

Evaluation of anaemia in geriatric patients: a retrospective hospital based study from Northern Sri Lanka

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Abstract

Background:

Anaemia in elderly is a common medical problem but it is often not evaluated as a sole clinical entity and the importance of anaemia is often neglected. The gravity of anaemia in elders and its impact on other diseases is not well known in Sri Lanka.

Methods:

It is a cross sectional descriptive study where data was extracted retrospectively from the data base and clinical records of patients who were referred to haematology unit of Teaching Hospital Jaffna, Sri Lanka for the evaluation of anaemia during September 2020 to February 2021. Common type of anaemia, severity, aetiological classifications and association with other diseases were analysed.

Results:

A total of 1121 elderly patients of above 60 years were analysed during the study period. Main source of referral was from medical wards. Female to male ratio was 51.2:48.8. Majority of them belonged to the age group of 60-69 years. Two third of the patients had normocytic anaemia (70.3%) followed by microcytic and macrocytic anaemia (23.7%). Moderate degree of anaemia was seen commonly in the patient's analysed but 28.3% found to have severe anaemia. Aetiological classification revealed anaemia of chronic diseases as the commonest type of anaemia in elderly accounting for 37% followed by multifactorial aetiology and iron deficiency anaemia. Common chronic diseases identified along with anaemia were diabetes, hypertension, ischaemic heart disease and chronic kidney disease.

Conclusion:

Normocytic anaemia is the commonest type of anaemia identified in this hospital based study and majority had a moderate degree of anaemia. Though the common aetiological cause identified is anaemia of chronic disease, there are significant percentage of multifactorial causes identified indicating a search of many possible causes are needed in elderly patients with anaemia. Identifying the prevalence of anaemia in all hospitalised elderly patients in the local setting, the causes and the impact on chronic and acute illnesses will immensely help in the management of elderly patients and to improve their quality of life.

Introduction

Anaemia in elderly, being one of the common medical problem in clinical practice, often goes unnoticed unless it is severe or causes deterioration in the underlying medical condition[1]. Elders have many physiological changes which goes blunted with aging and makes the clinical presentation of anaemia atypical and unnoticed[2]. Also to note that the onset of anaemia is often insidious so that the patients adjust their activities according to their symptoms and adopt to the clinical deterioration [3, 4].

Prevalence of anaemia in elderly population is higher in developing countries ranging between 20.6%-49.5% [5]. The accurate prevalence of anaemia in elderly in developing countries in hospitals and community is not very well studied.

Any degree of anaemia whether mild or severe can cause significant impact on the underlying comorbidity and cause decompensation with increased morbidity and mortality. It also causes a significant effect on quality of life [6, 7].

Many studies have shown that there are many adverse clinical outcomes associated with anaemia namely hospitalization, disability, morbidity and mortality, decline in physical performance and impact in quality of life [2, 8–14]. The mortality is high among patients with IHD, heart failure and chronic kidney disease [15, 16].

Anaemia in elderly has many underlying aetiologies. The common being the anaemia of chronic disease or inflammation and nutritional deficiency. However in many patients more than one aetiology can be identified and in some, the aetiology can still be unexplained [17]

Anaemia can be easily diagnosed and reversed and it plays an important role in improving the quality of life. The correct treatment of anaemia starts from adequate diagnosis and recognizing the underlying condition [18]. The understanding the importance of clinical assessment of anaemia per se in elderly and requesting appropriate laboratory and other investigations by clinician is an essential component in the management. Identifying the type of anaemia, aetiology and associated comorbidities will help immensely in the management of elderly with significant improvement of quality of life and morbidity and mortality.

Though the anaemia in elderly is very common in clinical practice, there is no research carried out to identify the types, aetiology and common comorbidities in the local settings and there is no published data available in Sri Lanka to date. Hence this retrospective study was initiated at haematology department of Teaching Hospital Jaffna to understand the anaemia in elderly and its types and the associated comorbidities.

Methods And Material

Study design and study settings

This was a cross sectional descriptive study and data was extracted retrospectively from the database and clinical records of patients who were referred to Haematology Unit of Teaching Hospital Jaffna for evaluation of anaemia during the study period.

Study population, Sample size and Sampling Technique

The study included all the patients above 60 years of age who underwent haematological examination for anaemia over a period of 6 months (1st September 2020 to 28th of February 2021) at haematology

unit, Teaching hospital, Jaffna.

To the best of our knowledge there were no studies published on pattern of anemia among geriatric population in Sri Lanka even though few general population prevalence studies were done. As our main objective is to identify the common hematological patterns of anemia we used the proportion identified in a study from India (normocytic anemia in 53.3% of patients followed by microcytic anemia (40%) and macrocytic anemia (6.6%) [19]. In order to capture maximum sample size, sample size was calculated using each of above percentage separately and maximum number was taken for our study.

The sample size was estimated using estimate a proportion formula [20]

$$n = z^2 \times P(1-P) / d^2$$

z -value at the confidence level = 95% is 1.96

Acceptable difference (d) = 0.05(5%)

Proportion	Estimated Sample size	Sample size C.I. up to 0.10 wide
53.3%	369	403
40.0%	383	403
6.6%	95	185

A sample size of 403 will yield a C.I. up to 0.10 wide for all the proportion mentioned above. So sample size was determined as 403.

Exclusion criteria: None

Ethical Approval: Ethical approval for this study was obtained from the Ethical Review Committee, Faculty of Medicine of University of Jaffna (Ref No: J/ERC/20/120/NDR/0239)

Sampling and recruitment procedure: There was no sampling technique applied and we collected data from all the patients' records during the period and we were able to collect 1121 patients' details for this study.

Data collection: Data were collected using data extraction sheets from the haematology record sheets of all anemia patients meeting the inclusion criteria maintained at haematology unit and collected by a trained data collector who was a medical officer working in the haematology unit and also one of the co-investigator. Data were extracted from the record sheets maintained at haematology unit, Teaching Hospital Jaffna.

For the diagnosis of anaemia WHO classification is used. Haemoglobin <13g/dl in men and <12g/dl in women is classified as anaemia. It is further classified in to mild, moderate and severe based on the

degree of anaemia[21].

The diagnosis of different types of anaemia is based on following criteria and is concluded by the Consultant Haematologists

1. Anaemia of chronic disorders

The anaemia of chronic disease (ACD) is a common normochromic or mildly hypochromic anaemia that occurs in patients with a systemic disease

Diagnosis

- Presence of systemic disorder included in the following list
- Mean corpuscular volume normal or mildly reduced (usually 77–82 fL)
- Mean corpuscular hemoglobin usually normal; occasionally reduced
- Serum iron reduced
- Total iron-binding capacity (transferrin) reduced
- Transferrin saturation mildly reduced
- Serum ferritin normal or increased
- C-reactive protein usually raised
- Erythrocyte sedimentation rate usually raised
- Associated Conditions

Chronic infections

Especially osteomyelitis, bacterial endocarditis, tuberculosis, abscesses, bronchiectasis, chronic urinary tract infections, osteomyelitis, HIV

Other chronic inflammatory disorders

Rheumatoid arthritis, juvenile rheumatoid arthritis, polymyalgia rheumatica, systemic lupus erythematosus, scleroderma, inflammatory bowel diseases, thrombophlebitis, severe trauma

Malignant diseases

Carcinoma (especially metastatic or associated with infection)

Others

Congestive heart failure, ischemic heart disease, AIDS

2.Iron Deficiency Anaemia(IDA)

Clinical History

Blood picture findings

Serum Ferritin < 30µg/L

Transferrin Saturation<16%

3.B12/Folate Deficiency

Clinical history (Vegetarian)

Blood Picture findings

Response to B12 Trial

4. Mixed deficiency

Clinical history

Normocytic normochromic anaemia with low serum Ferritin

Combined morphological features of Vitamin B12/Folate deficiency and Iron deficiency on blood picture

5. Autoimmune Hemolytic anaemias

Clinical history

Blood picture findings

Elevated reticulocyte count

Elevated indirect bilirubin

Elevated LDH

Direct coombs test -positive

6.Non-Immune Hemolytic anemia

Clinical History

Blood picture findings

Elevated Reticulocyte count

Elevated Indirect Bilirubin

Elevated LDH

Direct coombs test -Negative

7. Anemia Associated with Hypothyroidism

Anemia with no other cause

Thyroid function tests – Suggestive of Hypothyroidism (High TSH)

8. Anaemia of renal disease

Anaemia with no other identifiable cause

Diagnosed chronic kidney disease

9. Haematological malignancy.

Anaemia without any identifiable cause

Presence of diagnosis of a haematological malignancy (Acute Leukaemia /Multiple Myeloma /Lymphoma /Myeloproliferative neoplasm) based on blood picture and bone marrow biopsy

10. Anemia of acute blood loss

Anaemia with no other obvious cause

History of recent blood loss

Reticulocytosis without indirect bilirubinemia

11. Anemia of acute illness

Anaemia without obvious cause (Especially no obvious bleeding or hemolysis)

Admitted with acute /critical illness at ward setting /ICU for less than 1 week duration.

12. ACD + IDA

Fulfills the criteria for both anaemia of chronic disorders and iron deficiency anaemia

13. Multifactorial

Meeting more than one criteria mentioned above other than ACD+IDA

Data analysis

Data were analyzed using a recommended statistical package (SPSS version 28.0). Quantitative variable were expressed as percentage with CI and also mean values were calculated with SD for numeric variable. Chi squared test is used to identify association, P value <0.05 is considered as statistically significant. Results are summarized in tables and figures.

Results

Present study retrospectively examined 1121 records of the patients who were referred to haematological department of Teaching hospital Jaffna for the investigation of anaemia for the period of six months (between November 2020 to May 2021). Most of the patients were referred from medical wards (79.1%). Further 7.85% of patients were referred from surgical wards and only 7 patients (0.62%) were referred from Gynaecological wards even though around half of the patients (574) were females. Remaining 12.4% of the patients were referred from other wards such as orthopaedic, cardiac and other subspecialty wards. Background characteristics of patients is summarized in **Table 1**.

Table1: Background Characteristics of elderly patients with anaemia (N=1121)

Variable	Categories	No	Percentage
Age	60-69Years	491	43.8
	70-79Years	473	42.2
	Age80 and above	157	14.0
Sex	Male	547	48.8
	Female	574	51.2
Marital Status	Married	1081	96.4
	Single	20	1.8
	Widowed	20	1.8
Smoking Status	Yes	202	18.0
	No	919	82.0
Alcohol Status	Yes	225	20.1
	No	896	79.9
Vegetarian Status	Yes	238	21.8
	No	883	78.8

Mean age of the patients was 71.33±6.99 with minimum age 61 to maximum age 99. Majority of them belong to age 60-69 group (43.8%) followed by 70-79 age group (42.2%) and 14.0% belongs to age 80 and above. Female participants were slightly higher (51.2%) compared to males (48.8%) and majority

were married (96.4%). Two hundred and two (18.0%) were smokers and 20.1% reported consuming alcohol. Further 21.8% were vegetarian. Mean Hb of the 1121 patients was 8.88±1.95 with minimum 2 to maximum 12.9g/dl

As shown in **Table 2** males were more in age 60-69 category (45.1%) compared to females (42.4%) and in age group 70-79 similar observation was noted. But in age 80 and above group females were high (17.0%) compared to males (11.1%).

Table 2: Distribution of study subjects according to their age and sex

Categories	Sex		Total
	Male	Female	
Age group			
60-69Years	259(45.1%)	232(42.4%)	491(43.8%)
70-79years	251(43.7%)	222(40.6%)	473(42.2%)
80andabove	64(11.1%)	93(17.0%)	157(14.0%)
Total	574(100.0%)	547(100.0%)	1121(100.0%)

Comorbidities among participants:

Common comorbidities observed among elderly patient with anaemia in descending order are hypertension (48.7%), diabetes mellitus(44.2%), ischaemic heart disease(20.3%), Chronic Kidney Disease (CKD) (11.4%), bronchial asthma(9.4%), dyslipidaemia (6.5%), hypothyroidism (6.2%) and cerebrovascular disease(6.1%) (**Table 3**). Among the patients with CKD, five are in stage- 3a(0.4%), another 29 of them (2.6%) in stage 3b, further 47(4.2%) in stage 4 and 42 are in stage 5. In addition malignancies were identified among 37 patients (3.3%), chronic liver cell diseases(CLCD), rheumatoid arthritis(RA), peptic ulcer disease/GORD and epilepsy were found in 2.0%, 3.0%, 2.6% and 1.5% of them respectively. Tuberculosis was reported among 1.5%. Finally 13 patients (1.3%) had psychiatric illnesses and 2 identified as suffering from dementia. Furthermore, proportion of patients having COPD, RA and hypothyroidism significantly varied between male and female sex($P < 0.05$). While hypothyroidism and RA were common among females, COPD was more common among males. While 6.2% males had COPD, only 1% of females suffered from COPD($P < 0.001$). One hundred and ninety five(17.4%) males revealed smoking while only seven (0.62%) females reported smoking ($P < 0.001$).

Table 3: Distribution of Co-morbidities among participants by sex (n-1121)

Co-Morbidities	Male	Female	Statistics(Chi Square, P value)	Total(No;%;95%CI)
Diabetes Mellitus	233(42.6%)	263(45.8%)	1.179;0.278	496(44.2%;41.4-47.2)
Hypertension	256(46.8%)	290(50.5%)	1.553;0.213	546(48.7%;45.8-51.6)
Ischaemic Heart Disease	118(21.6%)	110(19.2%)	1.003;0.317	228(20.3%;18.1-22.8)
Cerebrovascular Accident	41(7.5%)	27(4.7%)	3.831;0.05*	68(6.1%;4.8-7.6)
BA(Bronchial Asthma)	49(9.0%)	56(9.8%)	0.210;0.647	105(9.4%;7.8-11.2)
COPD	34(6.2%)	6(1.0%)	21.761;<0.001***	40(3.6%;2.6-4.8)
Rheumatoid Arthritis	6(1.1%)	28(4.9%)	13.616;<0.001***	34(3.0%;2.1-4.2)
Peptic Ulcer Disease	11(2.0%)	18(3.1%)	1.406;0.236	29(2.6%;1.8-3.6)
CKD	71(13.0%)	57(9.9%)	2.575;0.109	128(11.4%;9.7-13.4)
Hypothyroidism	17(3.1%)	52(9.1%)	17.174;<0.001***	69(6.2%;4.9-7.7)
Malignancies	17(3.1%)	20(3.5%)	0.124;0.724	37(3.3%;2.4-4.5)
Dyslipidaemia	34(6.2%)	59(10.3%)	6.078;0.014**	72(6.5%;5.1-8.0)
Epilepsy	10(1.8%)	7(1.2%)	0.695;0.405	17(1.5%;0.9-2.4)
Psychiatric illness	6(1.1%)	7(1.2%)	0.037;0.848	13(1.2%;0.6-1.9)
Tuberculosis	12(2.2%)	5(0.95)	3.281;0.07	17(1.5%;0.9-2.4)
CLCD	13(2.3%)	9(1.6%)	0.559;0.455	22(2.0%;1.3-2.9)
Dementia	1(0.2%)	1(0.2%)	0.001;0.973	2(0.2%0.000-0.006)

Bleeding History and blood transfusion

Out of 1121 patients analysed 112 patients reported bleeding history (10%). Similarly 186 patients had reported blood transfusion(16.6%) among them 106 (9.5%) had blood transfusion within three months. Among the patients with bleeding history, 40 patients had blood transfusion (36.6%) while among 935 patients without bleeding history only 15.6% had blood transfusion. This results is statistically significant (**P<0.001**).

Table 4: Common relevant medication usage among elderly with anaemia

Medication	Number	Percentage (%)
Aspirin	285	25.4(22.9-28.0)
Clopidogrel	174	15.5(13.5-17.7)
NSAIDs	16	1.4(0.8-2.3)
Iron Tablets	64	5.7(4.5-7.2)
B12	17	1.5(0.9-2.3)
Folate	62	5.5(4.3-7.0)
Metformin	213	19.0(16.8-21.4)
PPI(Proton Pump Inhibitor)	136	12.1(10.3-14.1)
Methotrexate	11	1.0((0.5-1.7)
Anti-epileptics	19	1.7(1.1-2.6)

This study also examined the common medications linked to anaemia and results were summarized in **Table 4**. Two hundred and eighty five patients reported taking aspirin (25.4%) and further 15.5% reported they were on clopidogrel. Further analysis with bleeding history and aspirin intake revealed among 285 patients who were taking aspirin, only 6.7% reported bleeding while among 836 patients who were not taking aspirin 11.1% reported bleeding (P=0.03). Further 19.0% reported taking metformin and another 12.2% reported as being on PPIs.

Patterns, severity and aetiology of anaemia:

Majority of the participants (70.3%) had normocytic anaemia based on the MCV as shown in **Table 5** while 23.7% had microcytic anaemia and only 6.0% had macrocytic anaemia.

Table 5: Patterns of anaemia based on MCV

Type of Anaemia	Number	Percentage with CI
MCV<80 (Microcytic Anaemia)	266	23.7% (95%CI:21.3-26.3)
MCV=80-100(Normocytic Anaemia)	788	70.3%(95%CI:67.6-72.9)
MCV>100(Macrocytic Anaemia)	67	6.0%(95%CI:4.7-7.7)

Majority of them (**56.65%CI: 53.7-59.5**) had moderate level of anaemia (based on Hb (g/dL)-8.0-10.9) and another 28.28% (**CI: 25.7-31.0**) had severe anaemia (<8g/dL). One hundred and sixty nine patients (**15.08%CI-13.1-17.3**) had mild deficiency (>11.00-11.9/12.0g/dL) **[Figure 1]**.

Aetiological causes of anaemia among 1121 elders were summarized in **Table 6** in descending order of proportion. Common cause for anaemia was chronic disorders (ACD) (37.0%) followed by multifactorial

(15.1%), IDA (9.0%), anaemia of renal disease (8.2%), mixed deficiency anaemia (7.1%), B12/folate deficiency(6.4%) and haematological malignancy(3.2%).

Iron deficiency Anaemia

101 patients had iron deficiency anaemia and it is the 3rd common cause for the anaemia and second common single cause in the study population. There is no sex difference observed among the iron deficiency anaemia (Females 9.1% vs. males 9.0%; P=0.953). Similarly no differences observed between vegetarian and non-vegetarians (P=0.380). Among the 101 who had iron deficiency as sole aetiological cause, 14.9% had bleeding history while 1020 who had other forms of anaemia only 9.5% had bleeding history (P=0.08). Further among 101 patients with sole iron deficiency anaemia 79.2% had normal reticulocytes count, 17.8% had high count and another 3.0 % had low reticulocyte count(P=0.024). Among the 101 patients 94.1% had microcytic anaemia and 5.9% had normocytic anaemia.

Table 6: Aetiological classification of anaemia among the 1121 elderly patients

Diagnosis	Number	Percentage with CI
Anaemia of chronic disorders (ACD)	415	37.0(34.2-39.9)
Multifactorial	169	15.1(13.1-17.3)
Iron Deficiency Anemia (IDA)	101	9.0(7.4-10.8)
Anemia of Renal disease	92	8.2(6.7-9.9)
Mixed deficiency anaemia	80	7.1(5.7-8.8)
B12/folate deficiency	74	6.6(5.3-8.2)
Hematological malignancy	36	3.2(2.3-4.4)
Non Immune hemolytic anemia	33	2.9(2.1-4.1)
Anemia of acute illness	31	2.8(1.9-3.9)
Anemia of Acute blood loss	31	2.8(1.9-3.9)
Anemia associated with Hypothyroidism	7	0.6(0.3-1.3)
Others	7	0.6(0.3-1.3)
Autoimmune Hemolytic anemia	5	0.4(0.2-1.0)

*Others- Diagnosis not confirmed

B12 deficiency and anaemia

Seventy four patients had B12 deficiency anaemia as a sole cause for anaemia (6.6%) and 50% of them had macrocytic anaemia and another 50% had normocytic anaemia. Among 74 patients who had B12 deficiency anaemia 48.6 % were vegetarian while among 1047 patients who did not have B12 deficiency only 19.3 % were vegetarian (P<0.001). Among the patients with B12 deficiency 54.1% are males and 45.9% are females (P=0.349).

Anaemia of Chronic Disease:

Common aetiological cause among 1121 elderly patients was ACD (37.0%). Further sub analysis of ACD revealed DM was common (46.8%) cause for ACD followed by IHD (18.6%), RA (4.6%) and non-haematological malignancies identified in 17 patients (4.1%) (**Table 7**). Majority showed normocytic picture (86.3%) followed by microcytic picture (12.5%) and macrocytic (1.2%). 38.9% of females had ACD while 35.1% males had ACD and this result is not statistically significant (P=0.194).

Table 7: Distribution of patients as per underlying aetiology in anaemia of chronic disease

Disease	Number	Percentage
Diabetes Mellitus	194	46.8%
IHD	77	18.6%
RA	19	4.6%
Non Haematological malignancies	17	4.1%
COPD	12	2.9%
Chronic wound	8	1.9%
Bronchiectasis	8	1.9%
Tuberculosis	6	1.4%
HIV	3	0.7%
HTN	1	0.2%
Others	70	16.9%

*Others includes missing data as well

Anaemia with Multifactorial aetiology

Sub analysis of anaemia due to multifactorial aetiologies showed ACD with IDA is the common (34.9%) among multifactorial aetiologies followed by ACD with renal failure (17.1%) and ACD with acute illness (10.6%) as shown in **Table 8**.

Table 8: Distribution of patients as per underlying causes in anaemia with multifactorial aetiology patients (n-169).

Cause	Number	Percentage
ACD + Acute blood loss	10	5.9
ACD+B12 Deficiency	5	3.0
ACD+IDA	59	34.9
ACD+ Acute illness	18	10.6
ACD+ Mixed deficiency	11	6.5
ACD+ Renal failure	29	17.1
IDA+ Acute Blood Loss	6	3.6
Liver Disease +Acute Blood loss	1	0.6
Others	30	17.8

Discussion

A huge burden of anaemia in elderly is seen in many developing countries with very high prevalence in Africa and South East Asia (21). Sri Lanka, being a South Asian country is not an exception to this, however lack exact data on anaemia in elderly. A good health standards has led to rise in elderly population surviving with many comorbidities. Thus anaemia, being common with many chronic illnesses increases exponentially causing significant morbidity and mortality [1].

Anaemia in hospitalised elderly patients is a critical clinical problem and often multifactorial [4, 22]. Often anaemia in hospitalised patients are complicated with acute illnesses and will not truly reflect the anaemia prevalence in the community. There are no major studies done in anaemia in hospitalised patients in Sri Lanka.

A study done in North India found that mean age of patients with anaemia was 68.1+7.8 years, male to female ratio 1.6:1 and mean value of Hb 8.8+2.3g/dl,(19). Many other studies also found that men have a higher prevalence of anaemia than women in elderly(23). In comparison our study population revealed the mean age of 71.3 years with a slight female predominance. The majority is in the 60-69 years and 70-79 years age group with slight male predominance. However females are more affected in the age group >80 years.

The common pattern of anaemia based on RBC morphological features in our study is normocytic anaemia(70.3%) followed by microcytic anaemia(23.7%) and macrocytic anaemia(6.0%). This is in keeping with studies done in other countries[2,10,24,25] where normocytic anaemia is identified as the

common cause of anaemia in hospitalised elderly patients. However the percentage of normocytic anaemia is significantly higher in our study population.

The severity of identified anaemia is mainly moderate level (56.65%), followed by severe anaemia (28.8%) in our study. A study done in Tanzania revealed that more than two third of the participants were having either moderate or severe anaemia[6].However there are contrasting results in other studies where mild anaemia is mainly identified in elderly population[2,5,17]. Studies done in community and elders home revealed mild anaemia as the commonest type of anaemia [26-28].As our study included the patients who were referred for haematological evaluation, there is a high possibility that mild cases of anaemia were not referred or evaluated in the general wards as it was deemed that it is not significantly affecting the clinical picture. However it is shown that even a mild degree of anaemia can compromise patients' well-being and survival regardless of the cause and need evaluation.

A significant number of patients who had blood transfusion within three months had a bleeding history indicating the severity of the anaemia due to bleeding. Also to note that the common medication usage among the elderly patients with anaemia are aspirin, metformin, clopidogrel and PPI in our study. However the high percentage of non-communicable diseases notably DM, hypertension and IHD in the study population will justify these medication usage. Our analysis also revealed among patients using aspirin, only 6.7% reported bleeding while bleeding history was noted in 11.1% of non aspirin users. This finding is in line with a previous study where they found anaemia was 42% less common among aspirin users [29] but in contrast in a clinical trial conducted among elderly patients from Australia and US reported the use of low-dose aspirin for primary prevention resulted in a significantly higher risk of major haemorrhage and did not lower risk of cardiovascular events significantly [30]. Further whether this is a causal or a causal link with anaemia in the elderly needs a thorough evaluation by further studies.

The aetiological classification of anaemia is done in our study based on the criteria mentioned in the methodology. This is done with the available resources in this part of the country. As in other studies Anaemia of Chronic Disease(37%) is the most common type identified in the hospitalised elderly patients followed by anaemia due to multifactorial causes and IDA[24,25].The common aetiologies identified in the multifactorial causes are IDA, CKD, acute illnesses etc in addition to ACD. Anaemia of renal disease is classified separately as other than the mechanisms due to chronic disease, several other factors contribute to the development of anaemia in CKD. **Table 9** compares the common aetiological causes between studies from developing countries and developed countries with our current study where it is shown that we have more patients with anaemia of chronic diseases and multifactorial causes when compared to other developing countries. Of the chronic diseases DM is the commonly associated (46.8%) disease followed by IHD which is in keeping with the higher prevalence of these non-communicable diseases in our part of the world.

Table 9: Comparison of common aetiological causes between studies from developing countries and developed countries with current study

Diagnosis	Current study % with CI	In Developing countries % with CI	In Developed Countries % with CI
Anaemia of chronic disorders (ACD)	37.0(34.2-39.9)	22.9%(15.6-31.6) ^[19]	36.5% (32.1-41.2%) ^[31]
Multifactorial	15.1(13.1-17.3)	7.6%(3.6-14.0) ^[19]	28.1% (24.0%-32.4%) ^[31]
Iron Deficiency Anemia (IDA)	9.0(7.4-10.8)	24.8%(17.2-33.8) ^[19]	4.6%(2.5-7.9) ^[32]
Anemia of Renal disease	8.2(6.7-9.9)	12.4%(7.1-19.8) ^[19]	19.4%(14.7-24.8%) ^[32]
Mixed deficiency anaemia	7.1(5.7-8.8)	-	2.0% (1.0-3.8%) ^[33]
B12 deficiency	6.6(5.3-8.2)	2.8% (0.7-7.6%) ^[19]	5.9%(3.4-9.5) ^[32]
Hematological malignancy	3.2(2.3-4.4)	20%(13.2-28.5) ^[19]	7.5%(4.2-12.1) ^[33]
Non Immune hemolytic anemia	2.9(2.1-4.1)	-	-
Anemia of acute illness	2.8(1.9-3.9)	-	-
Anemia of Acute blood loss	2.8(1.9-3.9)	2.17% (0.1-9.5) ^[34]	-
Anemia associated with Hypothyroidism	0.6(0.3-1.3)	-	6.6(4.3-9.8) ^[35]
Others(unexplained)	0.6(0.3-1.3)	8.6%(4.3-15.1) ^[19]	43.7%(36.4-51.1) ^[33]
Autoimmune Hemolytic anemia	0.4(0.2-1.0)		

Limitation of the study

This study has involved only the patients referred to haematology department for further assessment of anaemia during the study period by all the treating units of the Teaching Hospital Jaffna. Patients who were not referred especially cases of mild anaemia could have been missed in the study as it is common to neglect a very mild degree of anaemia. Hence it may not reflect the true prevalence of anaemia in hospitalised patients. However this study gives an impression of severity and burden of anaemia in hospitalised elderly and attempted to identify the aetiological causes with available resources.

Conclusion

Normocytic anaemia is identified as the common cause of anaemia in hospitalised elderly patients and common aetiological cause identified is anaemia of chronic disease followed by multifactorial causes and IDA. In this particular study anaemia of moderate severity is identified which needs utmost attention. A large hospital based study as well as community based study is needed in Sri Lanka as the prevalence and aetiology of anaemia in both setup differs and need different approach in evaluation and management. Further adopting a systematic evaluation guideline in anaemia to identify the underlying cause of anaemia in elderly is of paramount importance as it will guide the treatment, improve the outcome and helpful to improve the quality of life.

Abbreviations

IHD Ischaemic Heart Disease

WHO World Health Organization

HTN-Hypertension

ACD Anaemia of Chronic Disease

HIV Human Immunodeficiency Virus

AIDS Acquired Immunodeficiency Syndrome

IDA Iron Deficiency Anaemia

LDH Lactate Dehydrogenase

TSH Thyroid Stimulating Hormone

CKD Chronic Kidney Disease

CLCD Chronic Liver Cell Disease

RA Rheumatoid Arthritis

GORD Gastro Oesophageal Reflux Disease

COPD Chronic Obstructive Pulmonary Disease

NSAID Non-Steroidal Anti Inflammatory Disease

PPI Proton Pump Inhibitor

MCV Mean Corpuscular Volume

DM Diabetes Mellitus

RBC Red Blood Corpuscle

USS-Ultrasound

Declarations

Ethics approval and consent to participate

Ethical approval for this study was obtained from the Ethical Review Committee, Faculty of Medicine of University of Jaffna (Ref No: J/ERC/20/120/NDR/0239). All methods were performed in accordance with the relevant guidelines and regulations. Informed consent was waived off by the Ethical Review Committee, Faculty of Medicine, University of Jaffna.

Consent for publication

Not applicable

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests

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Authors' contributions

VS, TS, TK and NR designed the study, ST, TS and TK collected the data, NR analysed the data, VS and NR wrote the manuscript and the final manuscript was read and approved by all authors.

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References

1. Maccio`A, Madeddu C. Management of Anemia of Inflammation in the Elderly. *Anaemia*. 2012.doi:10.1155/2012/563251
2. Melku M, Asefa W, Mohamednur A, et al. Magnitude of Anemia in Geriatric Population Visiting Outpatient Department at the University of Gondar Referral Hospital, Northwest Ethiopia: Implication for Community-Based Screening. *Current Gerontology and Geriatrics Research*.2018.https://doi.org/10.1155/2018/9869343
3. Partridge J, Harari D, Gossage J, Dhesi J. Anaemia in the older surgical patient: a review of prevalence, causes, implications and management. *J R Soc Med*. 2013; 106: 269–277. doi: 10.1177/0141076813479580
4. Mehta S, Goyal LK, Parmar R, Dhayal GL, Jain G. Anemia in Elderly: A Review. *Journal of The Indian Academy of Geriatrics*.2018; 14: 74-78)
5. Styszynski A ,Mossakowska M ,Chudek J et al.Prevalence of anemia in relation to socio-economic factors in elderly polish population: the results of polsenior study. *Physiology Pharmacol*.2018;69(1): 75-81.| doi: 10.26402/jpp.2018.1.08
6. Puyvelde KV, Cytryn E, Mets T, Beyer I. Anaemia in the elderly. *Acta Clin Belg*.2009; 64-4, DOI: 10.1179/acb.2009.047
7. Stauder R, Thein S L. Anaemia in the elderly: clinical implications and new therapeutic concepts. *Haematologica*.2014; 99(7). doi:10.3324/haematol.2014.109967
8. Gaskell H,Derry S,Moore RA,McQuay HJ. Prevalence of anaemia in older persons: systematic review. *BMC Geriatrics*. 2008; 8:1 doi:10.1186/1471-2318-8-1
9. Izaks, G.J,Westendorp RG, and Knook DL.The definition of anaemia in older persons. *JAMA*, 1999. 281(18): p. 1714-7.
10. Kikuchi, Five-year survival of older people with anaemia: variation with haemoglobin concentration. *J Am Geriatr Soc*.2001. 49: 1226-1228.
11. Zakai NA,Katz R, Hirsch C et al.. A prospective study of anaemia status, haemoglobin concentration, and mortality in an elderly cohort: the Cardiovascular Health Study. *Arch Intern Med*. 2005; 165(19): 2214-20.
12. Chaves PHM, Ashar B, Guralnik JM,Fried LP. Looking at the relationship between hemoglobin concentration and prevalent mobility difficulty in older women. Should the criteria currently used to define anaemia in older people be reevaluated? *J Am Geriatr Soc*.2002. 50(7): 1257-64.
13. Penninx BWJH, Guralnik JM, Onder G et al. Anaemia and decline in physical performance among older persons. *Am J Med*. 2003. 115(2):104-10
14. Penninx BW, Pahor M, Woodman RC, Guralnik JM. Anaemia in old age is associated with increased mortality and hospitalization. *J Gerontol A Biol Sci Med Sci*. 2006; 61: 474- 479.
15. Culleton BF, Manns BJ, Zhang J et al. Impact of anemia on hospitalization and mortality in older adults. *Blood*. 2006; 107(10):3841-6

16. Corona LP, Duarte OY, Lebrão ML. Prevalence of anaemia and associated factors in older adults: evidence from the SABE Study. *Rev Saúde Pública*. 2014; 48(5):723-731
17. Stauder R, Valent P, Theurl I. Anaemia at older age: aetiologies, clinical implications, and management. *Blood*. 2018; 131(5):505-514
18. Bianchi VE. Anemia in the Elderly Population. *J Hematol*. 2014; 3(4):95-106
19. Sharma D, Suri V, Pannu AK et al. Patterns of geriatric anaemia: A hospital-based Observational study in North India. *J Family Med Prim Care*. 2019; 8:976-80
20. Lwanga SK and Lemeshow S. sample size determination in health studies: a practical manual; World Health Organization 1991
21. WHO, Worldwide Prevalence of Anaemia 1993-2005, WHO Global Database on Anaemia, Geneva, Switzerland, 2008.
22. Price EA, Mehra R, Holmes TH, Schrier SL. Anemia in older persons: aetiology and Evaluation. *Blood Cells Mol Dis*.2011; 46(2): 159–165
23. Beghe C, Wilson A, Ershler WB. Prevalence and outcomes of anaemia in geriatrics: a systematic review of the literature. *Am J Med*. 2004 Apr 5; 116 Suppl 7A:3S-10S. doi: 10.1016/j.amjmed.2003.12.009.
24. Hammerman-Rozenberg R, Jacobs JM, Azoulay D, Stessman J. Aspirin prophylaxis and the prevalence of anaemia. *Age Ageing*. 2006 Sep;35(5):514-7. doi: 10.1093/ageing/afl066. PMID: 16905794.
25. McNeil JJ, Wolfe R, Woods RL, et.al. Effect of Aspirin on Cardiovascular Events and Bleeding in the Healthy Elderly. *N Engl J Med*.2018; 379:1509-1518
DOI: 10.1056/NEJMoa1805819
26. Joosten E, Pelemans W, Hiele , et al. Prevalence and causes of anaemia in a geriatric hospitalized population. *Gerontology*.1992. 38(1-2): 111-7.
27. Smith DL. Anemia in the elderly. *Am Fam Physician*. 2000 Oct 1; 62(7):1565-72. PMID: 11037074.
28. Pathania A, Haldar P, Kant S et al.Prevalence of anemia among elderly persons residing in old age homes in national capital territory, Delhi,India. *Indian Journal of Public Health*.2019; 63(4):288-292
29. Yildirim T, Yalcin A, Atmis V, Cengiz OK, Aras S, Varlı M, Atli T. The prevalence of anemia, iron, vitamin B12, and folic acid deficiencies in community dwelling elderly in Ankara, Turkey. *Arch Gerontol Geriatr*. 2015; 60(2):344-8. doi: 10.1016/j.archger.2015.01.001. Epub 2015 Jan 14. PMID: 25616321.
30. Tettamanti M, Lucca U, Gandini F et al. Prevalence, incidence and types of mild anaemia in the elderly: the “Health and Anaemia” population-based study.*Haematologica*.2010; 95,(11): 1849–1856.
31. Randi ML, Bertozzi I, Santarossa C et al. Prevalence and Causes of Anaemia in Hospitalized Patients: Impact on Diseases Outcome. *J Clin Med*. 2020;9(4):950.doi:10.3390/jcm9040950
32. Geisel T, Martin J, Schulze B et al. An Etiologic Profile of Anaemia in 405 Geriatric Patients. *Anaemia*. 2014. doi.org/10.1155/2014/932486

33. Artz AS, Thirman MJ. Unexplained anaemia predominates despite an intensive evaluation in a racially diverse cohort of older adults from a referral anaemia clinic. *J Gerontol A Biol Sci Med Sci*. 2011 Aug; 66(8):925-32. doi: 10.1093/gerona/glr090. Epub 2011 Jun 9. PMID: 21659341.
34. Jain V. Pattern of anaemia in elderly patients. *Int J Res Med Sci*. 2019; 7(7):2524-2529
35. Vitale G, Fatti LM, Prolo S, Girola A, Caraglia M, Marra M, Abbruzzese A, Gerli G, Mari D. Screening for hypothyroidism in older hospitalized patients with anemia: a new insight into an old disease. *J Am Geriatr Soc*. 2010; 58(9):1825-7. doi: 10.1111/j.1532-5415.2010.03040.x. PMID: 20863360.

Figures

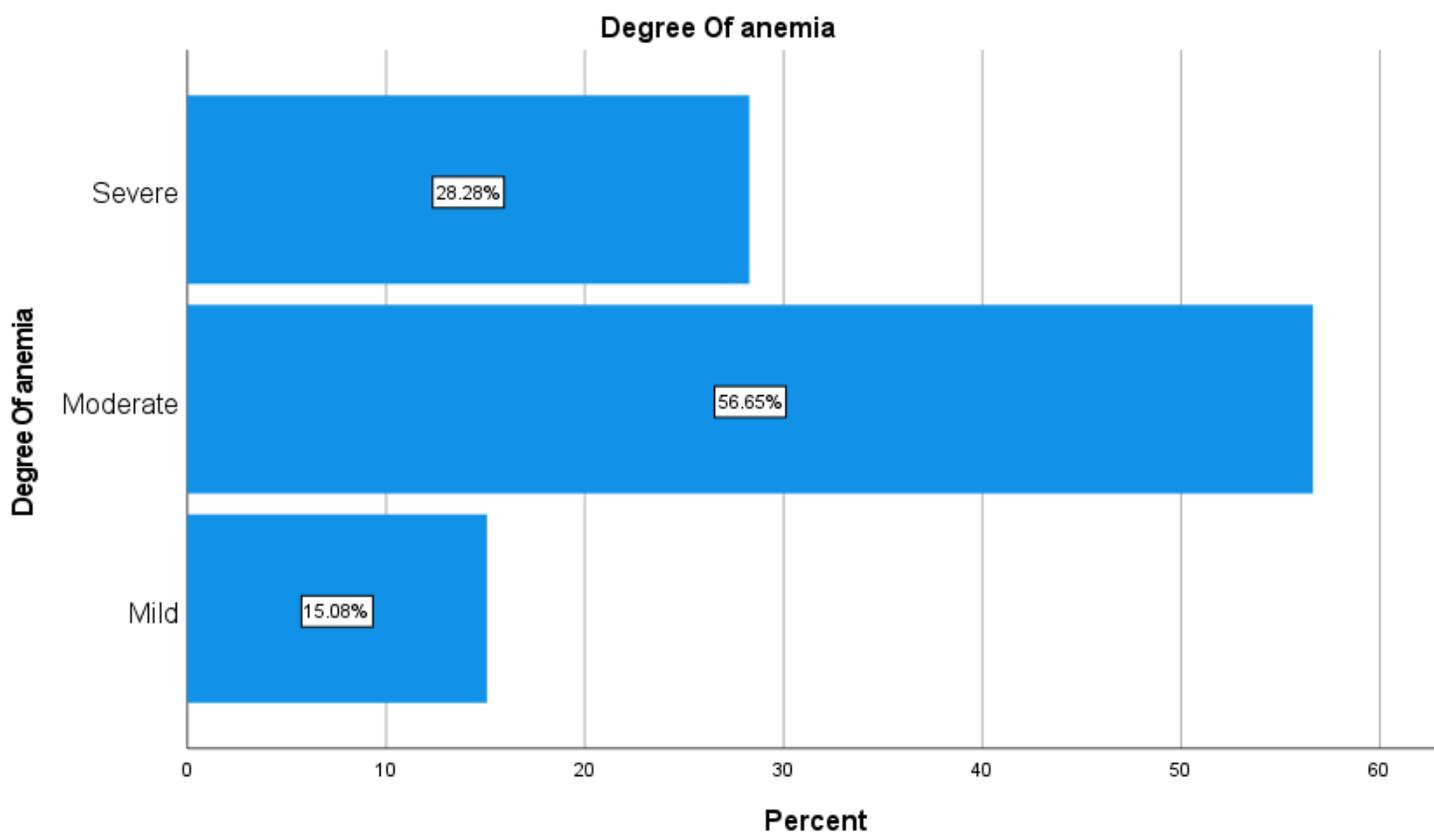


Figure 1

Severity of anaemia among elders