

A descriptive study of anaemia in the elderly at a tertiary care institute in Sri Lanka

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(Index words: anaemia, chronic diseases, elderly population, geriatrics, Sri Lanka)

Abstract

Introduction: Anaemia is a commonly encountered condition among the elderly population which calls for further evaluation to identify the cause and to prevent complications.

Objectives: To determine the prevalence, causes and complications related to anaemia among elderly patients admitted to two medical wards (15/16) of Colombo North (Teaching) Hospital, Ragama, Sri Lanka.

Methods: Patients aged over >65 years admitted to the above wards between April-Sep 2020 and who had anaemia were included in the study. Clinical and nutritional data were collected using an interviewer-administered questionnaire. Laboratory findings were extracted from hospital records.

Results: The majority of the patients were females (63.2%; n=129). The mean age was 72.5 years (65 - 92 years). Most of the patients (62.3%; n=127) were symptomatic for anaemia at the time of hospital admission. The majority of the participants (75.5%; n=154) did not demonstrate any complications related to anaemia. The severity of the anaemia was moderate among more than half of the patients (52.5%; n=107). Anaemia of chronic disease (54.4%; n=111) was the commonest etiological category detected. The majority of the cases with anaemia of chronic disease were due to chronic renal insufficiency (73.9%; n=82). The severity of the anaemia increased significantly with the presence of chronic disease (p 0.030).

Conclusion: Most patients in the present study had moderate anaemia whilst anaemia of chronic disease

was the leading aetiological class contributor. Community-based studies are needed to understand the true burden of anaemia in the ageing population in Sri Lanka.

Introduction

The elderly population has been increasing globally due to the advances in health care. Consequently, special attention is required for medical problems in the elderly. Anaemia is frequently encountered in the elderly population and is known to be associated with an increased risk of cardiovascular complications such as myocardial infarction, cardiac failure and cerebrovascular accidents [1]. Greater than 10% of individuals who are older than the age of 65 years develop anaemia globally; increasing to 50% among those who are older than 80 years of age [2]. Even though anaemia is characteristically mild and not likely to cause major symptoms, it is associated with high morbidity and mortality [3,4].

Low haemoglobin (Hb) levels in the elderly are associated with decreased physical activities, cognitive impairment, increased frailty, dementia, increased risk of falls and fractures, increased stress, and frequent hospital admissions which in turn significantly affect the health care needs and cost [5,6]. Moreover, declining haemoglobin levels and anaemia could be early indicators of previously undiagnosed malignancies among elders [7]. Causes of anaemia in the elderly can be classified into three broad groups: Nutritional deficiency (lack of iron,

Ceylon Medical Journal 2022; **67**: 94-101

DOI: <http://doi.org/10.4038/cmj.v67i3.9696>

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vitamin B12 or folate), anaemia of chronic disease (ACD) and unexplained anaemia (UA) are these categories. The prevalence of each cause of anaemia in the elderly depends on geographical factors and ethnicity. Clinical management of anaemia in the elderly is directed to its aetiology and would take into consideration the comorbidities of the person. Blood transfusion should not be considered unless there is severe anaemia (Hb level < 7-8 g/dL) especially if the patient is asymptomatic [8]. Oral iron replacement therapy can be started as a treatment and a diagnostic differentiator. Recent evidence suggests that lower doses of iron with a less-frequent dosing strategy (15mg-50mg Iron/daily) could be equally effective for elders while keeping the risk of adverse effects to a minimum [9]. Oral or parenteral therapy of vitamin B12 and oral folate is also recommended in patients with vitamin B12 and folate deficiency anaemia. In addition to that subspecialty referrals for other treatment options for underlying disorders such as chronic renal insufficiency/chronic kidney disease (CKD), gastrointestinal disorders, chronic inflammatory conditions and malignancies may also be considered.

The status of anaemia among the elderly population in Sri Lanka is largely unexplored. Locally published papers describing anaemia in the geriatric population are lacking and scanty evidence is available about the nutritional status of the elderly population. In one study, the mean daily intake of meat, fish and eggs of adults over 60 years has been reported to be lower (1.56 portions/day) than the recommended requirement (3-4 portions/day) [10]. Percentage intake of meat (4%) and green leafy vegetables (48%) were also relatively lower among adults over 60 years of age [11]. In the present study, we aimed to assess the presence, magnitude, and common underlying causes of anaemia and related complications among elderly patients admitted to medical wards of Colombo North Teaching Hospital (CNTH), Ragama, Sri Lanka.

Methods

Elderly patients with anaemia, who were admitted to two medical wards (ward no: 15/16) of Colombo North Teaching Hospital, Ragama, Sri Lanka between April 2020 – September 2020 were enrolled for the study. “Elderly” and “Anaemia” were defined according to the criteria of the World Health Organization (WHO) as the age of 65 years and above, and; Hb <12g/dL for females and <13g/dL for males respectively [12,13]. Patients who had undergone blood transfusions during the past three months and patients who were on haematinics at the time of data collection were excluded from the study. Informed written consent was obtained from each participant before recruitment.

Clinical data were collected at the initial visit of the participant using a pretested interviewer-administered questionnaire. Results of the following laboratory investigations were collected from the records; Full Blood

Count (FBC), Blood picture, reticulocyte haemoglobin, reticulocyte count, bone marrow biopsy, occult blood test, urine full report, serum ferritin, C-reactive protein (CRP), Thyroid function test, renal and liver function tests. Similarly, findings of upper and lower gastrointestinal endoscopies and an ultrasound scan of the abdomen were also extracted from the records. Diagnosis of iron deficiency anaemia (IDA) should be based on decreased transferrin saturation and increased total iron-binding capacity. However, these investigations are not conveniently available at CNTH. Therefore, diagnosis of IDA was done with careful inspection of blood film, serum ferritin level and CRP level after collaborative opinion and discussion with the consultant haematologist. Patients with lower red cell indices were further investigated with High-Performance Liquid Chromatography to exclude β -thalassaemia. Relevant laboratory investigations (bone marrow biopsy, Coomb’s test, etc.) were followed accordingly to identify the specific cause of anaemia (e.g.: Myelodysplastic syndrome, Leukaemia, Haemolytic anaemia) The status of nutrition of all the participants were also assessed using a formulated questionnaire. This study was approved by the Ethical Review Committee of Colombo North Teaching Hospital, Ragama, Sri Lanka (Ref No: 001904/CNTH/ECC). Informed written consent was obtained from all the participants before taking part in the present study. Statistical analyses were done using Statistical Package for social sciences version 26 and Microsoft Excel programmes (2016). Non-parametric studies such as the Mann-Whitney U test were applied to compare the haematological parameters between male and female groups. Fisher’s exact test was applied to determine non-random associations between the severity of anaemia and pre-existing complications; IDA and being a vegan. The effect size of the associations was determined by Cramer’s V test. Further, the Mantel-Haenszel test for trend was applied to determine the severity of the anaemia in the presence of various causes.

Results

A total of 1846 elderly patients (936 males and 910 females) were admitted to the wards 15/16 during the period of data collection. Of them, 221 patients had anaemia (140 females and 81 males). Seventeen patients were excluded (13 were on haematinics and 4 were non-consenting) and, 204 patients (129 females and 75 males) were recruited for the present study after obtaining informed consent. The overall prevalence of anaemia among elderly patients at wards 15/16 was 11.97% (221/1846) whereas, it was higher among female patients (15.38%; n=140) than males (8.65%; n=81). Of the recruited patients, most of them (94.6%; n=193) were of Sinhalese ethnicity. The majority of the patients were from the Gampaha district (97.55%; n=199). The ages of the patients ranged from 65-92 years. The mean age was 72.5 years (SD: 6.2 Y) (Table 1). There was no significant difference between the mean ages of male and female participants

(*p* 0.554). The commonest reason for hospital admission was dyspnea (34.80%; *n*=71) followed by urinary tract infection (15.19%; *n*= 31) and chest pain (8.33%; *n*=17). A full list of reasons for hospital admission with frequencies given in supplementary table 1. The majority of the participants (62.3%; *n* =127) were symptomatic for anaemia at admission to the hospital. However, most of them (75.5%; *n*=154) did not demonstrate any complications related to anaemia. Among those who had developed a complication, heart failure was the commonest complication detected (42.0%; *n*=21). The full list of complications noticed during admission is listed in Table 2.

The basic haematological parameters of all the participants are mentioned in Table 3. The mean haemoglobin concentration was 8.1 g/dL among all the participants. The Haemoglobin level of Seventy-nine (38.7%) patients was less than 8.0 g/dL and underwent transfusions during the hospital stay. The severity of the anaemia among the participants was assessed in line with the WHO classification. The majority (52.5%; *n*=107) of them were moderately anaemic (Hb: 8.0 - 10.49 g/dL), 42.2% (*n*=86) were severely anaemic (Hb: < 8.0 g/dL), whereas 5.4% (*n*=11) were mildly anaemic (Hb: 10.5 - 12.99 g/dl in

men; 11.99 g/dl in women). The status of the relationship between the severity of anaemia and the pre-existing complications was also assessed. However, Fisher's exact test was unable to determine a significant independent association between the severity of anaemia and pre-existing complications (*p* 0.375). The type of anaemia was classified based on the Mean Corpuscular Volume (MCV) values of the patients. The majority of the patients had normocytic anaemia (62.7%; *n*=128) followed by microcytic anaemia (27.9%; *n*=57). In addition, the type of anaemia was also grouped according to the underlining etiological category. The majority of the cases with anaemia were due to the impaired production of red cells in the bone marrow (83.3%; *n*=170) followed by the increased loss of blood (9.3%; *n*=19), presence of haemoglobinopathy (β -thalassaemia trait) (2.9%; *n*=6) and increased destruction of red cells (0.5%; *n*=1). Anaemia in eight patients was unexplained (3.9%). The exact aetiology triggering anaemia was further assessed in individual cases and, the existence of chronic disease (54.4%; *n*=111) was the commonest cause for anaemia followed by Iron deficiency (17.2%; *n*=35). The complete set of causes for anaemia in the present study is listed in Table 4.

Table 1. Basic demographic characteristics of the recruited patients

	<i>Male</i>	<i>Female</i>	<i>Total</i>
Number of patients (<i>n</i>)	75	129	204
Mean age (Y)/SD	72.1 (6.2)	72.8 (6.8)	72.5 (6.6)
Median age (Y)	71.0	72.0	72.0
Age range (Y)	65.0 – 90.0	65.0 – 92.0	65.0 – 92.0
Ethnicity	Sinhalese – 73 SL – Tamils – 2	Sinhalese – 120 SL – Tamils – 7 SL – Moors – 2	Sinhalese – 193 SL – Tamils – 9 SL – Moors – 2
District of residence	Gampaha – 72 Puttalam – 1 Kurunegala – 1 Kegalle – 1	Gampaha – 127 Kurunegala – 1 Colombo – 1	Gampaha – 199 Kurunegala – 2 Puttalam – 1 Colombo – 1 Kegalle – 1

Table 2. Complications detected among anaemic patients at admission to the hospital

<i>Complication</i>	<i>Number of patients</i>		
	<i>Male</i>	<i>Female</i>	<i>Total</i>
Heart failure	9	12	21
Ischaemic heart disease	8	11	19
Ischaemic stroke	4	6	10
Total			50

Table 3. Basic haematological parameters of the recruited participants

Parameter (Reference range)	Male (n=75) Mean (SD)†	Female (n=129) Mean (SD)	Total (n=204)	p Value*
Haemoglobin (g/dl) (13.0-18.0 – Male) (11.5-16.5 Female)	8.1 (1.5)	8.1 (1.7)	8.1 (1.6)	0.429
Red blood cell count (×10¹²/L) (4.3-5.9 – Male) (3.5-5.5 – Female)	2.82 (0.62)	3.00 (0.70)	2.93 (0.67)	0.115
White blood cell count (×10⁹/L) (4.5-11.0)	10.72 (8.61)	10.98 (6.61)	10.87 (7.46)	0.238
Platelet count (×10⁹/L) (150-450)	231.3 (155.3)	236.8 (127.8)	234.6 (139.2)	0.270
Haematocrit (%) 41%-53%: Male 36%-46%: Female	24.5 (4.4)	26.3 (10.5)	25.6 (8.6)	0.175
Mean corpuscular volume (fL) (80-100)	86.8 (12.1)	83.5 (12.4)	84.8 (12.4)	0.531
Mean corpuscular haemoglobin (pg) (27-32)	28.7 (4.9)	27.4 (5.1)	27.9 (5.1)	0.324
Mean corpuscular haemoglobin concentration (%) (33-35)	32.9 (2.0)	32.5 (2.1)	32.6 (2.1)	0.208
Reticulocyte percentage (%) (0-1.5%)	1.9 (1.2)	1.9 (0.8)	1.9 (1.0)	0.530

†SD – Standard Deviation

*p<0.05 of the Mann-Whitney U test was taken as significant

Table 4. Frequency of different causes for anaemia among the participants in the present study

Cause	Frequency (Male) n %	Frequency (Female) n %	Frequency (Total) n %
Chronic diseases	45 (60.0%)	66 (51.2%)	111 (54.4%)
Iron deficiency	8 (10.7%)	27 (20.9%)	35 (17.2%)
Chronic blood loss	8 (10.7%)	11 (8.5%)	19 (9.3%)
Undetermined	4 (5.3%)	4 (3.1%)	8 (3.9%)
Mixed deficiency	1 (1.3%)	6 (4.7%)	7 (3.4%)
Beta thalassaemia trait	2 (2.7%)	4 (3.1%)	6 (2.9%)
Myelosuppression chemotherapy	0	5 (3.9%)	5 (2.5%)
Bone marrow hypoplasia	1 (1.3%)	1 (0.8%)	2 (1.0%)
Chronic myelogenous leukaemia	1 (1.3%)	1 (0.8%)	2 (1.0%)
Acute myeloid leukaemia	1 (1.3%)	1 (0.8%)	2 (1.0%)
Lymphoma	0	2 (1.6%)	2 (1.0%)
Chronic lymphocytic leukaemia	1 (1.3%)	0	1 (0.5%)
Pure red cell aplasia	0	1 (0.8%)	1 (0.5%)
Myelodysplastic syndrome	1 (1.3%)	0	1 (0.5%)
Multiple myeloma	1 (1.3%)	0	1 (0.5%)
Immune haemolytic anaemia	1 (1.3%)	0	1 (0.5%)
Total	75 (100%)	129 (100%)	204 (100%)

Among the chronic diseases detected, CKD (73.9%; n=82) was the most commonest followed by chronic liver cell disease (24.3%; n=27) and malignancy (1.8%; n=2). The association between the presence of chronic disease and the severity of the anaemia was assessed by Mantel-Haenszel test for trend. Linear-by-linear association in chi-square (4.875) demonstrated that the severity of anaemia increases significantly with the presence of chronic disease (p 0.030). Cramer's V test was then run to determine the strength of the relationship between the presence of chronic disease and the severity of anaemia. It was however weak suggesting the association between the severity of anaemia and the presence of chronic disease could be neglected ($\phi_c = 0.155$; p 0.082). Nutritional status was also assessed using a mini nutritional assessment form (sup. File 02) basic questionnaire. The majority of the patients were non-vegan (89.2%; n=182) and similarly, most of the participants had taken worm treatment (65.2%; n=133). The frequency of haem consumption was further assessed on a scale among non-vegans and a large majority of them were consuming haem-containing food once a week (92.8%; n=169). Contrastingly, the frequency of consumption of green leafy foods was much better among all the participants with almost three-fourths (74.5%; n=152) consuming green leafy foods 2-3 times per week. The association between the IDA and being a vegan was also assessed and Fisher's exact test demonstrated a significant independent association between IDA and being a vegan (p < 0.001). Nevertheless, Cramer's V value suggested that this relationship was only moderate despite being significant ($\phi_c = 0.471$; p < 0.000).

Discussion

As far as we are aware this is the first study highlighting the clinical aspects of anaemia among the elderly population in Sri Lanka. The severity of the anaemia among elders could depend on geography and socio-economic factors. The severity of the anaemia leans towards high in low-income settings and low in high-income settings [14]. More than a third (42.2%; n=86) of the participants of the present study had severe anaemia which highlights the seriousness of anaemia in the elderly in a low-income setting such as Sri Lanka. Similar findings have been noted from studies originating in Bhopal, Bangalore and Varanasi India, in which the incidence of severe anaemia among hospitalized elderly anaemic patients was 41.0%, 42% and 55.63% respectively [15-17]. Contrastingly, a much lower fraction of severe anaemia (14.7%) has been reported among anaemic elders from Italy [18].

Interestingly, the majority (75.5%; n=154) of the participants in the present study did not show any complications related to anaemia. Cardiovascular diseases (heart failure, ischaemic heart disease and ischaemic stroke) accounted for all the complications detected in the present study related to anaemia (24.5%; n=50). Prevalence of cardiovascular diseases however was much higher (59.3%; n=105) among Italian elderly patients with anaemia [18], and lower (9%; n=9) among patients from

Bangalore India [19]. As recent evidence suggests, even mild anaemia inpatients with cardiovascular diseases such as heart failure could increase morbidity and mortality [20, 21]. Hence, close to one-fourth of the elderly anaemic patients in the present study have a higher risk of mortality related to cardiovascular complications. The existence of chronic disease was the commonest cause (54.4%; n=111) for anaemia among elderly patients in the present study. Similar findings were reported in a study done in Assam, in which chronic diseases accounted for anaemia among 56% of hospitalized geriatric anaemic patients [14]. However, in Bangalore and Chandigarh, chronic diseases accounted for anaemia in only 32% and 35.2% of elderly anaemic patients respectively [17, 22]. The Third National Health and Nutrition Examination Survey conducted in the USA reported that one-third of the cases of anaemia among the elderly population were due to chronic inflammations and diseases. These observations suggest that the relative contribution of ACD among the geriatric population is highly variable and could depend on multiple factors such as socio-economic and geographical factors. Incidentally, there was a significant association between the severity of anaemia and the existence of chronic disease among the participants of the present study.

CKD was the commonest subtype of chronic disease (73.9%; n=82) detected among the participants of the present study. In Sri Lanka, CKD has become a major public health issue in recent years. It has been reported that 15.4% of households in Sri Lanka had at least one symptomatic CKD patient between 2009-2018 with the highest incidence among females (62%) [23]. In the present study too, the majority of the anaemic patients with CKD were females (53.7%; n=44). The overall prevalence of anaemia among CKD patients in Sri Lanka has ranged between 72-93% with the highest incidence being among female patients [24, 25]. However, until the present study, there was limited information available about the prevalence of anaemia caused by CKD among the elderly population in Sri Lanka.

Even though close to three fourth of the participants of the present study regularly (2-3 times per week) consumed green-leafy vegetables, the majority (93%; n=169) consumed haem-containing foods only once a week. We were unable to ascertain the exact reason for the poor intake of haem-containing foods among the participants of the present study. Although demand for meat products has increased in recent years in Sri Lanka, the average frequency of meat consumption remains around 1-2 times per week [26,27]. However, inadequate information is available about meat consumption among the elderly population in Sri Lanka. The present study does not describe the manifestation of macrocytic anaemia among elderly adults in detail due to the limited facilities at CNTH to estimate serum Vitamin B12 and Folate levels.

This hospital-based study of anaemia among geriatric patients in a tertiary care hospital in Sri Lanka has found that most patients had moderate anaemia whilst ACD was the leading aetiological class contributor. Studies

conducted at the community level are needed to understand the true prevalence of the burden of anaemia in the ageing population in Sri Lanka.

Acknowledgement

The authors wish to thank the elderly patients who participated in this study.

Author contributions

Conceptualization, AP, KCC; Data curation, TD; Investigation, KCC, TD, RP, YC, DA; Methodology, KCC, TD, AP; Project administration, AP; Supervision, AP, DA; Writing-original draft, TD, KCC; Writing-review and editing, TD, AP.

Conflict of Interest

There are no conflicts of interest.

Funding

None.

Ethics Approval

Ethical clearance for the study was obtained from Ethics Review Committee, Colombo North Teaching Hospital, Ragama, Sri Lanka (Ref No: 001904/CNTH/ECC). Informed written consent was obtained before enrolling participants in the study.

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Supplementary Table 1. Reasons for hospital admission among elderly anaemic patients

<i>Reason for admission</i>	<i>Frequency (n)</i>	<i>Per cent (%)</i>
Dyspnoea	71	34.8
Urinary tract infection	31	15.2
Chest pain	17	8.3
Hypoglycaemia	6	2.9
Ischaemic stroke	6	2.9
Lower respiratory tract infection	5	2.5
Melaena	5	2.5
Haematemesis	5	2.5
Fever	5	2.5
Somatic complaints	5	2.5
Cellulitis	4	2.0
Musculoskeletal pain	4	2.0
Heart failure	4	2.0
Acute kidney injury	3	1.5
Gastro-oesophageal reflux disease	3	1.5
Confusion	3	1.5
Syncope	3	1.5
Acute gastroenteritis	3	1.5
Ankle oedema	2	1.0
Blood transfusion	2	1.0
Loss of conscious	2	1.0
Lower GI haemorrhage	2	1.0
Back pain	2	1.0
Hepatic encephalopathy	2	1.0
Urosepsis	2	1.0
Bed sore	1	0.5
Leptospirosis	1	0.5
Chronic wound infection	1	0.5
Hypertension	1	0.5
Psychotic	1	0.5
Fits	1	0.5
Infective diarrhoea	1	0.5
Total	204	100.0

Supplementary file 2**Mini Nutrition Assessment (MNA) form**

01. Patient's name Age..... Gender.....
02. Address.....
03. Contact No.....
04. Dietary factors:
 - Vegan:
 - Non Vegan:
05. Worm treatment taken during the last year: Yes / No
06. Food frequency questionnaire
 - Frequency of consumption of haem iron (Fish/Meat)
 - Daily
 - 2-3 times a week
 - Once a week
 - Once a month
 - Never
 - Frequency of consumption of green leafy vegetables
 - Daily
 - 2-3 times a week
 - Once a week
 - Once a month
 - Never