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Original article

Prevalence of Anemia Among Female Undergraduate Students of Government Medical College Kottayam, Kerala

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ABSTRACT

Background: Anemia is a problem among young adult females. The present study was planned to estimate the prevalence and selected determinants of anemia among female undergraduates of Government Medical College Kottayam. **Materials and Methods:** A cross sectional study was conducted among 183 female undergraduates of Kottayam Medical college. Data was collected from the subjects using a pretested interview schedule, 3 ml of blood was collected in EDTA bottles and send to pathology lab for complete blood count in automated haematology analyser sysmex KX21. **Results:** The prevalence of anemia was 19.13%. Duration of menstrual flow more than five days and passing of clots during menstrual cycle were found to be risk factors of anemia in univariate analysis.(Crude Odds Ratio(COR) 4.54 and 3.69) respectively. Among determinants of anemia recurrent infection was found to be statistically significant(p0.03).Pallor was present in 73.9% of anemic subjects whereas normal subjects showed only 11.2 %(COR 24.35)with a p value of 0.001.On multivariate analysis pallor,(adjusted odds ratio(AOR) of 23.57 with p value of 0.001) and duration of menstrual flow(AOR of 4.35 with p 0.005) were found to be predictors of anemia. **Conclusion:** Anemia is a mild public health problem among female undergraduate medical students of Government medical college Kottayam with a prevalence rate of 19.13% .

KEYWORDS: Anemia, Determinants of anemia, Female undergraduate medical students, Government Medical College, Prevalence.

INTRODUCTION

Anemia is a global public health problem affecting both developed and developing countries. Globally anemia affects 1.62 billion people. It occurs at all stages of life cycle, but is more prevalent in pregnant women and young children. However population group with greatest number of individuals affected is non pregnant women (468.4 million).The prevalence of anemia among non pregnant women in South East Asia is 45.7%.[1] As per District Level Health Survey(DLHS 2002-2004) prevalence of anemia in adolescent girls is very high(72.6%).[2] The national survey in India conducted between 1998 - 1999 reported an anemia prevalence rate of 52% among young women[3] and the same survey in 2005 -2006 showed a prevalence of 56%.[4]

Anemia is defined as a reduction in the red cell volume or haemoglobin concentration below the normal range for that particular age, sex and race. The most significant contributor for anemia is iron deficiency. So prevalence of anemia is often used as a proxy for Iron deficiency anemia (IDA). The main risk factors for iron deficiency anemia includes low intake of iron, poor absorption and presence of high phytates and oxalates in the diet. The principal cause of IDA in young women is the excessive loss of blood during menses. Other cuases include helminthic infestation, other chronic infections or malignancies.

Health consequences of anemia include increased risk of maternal and foetal mortality in pregnant women. Anemia can be caused or aggravated by parasitic diseases. Iron deficiency may impair cellular responses and immune functions and increase susceptibility to infections. The iron deficiency anemia can impair cognitive and physical development of children and affect physical performance of adults[5].It can even cause lack of concentration, irritability and impair academic performance of students. Next to young children, young women are vulnerable to IDA[6] because of the monthly blood loss. There are no published

studies of anemia among medical students in our state till now. Hence the present study was planned to estimate the prevalence and determinants of anemia among female undergraduate medical students of Government medical college of Kottayam.

MATERIALS AND METHODS

A cross sectional medical institution based study was carried out between May – July 2012 in government medical college Kottayam. The study subjects were female undergraduate students. There were a total of 424 female students in five batches, and a sampling frame was prepared with this 424 students. By taking the prevalence as 23 % [7] and absolute precision of 5, the sample size was found to be 166 for finite population in statcalc function of Epiinfo version 3.5.1. By taking 10% of non response rate final sample was fixed as 183.Subjects with known haematological disorders were excluded from the study. From the sampling frame, a random sample of 183 students was selected using random number table.

Permission was obtained from the institutional ethics committee prior to the start of study. After taking informed consent, the selected subjects were interviewed using a pretested schedule. Information on sociodemographic variables, dietary pattern, menstrual history, history of recurrent infection, worm infestation, and symptoms of anemia were collected. All subjects were examined for pallor. Height and weight were measured nearest to 1 cm and 0.5 kg respectively. 3 ml of blood was drawn and collected in EDTA(potassium) bottles and sent to the haematology lab of pathology department for complete blood count .The value of haemoglobin, MCV(mean corpuscular volume), MCH(mean corpuscular haemoglobin), Hct(hematocrit) and MCHC(mean corpuscular haemoglobin concentration) were recorded in the schedule.

The next day, the results of the haematological investigations were conveyed to the subjects and those found to have anemia were referred to general medicine department for further evaluation and management. They were also given appropriate dietary advices. For analysis purpose study subjects were divided into anemic and normal subjects according to haemoglobin value.

The cut off value for the determination of anemia is blood Hb concentration < 12 gm/dL. The severity of anemia is classified based on WHO criteria [5]. BMI was graded based on WHO classification for asian adults[8]. Modified Kuppuswamy's scale[9] was used to assess socio economic status.

Statistical analysis:

The data was entered in Microsoft Excel and analysed using SPSS version 16.0. Chi square test was performed to determine the association between qualitative variables. Student t test was used to find out difference between two means. p value of < 0.05 was considered to indicate statistical significance. Crude Odds Ratio(COR) and 95% Confidence Interval (CI) were estimated in the univariate analysis. Those variables which were found to be significant in univariate analysis were included in multivariate logistic regression model by enter method to identify the individual predictors. Adjusted Odds Ratio (AOR) and 95% CI were reported.

RESULTS

The mean age of study subjects was 20.46 with standard deviation of 1.18.The median monthly income in the family of study subjects was ₹30000 (interquartile range ₹20000, ₹40000) (table no.1).The highest education of the head of the family was either professional(18%) or post graduate and degree(53.6%).Except for a few study subjects, all had their fathers occupation as professional (19.7%),semi professional(18%) or business and clerical (42.6%). Thus majority of study subjects belonged to either upper middle(72.7%) and upper class(17%) (table no.1).

Table 1: Socio demographic characteristics of the head of the family of study subjects

Education of head of family	No.	(%)	Occupation of head of family	No.	(%)	Socioeconomic status	No.	(%)
SSLC*	23	(12.6)	Skilled	36	(19.7)	Upper Lower	8	(4.3)
HS† & Diploma	29	(15.8)	Clerical & Business	78	(42.6)	Lower Middle	11	(6)
Degree & PG ‡	98	(53.6)	Semi professional	33	(18)	Upper Middle	133	(72.7)
Professional	33	(18)	Professional	36	(19.7)	Upper Upper	31	(17)
Total	183	(100)	Total	183	(100)	Total	183	(100)

* Secondary School Leaving Certificate, † Higher Secondary, ‡ Post Graduate

Prevalence of anemia in the present study was found to be (35/183)19.13%and 95 % CI 16.23 – 22.03.Except for a single subject, all (97%) were having mild anemia. Descriptives of anthropometric and haematological parameters of the study subjects are given in table no.2. All variables were normally distributed in the study subjects.

The prevalence of anemia was higher among hostlers (20%) compared to dayscholars (14.3%).The prevalence of anemia was 12.5 % for the vegetarians and it was 19.4 % among non vegetarians. Prevalence of anemia was 19.7% and 16.1 % respectively among middle plus lower social class and upper class respectively. Similarly anemia was 21.6 % among undernourished versus 18.5 % among normal and overweight. But all these proportions were found to be not significant statistically.

Table 2 : Descriptives of anthropometric and haematological parameters in the study subjects (n=183)

	Mean	SD (standard deviation)	Range	95% CI for mean	
				Lower	Upper
Height	158.72	6.1	(143, 172)	157.83	159.61
Weight	52.33	6.85	(39, 80)	51.33	53.33
BMI*	20.78	2.58	(15.62,29.51)	20.40	21.15
Hct†	38.21	2.77	(28,45.3)	37.80	38.61
Hb‡	12.74	0.92	(9.6, 15.1)	12.60	12.87
MCV§	86.92	4.93	(69.1, 95.4)	86.20	87.64
MCH||	28.81	2.11	(19.4, 33.0)	28.50	29.12
MCHC¶	33.03	1.11	(28.1, 37.5)	32.87	33.19

*Body Mass Index† Haematocrit , ‡Haemoglobin , §Mean Corpuscular Volume , ||Mean Corpuscular Haemoglobin, ¶Mean Corpuscular Haemoglobin Concentration

Table 3 : Comparison of haemoglobin and other haematological parameters among anaemic and normal subjects

	Anaemic (mean ±SD)N=35	Normal (mean ± SD)N=148	p value
Haemoglobin	11.39 ± 0.63	13.05 ± 0.67	0.001
MCV	82.75 ± 6.25	87.91 ± 3.99	0.001
MCH	27.00 ± 2.77	29.24 ± 1.67	0.001
MCHC	32.06 ± 1.38	33.26 ± 0.89	0.001
Hct	34.16 ± 1.59	39.16 ± 2.02	0.001

Table 4 : distribution of anaemia according to various determinants

Characteristics	Anaemic (N=35) No (%)	Normal (N=148) No (%)	Crude odds ratio	95% CI	P value
Socioeconomic status					
Lower and middle class	30 (19.7)	122 (80.3)	1.28	(0.45,3.60)	0.80
Upper class	5 (16.1)	26 (83.9)			
Residential status					
Hosteller	31 (20)	124 (80)	1.5	(0.48,4.64)	0.61
Day scholar	4 (14.3)	24 (85.7)			
Dietary pattern					
Vegetarian	1 (12.5)	7 (87.5)	0.59	(0.08, 4.98)	0.97
Non vegetarian	34 (19.4)	141 (80.6)			
Worm infestation					
Yes	5 (29.4)	12 (70.6)	1.89	(0.6, 5.26)	0.32
No	30 (18.1)	136 (81.9)			
Frequent infection					
Yes	2 (100)	0 (0)	--	---	0.03
No	33 (18.2)	148 (81.8)			
Menstrual irregularity					
Yes	33 (20.1)	131 (79.9)	2.14	(0.47, 9.73)	0.31
No	2 (10.5)	17 (89.3)			
Duration of flow					
> 5 days	15 (41.6)	21 (58.4)	4.54	(2.01, 10.23)	0.001
≤ 5 days	20 (13.6)	127 (86.4)			
Passing of clots					
Yes	8 (42.1)	11(57.9)	3.69	(1.36, 10.03)	0.007
No	27(16.5)	137(83.5)			

Out of the total 164 subjects with irregular menstrual cycles 20.1 % were anemic whereas only 10.5% were anemic among the regular menstrual cycle group. But this observed difference was not statistically significant. But there was significant association between prevalence of anemia and duration of menstrual cycle (p 0.001).

The prevalence of anemia was 4.5 times more among subjects with duration of menstrual flow more than five days (COR 4.54: 95% CI 2.01-10.23) with a p value0.001 (table

no.4). Similarly there was negative correlation between haemoglobin value and days of menstrual flow(r=-0.19,p 0.03). Passing of clots during menstrual cycle was found to be a risk factor during univariate analysis with an odds ratio of 3.69 (95% CI 1.36-10.03) and a p value of 0.007 (table no.4).

Among the determinants, history of worm infestation showed a prevalence of 29.4% compared to 18.1 % in group with no history of worm infestation. But this observed difference was not statistically significant(table no.4). Recurrent infection was present only in anemic subjects (100%) .This association was statistically significant (p 0.03) by applying fishers exact test. Proportion of subjects with symptoms showed no significant difference between anemic and normal group(table no.5)But pallor which is the clinical sign of anemia was present in 73.9 % of anemic subjects whereas it was present only in11.2 % of normal subjects with an odds ratio of 24.35 (95 % CI 7.8-64) and p value of 0.001(table no.5).

Table 5 : Distribution of anaemia according to symptoms

Characteristics	Anaemic (N=35) No (%)	Normal (N=148) No (%)	Crude odds ratio	95% CI	P value
Palpitation					
Yes	3 (23.1)	10 (76.9)	1.29	(0.34, 4.97)	0.71
No	32 (18.8)	138 (81.2)			
Dyspnoea					
Yes	9 (25)	27 (75)	1.55	(0.65,3.68)	0.34
No	26 (17.7)	121 (82.3)			
Fainting					
Yes	8 (26.7)	22 (73.3)	1.69	(0.68,4.21)	0.25
No	27 (17.6)	126 (82.4)			
Pallor					
Yes	17 (73.9)	6 (26.1)	24.35	(7.8, 64)	0.001
No	18 (11.2)	142 (88.8)			

"Table 6 : Distribution of anaemia according to BMI and haematological parameters"

Characteristics	Anaemic (N=35) No (%)	Normal (N=148) No (%)	Crude odds ratio	95% CI	P value
BMI					
Undernourished	8 (21.6)	29 (78.4)	1.32	(0.50, 2.95)	0.66
Normal and overweight	27 (18.5)	119 (81.5)			
MCV					
<80	11 (68.8)	5 (31.2)	13.11	(4.18, 41.10)	0.001
≥80	24 (14.4)	143 (85.6)			
MCH					
<27	17 (54.8)	14 (45.2)	9.04	(3.82, 21.39)	0.001
≥27	18 (11.8)	134 (88.2)			
MCHC					
<32	15 (60)	10(40)	10.35	(4.10,26.16)	0.001
≥32	20 (12.7)	138 (87.3)			
Hct					
< 36	35 (87.5)	5 (12.5)			
≥ 36	0	143 (100)			

The mean haemoglobin, MCV, MCH, Hct & MCHC (table no.3) were significantly low in anemic subjects compared to normal subjects.(p 0.001)Haematological parameters were categorised into MCV < 80 and ≥80,MCH <27 and ≥27,PCV <40 and ≥ 40,Hct <36 and ≥36 and MCHC < 32 & ≥32.These haematological indices were found to significantly (p 0.001)associated with anemia(table no.6).

Table 7 : Predictors for anaemia- logistic regression

Predictors	Adjusted odds ratio	95% CI	p value
Pallor	23.57	(7.55, 73.61)	0.001
Duration of menstrual flow	4.35	(1.55, 12.21)	0.005

Multivariate analysis was done using enter method and model summary obtained a nagelkerke R^2 of 0.413. (table no.7) Pallor was found to be an important predictor of anemia with adjusted odds ratio of23.57(95% CI 7.55-73.61)and p value of 0.001.Duration of menstrual flow was another predictor of anemia with AOR of 4.35(95%CI 1.55-12.21) and p value of 0.005.

the sign of anemia was found in 73.9% of anemic subjects. Multiple logistic regression revealed that pallor and duration of menstrual flow were important predictors of anemia.

DISCUSSION

The prevalence of anemia among female medical undergraduate students of Kottayam Medical College was 19.13 % which is a mild public health problem[1].This prevalence is comparatively lower when compared to several studies conducted in India[10 -12] This may be due to the fact that majority of the study subjects either belonged to upper middle class (72.7%) and upper class (17%). In the present study 97 % were having mild anemia only. This finding is similar to that of Sultan A.H[13]. There was no association between socioeconomic class and anemia.This finding is like the result obtained by Saratha A et al[14] but against the results obtained by Chaudhary S.M[15]. Dietary habits had no association obtained in this study like the results of other studies[14,15]. Even though majority of the study subjects were non vegetarians eating a mixed diet, frequency of iron rich food will be low in the diet. Considering the residential status hostlers had a higher proportion of anemia than the day scholars, even though it was not significant. This can be explained by the fact that the quality of food served in the hostel is poor. There was no association with BMI and anemia which is in conformity with other study [14].

The mean Hb value in the present study was 12.74 which is corresponding with the mean Hb value obtained in the study among female students attending Dubai Medical college by Ayoub AI[16]. The mean values of Hb, MCV, MCH, MCHC were significantly lower in the anemic group when compared to normal subjects. This finding is in agreement with the result of B.C.Mehta[17]. As anemia progresses the cells become more microcytic with marked fall in MCH, MCV and MCHC.

There was no association between worm infestation and anemia even though an observed difference of 10% was present in the study. This may be due to the fact that we had only asked for the history of worm infestation instead of stool examination which is more objective. Recurrent infection was found to be significantly associated with anemia in the present study. This is because iron deficiency increases the susceptibility to common infection by impairing the host defence mechanism. Even though menstrual irregularity was not a risk factor in this study, duration of menstrual flow more than five days and passing of clots during menstruation were found to be risk factors for anemia.

So also there was negative correlation between Hb and duration of menstrual flow. As the duration of flow increases there will be much blood loss. Similarly passing of clots also indicates more blood loss resulting in anemia. These results are against the result obtained by Saratha et al[14] . The various symptoms like palpitation, dyspnoea and fainting were not associated with anemia like the result of BC Mehta[17]. This is due to the reason that most of the anemic subjects were under mild category only. But pallor,

CONCLUSION

The overall prevalence of anemia among undergraduate medical students was 19.13% with pallor and duration of menstrual flow as important predictors of anemia. Weekly iron supplementation can be tried in the study population to combat the problem.

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