

Section

General Medicine

Original

Article

Estimate the Relationship on Haemoglobin, Serum Iron & Vitamin B12: A Prospective Observational Study

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ABSTRACT

Background: Anaemia is a global public health problem which affects both the developing and the developed countries and it is an indicator of poor nutrition and poor health with major consequences for human health, as well as for the social and economic development of a population. Anemia is a common problem throughout the world and iron deficiency is the most prevalent nutritional deficiency in the world. The purpose of the study is to estimate the relationship on Haemoglobin, Serum Iron & Vitamin B12.

Methods: A hospital based, Prospective observational study was carried out at Vedantaa Institute of Medical Sciences, Palghar. Hemoglobin, Serum Iron & Vitamin B12 was done for 100% sample of enrolled of the Vedantaa Institute of Medical Sciences, Palghar at the age between 11 to 98 years. Statistics was carried out the estimate the relationship on Haemoglobin, Serum Iron & Vitamin B12.

Results: The analysis of the obtained data was based on the objective of the study. Descriptive and inferential statistics was used for data analysis and data interpretation. Results of the study revealed that 34.9% of the samples are males and 65.1% of the samples are female. 14.3% of the samples are in the age group of less than 11.8 to 36.8 years, 52.4% of samples were in the group of 36.8 to 61.8 years, 30.2% of samples were in the group of 61.8 to 86.8 years and 3.2% of samples are more than 86.8 years of age. After analysis and interpretation of data, it was found that out of boys 34.8% males were anaemic and out of females 65.2% females were anaemic.

Conclusions: The prevalence of anemia in the developing countries tends to be three to four times higher than in the developed countries. Hence, improvement in dietary habits related to consumption of green leafy vegetables should be included in diet plan. Health education, seminars on menstrual hygiene should be conducted at regular intervals.

Keywords: Haemoglobin, Serum Iron, Vitamin B12, Prevalence, Regression analysis.

Published Online: September 30' 2019

Received: 31.07.19

Accepted: 12.08.19

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INTRODUCTION

Nutritional anaemia is defined as a condition in which the haemoglobin content of the blood is lower than normal as a result of a deficiency of one or more essential nutrients, regardless of such cause of deficiency. However, in defining a departure from normality, it must be recognised that normal haemoglobin levels vary with age, sex, weight, physiological status & altitude. In this study the terms of iron deficiency & vitamin b12 deficiency are used in preference of Iron deficiency anaemia & B12 deficiency anaemia, respectively.¹ India has always been a country with a high prevalence of anaemia. In India, prevalence ranges between 33-89 percent.² Anaemia is one of the most

common health problems in India which is much more prevalent in the rural than in the urban areas.^{3,4} Anemia, defined by low hemoglobin or hematocrit, is a widespread public health problem both in developing and developed countries. It affects more than 2 billion people worldwide with an estimated 36% of developing world's population suffering from this disease.^{5,6} According to the WHO, the prevalence of IDA is about 18 per cent in developed countries and 35-75 per cent (average 56%) in developing countries.⁷

Anemia was defined according to American College of

Access this article online	
Website: www.iabcr.org	Quick Response code 
DOI: 10.21276/iabcr.2019.5.3.16	

How to cite this article: Shinkar .S, Ghule A, Pangare M. Estimate the Relationship on Haemoglobin, Serum Iron & Vitamin B12: A Prospective Observational Study. Int Arch BioMed Clin Res. 2019;5(3):53-56.

Source of Support: Nil, **Conflict of Interest:** None

Physicians cut-offs as Hb level <12 g/dL for females and <14 g/dL for males. Also, Iron Deficiency Anaemia was defined according to American College of Physicians cut-offs as Serum Iron level < 60 µg/dL & Vitamin B12 deficiency was defined according to American College of Physicians cut-offs as Vitamin B12 level <200 pg/mL.⁸

METHODS

The study was conducted in a hospital base, Prospective observational study was carried out at Vedantaa Institute of Medical Sciences, Palghar. With the aim to find out the estimate the relationship on Haemoglobin, Serum Iron & Vitamin B12.

Study Area: Out Patient Department of General Medicine, Vedantaa Institute of Medical Sciences, Palghar.

Study Population: 100% sample of enrolled of the Vedantaa Institute of Medical Sciences, Palghar.

Sample size: In this study was selected from 63 (100%) sample of enrolled of the Vedantaa Institute of Medical Sciences, Palghar.

Statistical Analysis: The data were entered in IBM compatible computer, using the Statistical Package for Social Science (SPSS), version 23.0. Descriptive analysis using frequency counts, percentages and means with standard deviations (SD) was carried out. Bivariate analysis using chi-square test was used to find out the association between the independent variables and the outcome variable (anaemia). Statistical significance was set at p< 0.05.

RESULTS

In the present study a total of 63 selected samples out of 22 (34.9%) male & 41 (65.1%) female. The age group was between 11.8 to 95.3 years. The mean age of 60.73±16.76 for males, 50.40±17.15 for females & the mean Haemoglobin levels are 11.22±2.54 for males, 10.30±2.28 for females.

The overall prevalence of anaemia in the study subjects is 73.02%. The overall prevalence of Iron deficiency anaemia in the study subject is 47.6%. The prevalence of anaemia with Iron deficiency anaemia in the study subjects is 60.9% but the association of Anaemia with Iron deficiency anaemia is significant (Table No.1). The overall prevalence of Vitamin B12 deficiency is 14.3%. The prevalence of Anaemia & Vitamin B12 deficiency anaemia in the study subjects is 17.4% & the association of Anaemia with Vitamin B12 deficiency anaemia is not significant (Table No.2).

In the present study (Table No.3) the Haemoglobin is moderately strong positively correlated with Serum Iron (r = 0.553). But Haemoglobin & Serum Iron is Slightly negatively correlated with Vitamin B12 (r = -0.143, r = -0.159).

Table 1: Association between Anaemia with Iron Deficiency Anaemia.

	Serum Iron	Iron Deficiency Anaemia	Non-Iron Deficiency Anaemia	Total	P Value
Haemoglobin	Anaemic	28 (60.9%)	18 (39.1%)	46 (100.0%)	0.001
	Non-Anaemic	2 (11.8%)	15 (88.2%)	17 (100.0%)	
	Total	30 (47.6%)	33 (52.4%)	63 (100.0%)	

Table 2: Association between Anaemia with Vitamin B12 Deficiency Anaemia.

	Vitamin B12	B12 Deficiency Anaemia	Non B12 Deficiency Anaemia	Total	P Value
Haemoglobin	Anaemic	8 (17.4%)	38 (82.6%)	46 (100.0%)	0.423
	Non-Anaemic	1 (5.9%)	16 (94.1%)	17 (100.0%)	
	Total	9 (14.3%)	54 (85.7%)	63 (100.0%)	

Table 3: Correlation with Haemoglobin, Serum Iron & Vitamin B12.

Pearson's Correlations	Haemoglobin	Serum Iron	Vitamin B12
Haemoglobin	1	0.553	-0.143
Serum Iron	0.553	1	-0.159
Vitamin B12	-0.143	-0.159	1

Figure 1: Distribution of patients according to the age group.

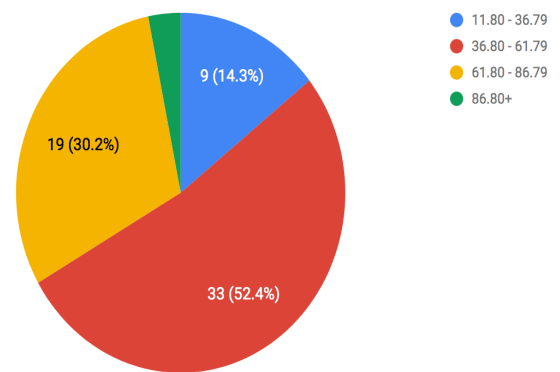


Fig 1: Distribution of patients according to the age group

Figure 2: Distribution of patients according to the Gender

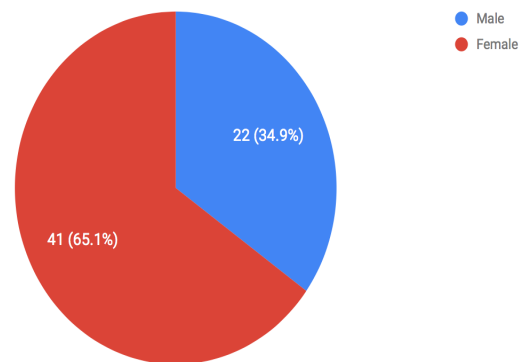


Fig 2: Distribution of patients according to the gender

DISCUSSION

The exact figures for the prevalence of anaemia vary from study to study, but anaemia is an extremely serious public health problem in India. This study was conducted to estimate the relationship on Haemoglobin, Serum Iron & Vitamin B12. In the present study, as per the age distributions of more patients were in the age group of 36.8 to 61.8 years. There were 52.4% patients in the age group of 36.8 to 61.8 years. 30.2% patients were in the age group of 61.8 to 86.8 years. 14.3% patients were in the age group of 11.8 to 36.8 years. Only 3.2% patients were in the age group of more than 86.8 years Figure 1. This study showed

that 34.9% of the samples were males and 65.1% of the samples were females as shown in Figure 2.

The overall prevalence of anaemia was 73.02% in patients of rural area of Maharashtra. In age group of 11.8 to 36.8 years had anaemia i.e. 6.5% patients. In age group of 36.8 to 61.8 years 52.2% patients had anaemia. In age group of 61.8 to 86.8 years 37% patients had anaemia. The patients in age group of more than 86.8 years 4.3% had anaemia. Out of 63 patients only 17 (26.98%) subjects were with normal haemoglobin. In all the age group, it was much more seen in the age group of 36.8 to 61.8 years. Also it was found that out of total 63 patients, 16 (34.8%) males were anaemic and 30 (65.2%) females were anaemic. According to the WHO, if the prevalence of anemia at the community levels was more than 40%, it was considered as a problem of high magnitude 9.10. In the study by Gupta VK et al , the overall prevalence of anaemia was 89.5% in females and 89.9% males.¹¹

The overall prevalence of Iron deficiency anaemia was 47.6% in patients of rural area of Maharashtra. In age group of 11.8 to 36.8 years had Iron deficiency i.e. 10.0% patients. In age group of 36.8 to 61.8 years 56.7% patients had Iron deficiency. In age group of 61.8 to 86.8 years 30.0% patients had Iron deficiency. The patients in age group of more than 86.8 years 3.3% had Iron deficiency. Out of 63 patients only 33 (52.4%) subjects were with normal Serum Iron level. In all the age group, it was much more seen in the age group of 36.8 to 61.8 years. Also it was found that out of total 63 patients, 7 (23.3%) males were Iron deficiency and 23 (76.7%) females were Iron deficiency.

The overall prevalence of Vitamin B12 deficiency was 14.3% in patients of rural area of Maharashtra. In age group of 11.8 to 36.8 years had no Vitamin B12 deficiency. In age group of 36.8 to 61.8 years 66.7% patients had Vitamin B12 deficiency. In age group of 61.8 to 86.8 years 33.3% patients had Vitamin B12 deficiency. The patients in age group of more than 86.8 years had no Vitamin B12 deficiency. Out of 63 patients only 54 (85.7%) subjects were with normal Vitamin B12 level. In all the age group, it was much more seen in the age group of 36.8 to 61.8 years. Also it was found that out of total 63 patients, 5 (55.6%) males were Vitamin B12 deficiency and 4 (44.4%) females were Vitamin B12 deficiency.

The overall prevalence of anaemia with Iron deficiency was 60.9% in patients of rural area of Maharashtra. Also, The overall prevalence of anaemia with Vitamin B12 deficiency was 17.4% in patients of rural area of Maharashtra. The overall prevalence of Vitamin B12 deficiency with Iron deficiency was 20.0% in patients of rural area of Maharashtra.

In the present study, A linear regression analysis using enter method found that the Table 4 provides R, R², adjusted R² and the standard error of the estimate, regression model fits the idea:

Table 4: A linear regression analysis

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.553	0.305	0.294	29.68214

The above table shows the R is the correlation coefficient value of the Haemoglobin with Serum Iron is 0.553, indicates the good level of prediction. The R squared value represents as Coefficient of determination is 0.305 that means the Haemoglobin explain 30.5% of the variability of Serum Iron value. However Adjusted R square interpret to accurately report the data.

Table No. 5 Regression model is good for the data

ANOVA					
Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	108.514	1	108.514	26.81	0.000
Residual	246.901	61	4.048		
Total	355.414	62			

The table shows that the independent variable statistically significant predict the dependent variable, F (1, 61) = 26.81, p value is 0.000 (i.e. the regression model is a good fit of the data.

Estimate the model coefficients using the equation (Table No. 6) to predict Haemoglobin from Serum Iron & Vitamin B12 is Haemoglobin = 8.264 + 0.037 (Serum Iron)

Table No. 6 Model coefficients using the equation

Model	Coefficients			t	Sig.
	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta		
Constant	8.264	0.522		15.845	0.000
Hb	0.037	.007	0.553	5.178	0.000

In the above table shows that for each one g/dL increase in Haemoglobin there is increase in Serum Iron µg/dL. Also conclude that the coefficients are statistically significantly different to zero. The t- value & corresponding p value are located in the "t" & "Sig." columns respectively.

In general, Multiple Linear regression was run to predict Haemoglobin from serum iron not Vitamin B12.

CONCLUSION

Our study highlights the fact that the prevalence of anaemia is very high in rural areas in Maharashtra. Also the prevalence of Iron Deficiency Anaemia is very high in rural areas in Maharashtra. We suggest that there is a need for well- planned, systematic and large-scale studies by using standardised methodologies to estimate the prevalence of anaemia as well as the causes of anaemia at the community level among males and females in all age groups, and the representation of the different regions of India. However more studies are needed to support this observation. The limitation of this study is that it was done on a smaller sample size and was not de- signed specifically to study all the risk factors for anaemia in this population. There is a need for further exploration on this topic.

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