A Hospital-Based Study of Anaemia in Adults

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ABSTRACT

BACKGROUND

Anaemia is highly prevalent in Indian population. While most studies focus on children and women of reproductive age, there are relatively few studies of anaemia in older adults. This age group is also a highly vulnerable group which is commonly represented in medical ward admissions due to infections, diabetes, hypertension, etc. When anaemia is present as comorbidity in these patients, it can influence the course of the disease and prognosis. We wanted to study the severity and type of anaemia and association with various disorders in patients hospitalised with medical illnesses.

METHODS

151 adults above 40 years of age who were admitted with non-critical illnesses and anaemia in medical wards of SRM hospital and medical college were included in the study. Comorbidities were documented and appropriate investigations were carried out. The results were analysed.

RESULTS

There was an age-related association of anaemia among adult males and females above 40 years of age. Anaemia was significantly associated with chronic diseases like diabetes and systemic hypertension. CKD ($p=0.011$) and CLD ($p<0.001$) were significantly higher in males compared to females. Normocytic anaemia was the commonest anaemia in adults more than 50 years of age admitted in the medical wards.

CONCLUSIONS

In patients hospitalised for medical illnesses, anaemia is present in significant association with diabetes and hypertension. In adults older than 50 years of age, normocytic anaemia is predominant.

KEYWORDS

Anaemia, Normocytic Anaemia, Microcytic Anaemia, Macrocytic Anaemia, Older Adults

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BACKGROUND

Anaemia is a condition in which the number of red blood cells and consequently their oxygen carrying capacity is insufficient to meet the body's physiologic needs. India being the most populous country accounts for the most number of anaemia cases in the world. According to National Family Health Survey - 4 (NFHS-4) the prevalence of anaemia in non-pregnant females aged 15-49 years is 53.2% and in men aged 15-49 years is 22.7% in India.[1] Iron deficiency anaemia is the most common type of anaemia in the community according to the WHO health report.[2] Most studies of anaemia are concentrated in children and females in the reproductive age group as they are very vulnerable groups. Anaemia in older adults also causes morbidity though not so frequently studied. Since this is the age group which is also afflicted with many chronic and lifestyle diseases, the impact of anaemia is multiplied. Anaemia in adults may be associated with other chronic illnesses and it adversely affects their outcome. Admissions among this population are commonly related to conditions like diabetes, hypertension, stroke, alcohol-related conditions, heart failure, chronic kidney disease (CKD) etc. We aim to document the extent of anaemia in this population, association with other morbidities and the types most commonly prevalent in a bid to increase awareness of this problem.

METHODS

This is a cross-sectional observational study done in the Department of General Medicine, SRM Medical College, Kattankulathur from July 2019 to September 2019. Using simple selection, 151 patients aged more than 40 years admitted in the medical wards and found to have anaemia were taken up for the study. Anaemia was defined as haemoglobin <13 g/dL (males) and <12 g/dL (females) according to WHO criteria. Severity of anaemia was classified according to WHO. (Table 1)

Group (15 Years and Above)	Haemoglobin (g/dL) Mild	Moderate	Severe
Non-pregnant women	11-11.9	8.0 -10.9	< 8.0
Men	11- 12.9	8.0 – 10.9	< 8.0

Table 1. Classification of Severity of Anaemia[3]

Inclusion Criteria

1. Adult males with haemoglobin <13 g/dL aged >40 years.
2. Non-pregnant women with haemoglobin <12 g/dL aged >40 years.
3. Admitted under General Medicine in SRM Medical College Hospital.
4. Haemodynamically stable.

Exclusion Criteria

1. Patients who were haemodynamically unstable and/or deemed to be critically ill at the time of admission
2. Patients with known haematological disorder.
3. Patients who did not consent for the study.

All baseline characteristics of the included patients including co morbidities were recorded and the following investigations were done wherever relevant: Complete haemogram, Peripheral smear, Serum iron, Total iron binding capacity (TIBC), Transferrin saturation, Stool for occult blood, Reticulocyte count, oesophagogastroduodenoscopy (OGD scopy), ultrasonogram of abdomen. Haematological analysis was done by automated-SLS-Hb method using SYSMEX XN-1000 autoanalyzer.

A total of 151 patients were enrolled after obtaining informed consent. The patients were divided into age groups 40-49, 50-59, 60-69, 70-79 and 80-89. The type of anaemia, severity of anaemia and associated co morbidities were documented. The results were analysed.

Statistical Analysis

Statistical testing was conducted with the statistical package for the social science system version SPSS 17.0. Data was presented as mean ± SD, frequencies and percentages. Descriptive statistics were elaborated in the form of means and standard deviations for continuous variables and frequencies and percentages for categorical variables. Group comparisons were made using independent sample t-test for continuously distributed data and chi-squared test for categorical data. Pearson's correlation coefficient was used to explore linear correlation between two continuous variables. Appropriate non-parametric tests were used for non-normally distributed data. Level of significance was taken as $p < 0.05$.

RESULTS

44.4% of the patients were male and remaining 55.6% were females. (Table 2) 59.6% of patients had normocytic normochromic anaemia and 37.1% had microcytic hypochromic anaemia. 64.9% had moderate anaemia, 31.8% had severe anaemia and 3.3% had mild anaemia. Diabetes mellitus was present in 49.7% of the patients, systemic hypertension in 41.7%, chronic kidney disease in 31.1%, coronary artery disease in 33.1% and chronic liver disease in 7.9%. Some patients had more than one co-morbidity. As seen in Table 3, microcytic hypochromic anaemia was significantly higher in females when compared to males although normocytic normochromic anaemia was the predominant type of anaemia. Only 7.5% of study population had mild anaemia. Majority had moderate anaemia, 62.7% among males and 66.7% among females.

Both CKD (p=0.011) and CLD (p<0.001) were significantly higher in males compared to females.

As seen in Table 4, the difference between various age groups who had Type 2 diabetes mellitus and anaemia was statistically significant (p<0.001) with 60-69 age group having a maximum incidence of 68.6% versus a minimum incidence of 23.3% in 40-49 years The difference between various age groups who had systemic hypertension and anaemia was statistically significant (p=0.001) with 80-89 age group having a maximum incidence of 66.7% versus a minimum incidence of 20.9% in 40-49 years. The difference between various age groups and type of anaemia was statistically significant (p < 0.001) as seen in Table 5.

Socio-Demographic and Clinical Parameters	Mean ± SD/ N (%)
Age	
40-49 Years	43 (28.5%)
50-59 Years	39 (25.8%)
60-69 Years	35 (23.2%)
70-79 Years	28 (18.5%)
80-89 Years	6 (4.0%)
Gender	
Male	67 (44.4%)
Female	84 (55.6%)
Type of Anaemia	
Normocytic Normochromic Anaemia	90 (59.6%)
Microcytic Hypochromic Anaemia	56 (37.1%)
Severity	
Mild	5 (3.3%)
Moderate	98 (64.9%)
Severe	48 (31.8%)
Type-2 DM	75 (49.7%)
Systemic Hypertension	63 (41.7%)
CKD	47 (31.1%)
Coronary Artery Disease (CAD)	50 (33.1%)
Chronic Liver Disease (CLD)	12 (7.9%)

Table 2. Summary of Socio-Demographic and Clinical Parameters

Parameters	Male (n= 67)	Female (n= 84)	P
Type of Anaemia* **			0.014[1]
Normocytic Normochromic	46 (68.7%)	44 (52.4%)	
Microcytic Hypochromic	17 (25.4%)	39 (46.4%)	
Severity of Anaemia* **			0.041[2]
Mild	5 (7.5%)	0 (0.0%)	
Moderate	42 (62.7%)	56 (66.7%)	
Severe	20 (29.9%)	28 (33.3%)	
Type-2 DM	34 (50.7%)	41 (48.8%)	0.813[1]
Systemic Hypertension	28 (41.8%)	35 (41.7%)	0.988[1]
CKD* **	28 (41.8%)	19 (22.6%)	0.011[1]
CAD	20 (29.9%)	30 (35.7%)	0.447[1]
CLD* **	11 (16.4%)	1 (1.2%)	<0.001[1]

Table 3. Association between Gender and Parameters

***Significant at p<0.05, 1: Chi-Squared Test, 2: Fisher's Exact Test

Microcytic hypochromic anaemia was the major type of anaemia in younger individuals with 60.5% incidence in 40 - 49 years age group while above 50 years normocytic normochromic anaemia was the predominant type of anaemia.

From Table 5, it can be seen that 59.6% had normocytic normochromic anaemia and 37.1% had microcytic hypochromic anaemia. Apart from these, macrocytic anaemia was seen in 2 patients (1.3%). There was one case each of dimorphic anaemia, pancytopenia with dimorphic anaemia, pancytopenia with macrocytic anaemia. One patient with severe microcytic hypochromic anaemia had basophilic stippling and was diagnosed with lead poisoning.

DISCUSSION

In a 2005 map of the world showing prevalence of anaemia, India was one of the countries with severe anaemia (≥ 40%) while the USA was a region of mild prevalence.[4] A more recent population-representative data showed that in 2011, prevalence of anaemia was highest in South Asia and central and west Africa.[5] Even in the USA, more recent data states that prevalence of anaemia has increased, with large racial and age-wise differences.[6]

It is therefore not surprising that anaemia has been shown to be a common co morbidity in patients admitted to the medical wards.[7] In view of this, we aimed to study the types of anaemia and associated co morbidities among inpatients in a university hospital in South India. In a study of hospitalized elderly patients, Nathavitharana et al showed that anaemia was more prevalent in patients aged 65 and more as compared to younger patients. Anaemia was linked with increased length of hospitalization, mortality and hospital readmission[8] in their study. In present study, patients younger than 60 were more in number (54.30%). Many adult anaemia studies have been conducted in over 60 or 65 age groups. Present study had a large number of patients from 50 years onwards. This reflects a field study from rural Haryana where anaemia was found to be positively associated with males of age more than 50 years.[9]

Parameters	Age: 40-49 Years (n = 43)	Age: 50-59 Years (n = 39)	Age: 60-69 Years (n = 35)	Age: 70-79 Years (n = 28)	Age: 80-89 Years (n = 6)	P Value
Severity						0.086[2]
Mild	1 (2.3%)	0 (0.0%)	1 (2.9%)	2 (7.1%)	1 (16.7%)	
Moderate	22 (51.2%)	27 (69.2%)	27 (77.1%)	18 (64.3%)	4 (66.7%)	
Severe	20 (46.5%)	12 (30.8%)	7 (20.0%)	8 (28.6%)	1 (16.7%)	
Type-2 DM**	10 (23.3%)	24 (61.5%)	24 (68.6%)	13 (46.4%)	4 (66.7%)	<0.0011
Systemic Hypertension***	9 (20.9%)	21 (53.8%)	21 (60.0%)	8 (28.6%)	4 (66.7%)	0.0011
CKD	7 (16.3%)	15 (38.5%)	10 (28.6%)	12 (42.9%)	3 (50.0%)	0.0811
CAD	12 (27.9%)	15 (38.5%)	13 (37.1%)	8 (28.6%)	2 (33.3%)	0.8181
CLD	6 (14.0%)	2 (5.1%)	4 (11.4%)	0 (0.0%)	0 (0.0%)	0.2132

Table 4. Association between Age and Parameters

***Significant at p<0.05, 1: Chi-Squared Test, 2: Fisher's Exact Test

Type of Anaemia	Age (n %)						Chi-Square Test	
	40-49 Years	50-59 Years	60-69 Years	70-79 Years	80-89 Years	Total	X^2	P Value
Normocytic Normochromic Anaemia	14 (35.0)	26 (70.3)	25 (71.4)	19 (67.9)	6 (100.0)	90 (59.6)	18.782	<0.001
Microcytic Hypochromic Anaemia	26 (65.0)	11 (29.7)	10 (28.6)	9 (32.1)	0 (0.0)	56 (37.1)		

Type of Anaemia	Age (n %)						Chi-Square Test	
	40-49 Years	50-59 Years	60-69 Years	70-79 Years	80-89 Years	Total	X^2	P Value
Total	40 (100.0)	37 (100.0)	35 (100.0)	28 (100.0)	6 (100.0)	146 (100.0)		

Table 5. Association between Age and Type of Anaemia (n = 146)

Table 3 shows that there was a statistically significant difference between different age groups and type of anaemia ($p < 0.001$). Normocytic anaemia was predominant (59.6%) in our study. This is similar to a study conducted by Bhasin et al (2011) in which normocytic anaemia was present in 62% of elderly hospitalised patients in South India.[10] Bahadur et al found that among male adult blood donors, normocytic normochromic anaemia was predominant.[11] On the other hand, in an epidemiological study conducted in Andhra Pradesh, Alvarez-Uria et al found that microcytic anaemia was the commonest type of anaemia. However, the percentage of normocytic anaemia increased with age.[12]

In our study, no females and only 7.5% of males were found to have mild anaemia. As this was a hospital-based study, only those with more severe anaemia may have sought medical attention. There was no significant difference in moderate and severe anaemia among men and women. Among women, 46.4% had microcytic anaemia, while only 25.4% of men had microcytic anaemia. This was significant (p value = 0.014) table 2. In the age group 40-49 years, the predominant anaemia was microcytic hypochromic 65.0% vs normocytic 35.0%. This could be explained by inclusion of women from the age of 40.

Association with Comorbidities

Since anaemia is highly prevalent in India and the prevalence among adults is also high, it is to be expected that it is associated with multiple comorbidities. This was found to be the case in an epidemiological survey from Haryana in which 27.2% reported presence of co morbidity (renal disorder, liver disorder, malignancy or bleeding per rectum).[9]

In present study, Type 2 diabetes mellitus (DM) was associated with anaemia in 49.7% of cases which was significant. (p value <0.001). Association of Type 2 diabetes with anaemia has been studied. The prevalence of anaemia in patients with diabetes was estimated to be approximately 18% in India.[13,14] Studies have shown that anaemia in diabetes has been associated with both increased and decreased erythropoietin levels. Barbieri et al (2015) attributed normochromic anaemia in diabetic patients to hyperglycaemic state itself.[15] It is postulated that hyperglycaemia and Type 2 DM are associated with increased expression of cytokines like IL-6, which reduce sensitivity of erythroid precursor cells to erythropoietin. Anaemia in Type 2 DM can be found before nephropathy develops. In present study, 61.5% of patients in 50-59 age group and 68.6% of those in 60-69 age group had diabetes mellitus and anaemia. This has an implication for increased morbidity in diabetic patients. Sahay et al state that identification and treatment of anaemia with appropriate medications in patients with diabetes is important to reduce adverse outcomes.[16]

Systemic hypertension was found in 41.7% of individuals. This may be due to increased prevalence of hypertension in patients with chronic kidney disease. Atsma et al found that increased haemoglobin level was associated with systemic hypertension.[17] This is in contrast to our study where anaemia was found to be significantly associated with systemic hypertension (p value = 0.001). There was no significant difference between the genders.

Significantly more men had association with chronic kidney disease than women (41.8% vs 22.6%) (P value = 0.011). One hospital-based study from South India studied 100 patients over 60 years of age with anaemia and found that the commonest cause of anaemia was renal failure and the commonest type of anaemia was normocytic anaemia (9). Many studies indicate that there is a renal function threshold below which the risk of anaemia increases, but the threshold value varies between studies, ranging from 30 mL/min to 60 mL/min.[18,19,20,21]

16.4% of men had associated chronic liver disease (CLD) and anaemia compared to 1.2% of women. This value was statistically significant. These numbers reflect the preponderance of alcoholic liver disease in men. The common causes of anaemia in CLD patients are upper gastrointestinal (UGI) bleeding, hypersplenism due to portal hypertension, malabsorption due to alcohol intake and side effect of drugs. But in current study all the cases of CLD presented with UGI bleed.[22]

Coronary artery disease (CAD) was associated with anaemia in 33.1% of patients in our study. Chronic anaemia has a complex relationship with CAD. Though initially it increases cardiac output, later on it may lead to adverse cardiac remodelling.[23] Arora et al showed prevalence of anaemia in 76.6% of patients with congestive heart failure.[24] Anaemia is a significant risk factor in patients with CHF. De Franceschi et al have shown that the prevalence of anaemia increases with heart failure severity, due to various mechanisms like: (i) worsening chronic inflammatory state (ii) anorexia (iii) GI mucosal oedema and decreased gastric and intestinal motility (iv) decreased mesenteric blood flow and (v) frequent blood tests.[25] Presence of anaemia with heart failure is associated with increased rates of hospitalization, more symptoms and increased mortality.[26]

CONCLUSIONS

There is an age-related association of anaemia among adult males and females above 40 years of age. There appears to be an association with chronic diseases like diabetes and systemic hypertension. Normocytic anaemia is the commonest anaemia in adults more than 50 years of age

admitted in the medical wards. There is therefore a need for more studies on anaemia in adults in India where anaemia has a high prevalence.

Limitations

This was a hospital based study; so, prevalence could not be studied. Important parameters like serum ferritin were not measured as many patients were not willing for additional investigations. Since there was no follow-up, the true effect of anaemia on morbidity or mortality could not be determined.

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