prevalence. The students were between age of 18 to 24 years. Most of the cases had an average moderate type of constitution and few females were thin built. It was observed that majority of the subjects were sedentary while some where physically active. Non of our students were addict ed. Majority of them were vegetarians and a few were occasional non-vegetarians. All belonged to upper and lower middle socio-economic class.

The values for mean haemoglobin, TRBC count, PCV, and Absolute Indices(MCHC,MCH and MCV) with standard error in the case of 93 male and 57 female medical students have been presented in Table-1.

TABLE -1
SHOWING THE MEAN VALUES OF VARIOUS PARAMETERS AND THEIR STANDARD ERROR IN THE MALES, FEMALES AND ENTIRE SERIES

Sex and Number	Hb.	TRBC	PCV/hct	MCHC	MCH	MCV
	Gm/dl	Millions /cu.mm	%	Gm%	Pg	Cuµ
Both sexes (150)	13.2 ±0.12	4.97 ±0.05	44.04 ±0.36	29.8 ±0.16	26.7 ±0.26	89.62 ±0.75
Male (93)	13.9 ±0.10	5.14 ±0.06	46.21 ±0.35	30.07 ±0.19	27.35 ±0.33	91.06 ±0.95
Female (57)	11.9 ±0.17	4.68 ±0.08	40.49 ±0.45	29.32 ±0.27	25.6 ±0.4	87.28 ±1.16

Bar Diagram -1
SHOWING THE MEAN VALUES OF VARIOUS PARAMETERS AND THEIR STANDARD ERROR IN THE MALES, FEMALES AND ENTIRE SERIES

The bar diagram No.1 shows the mean values obtained in males, females and entire series. When these values where compared it was observed that the values are higher in males than females.

On statistical analysis it was observed that there was a statistical significant difference in the mean values of haemoglobin, PCV and MCH in males and females. Table-2//.....

TABLE 2
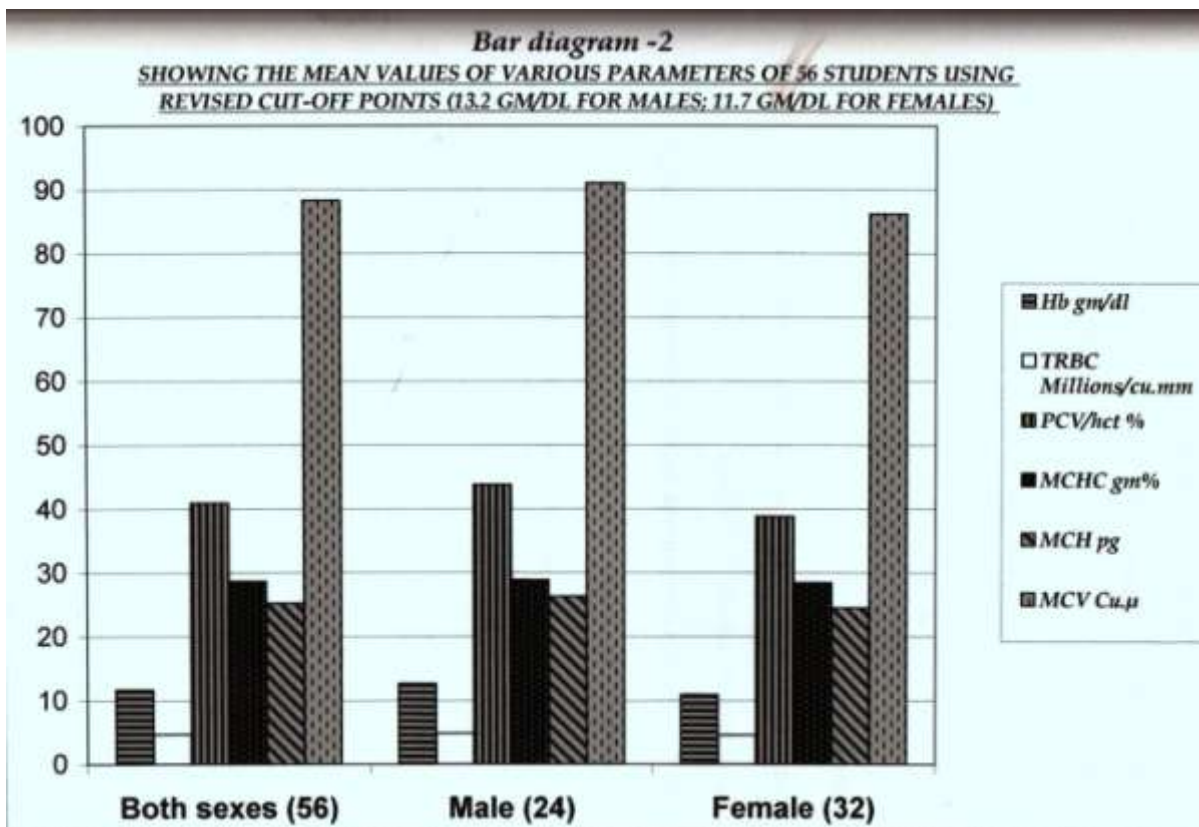### SHOWING STATISTICAL ANALYSIS OF PARAMETERS OF TABLE-1

Parameters	Males (93)		Females (57)		T-value	P-value
	Mean	S.E.	Mean	S.E.		
Hb gm/dl.	13.9	± 0.12	11.9	±0.17	10	<0.001
TRBC million/cu.mm.	5.14	± 0.06	4.68	±0.08	0.15	<0.8
PCV %	46.21	±0.35	40.49	±0.45	10	<0.001
MCHCgm %	30.07	± 0.19	29.32	±0.27	2.27	<0.02
MCH pg.	27.35	± 0.33	25.6	±0.4	3.37	<0.001
MCV cu.µ	91.06	±0.95	87.28	±1.16	2.52	<0.01

Although the mean values of TRBC, MCHC and MCV are higher in males than females but their difference were not stastistically significant.

Table-3 shows mean values with their standard error of haemoglobin, TRBC count, PCV and Absolute Indices in case of 24 male and 32 female medical students who were having haemoglobin cut off less than 13.2gm/dl for males and 11.7gm/dl for females.

TABLE –3
SHOWING PARAMETERS OF 56 STUDENTS USING REVISED CUT-OFF POINTS (13.2 GM/DL FOR MALES; 11.7 GM/DL FOR FEMALES)

Sex and Number	Hb gm/dl	TRBC Millions/ cu.mm	PCV/hct %	MCHC gm%	MCH pg	MCV Cu.µ
Both sexes (56)	11.7 ±0.14	4.71 ±0.09	40.94 ±0.53	28.64 ±0.24	25.26 ±0.44	88.3 ±1.4
Male (24)	12.6 ±0.08	4.88 ±0.13	43.8 ±0.7	28.91 ±0.4	26.3 ±0.67	91 ±2.06
Female (32)	10.9 ±0.13	4.59 ±0.123	38.8 ±0.52	28.43 ±0.32	24.5 ±0.57	86.2 ±1.9

Bar diagram -2
SHOWING THE MEAN VALUES OF VARIOUS PARAMETERS OF 56 STUDENTS USING REVISED CUT-OFF POINTS (13.2 GM/DL FOR MALES; 11.7 GM/DL FOR FEMALES)

The bar diagram No-2 exhibits the mean values of males and females who were below the revised cut- off points for haemoglobin. The means are again higher for males when compared with females.

Table 4
SHOWING STATISTICAL ANALYSIS OF PARAMETERS OF TABLE-3

Parameters	Males (24)		Females (32)		t-value	p-value
	Mean	S.E.	Mean	S.E.		
Hb (gm/dl.)	12.6	±0.08	10.9	±0.13	11.2	<0.001
TRBC (million/cu.mm.)	4.9	±0.13	4.6	±0.123	1.5	<0.1
PCV (%)	43.8	±0.7	38.8	±0.52	5.6	<0.001
MCHC (gm %)	28.91	±0.4	28.43	±0.32	1	<0.3
MCH (pg.)	26.3	±0.67	24.5	±0.57	2.34	<0.01
MCV (cu.μ)	91	±2.06	86.2	±1.9	1.71	<0.05

The statistical difference in the values of these parameters in males and females is depicted in Table-4. This Table depicts that haemoglobin content and PCV values in males are higher as compared to females and the differences are highly statistically significant. There were no significant difference in other parameters of males and females.

5. Discussion

The present work was undertaken in 150 medical students with the object of studying the prevalence of anaemia amongst them. There were 93 male and 57 female of age group 18 to 25 years. All the subjects were examined clinically. The haemoglobin estimation, TRBC count, PCV, Absolute Indices were done in all cases. The mean value with standard error of the haemoglobin content was 13.9+_0.10 in males and 11.9+_0.17 in females, TRBC count was 5.14+_0.06 and 4.68+_0.08, PCV was 46.21+_0.35 and 40.5+_0.45, MCHC was 30.07+_0.2 and 29.32+_0.27, MCH was 27.35+_0.33 and 25.6+_0.40, MCV was 91.06+_0.95 and 87.28+_1.16. All the parameters were less in females as compared to males. In all the parameters except TRBC count and MCHC, the differences were highly significant. On interpretation of the data, using the WHO criteria(cut-off points 14gm/dl for males and 12gm/dl for females) for reference placed the prevalence of anaemia at 49.3%. According to the WHO technical report 1968 to 1975 the prevalence of anaemia in India(Vellore) for males was 6% and for females was 35%. While it was 64% in females in India(Delhi), following the same criteria. However according to the data of NHANES II from 1976 to 1980, the prevalence of anaemia in the age group between 18-24 years in the United States for males was 2.7% and for females was 3.3% with the revised cut-off points (13.2gm/dl for males and 11.7gm/dl for females). When this study used the revised cut-off points, 56 students were found below the cut-

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off points, out of which 16% were males and 21.3% were females.

6. Summary

The present study was under taken in 150 medical students, which included 93 males and 57 females. The entire series was subjected to haematological investigation for anaemia prevalence. In this study the case records of each subject were maintained. Out of 150 students, 56 were below revised cut-off points for haemoglobin i.e 13.2gm/dl for males and 11.7gm/dl for females. But on carrying out transferrr in saturation studies only 14 female subjects had their transferrin saturation between 15 to 20% - the reference range for latent iron deficiency anamia. Rest of the students (42) were found to have transferrin saturation above 20%.

7. Conclusion

The use of a single haemoglobin estimation is of limited value in determining the prevalence of anaemia. If the WHO protocol is used for reference the prevalence of anaemia is amplified due to higher cut-off values which are not applicable in our country. The revised cut-off values provided by NHANES(United States) for prediction of anaemia are better applicable in a developing country like India. The overall prevalence of anaemia in our study was found to be 9.3%. But since the anaemic subjects were exclusively females it can also be concluded that the prevalence was zero percent in males and 24.56% in females.

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