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AN EPIDEMIOLOGICAL STUDY ON PREVALANCE OF ANEMIA AND ITS PROFILE AMONG ELDERLY POPULATION AT TERTIARY CARE CENTRE AT BIHAR

General Medicine

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ABSTRACT

Anemia in elderly is a very important co-morbidity and far more important cause of increased mortality than expected. It's often under considered and the consequences of anemia are related as normal ageing symptoms. Here we study 200 elderly people attending a tertiary hospital at Bihar and discuss about the prevalence and its cause in various subgroups .We also hereby discuss and elaborate about the association of anemia with other co- morbidities .

KEYWORDS

Anemia,Elderly,Morbidity.

INTRODUCTION-

Anemia is common in the older adult population. The world population is ageing; in 2000 there were 600 million people aged 60 or over, and it is estimated that this figure will double by 2025, and more than triple to 2 billion by 2050. The "oldest old", often defined as those aged 85 or older, show the largest increase in numbers.

Although typically mild, it has been associated with substantial morbidity and mortality.The major disadvantage of consequence of anemia in elderly is that symptoms of even severe anemia is often accepted as a part of natural ageing in elders.World Health Organization (WHO) criteria of a hemoglobin (Hgb) <13 g/dL (<130 g/L) in men and <12 g/dL(<120 g/L) in women have been used to define anemia [6]. However, these criteria were based upon data in populations that did not include individuals >65 years of age [7-0], and may or may not be applicable to the older individual. There has been debate about the use of these values [5], and in particular, whether they should be used to define anaemia in older people [6], but there is no widely accepted alternative definition of anaemia in this age group.

In general, haemoglobin levels are lower in older than in younger people. The reasons for this are not completely understood. It is unclear whether haemoglobin falls in older people because this is a feature of normal ageing, or whether it is always pathological, even if underlying conditions cannot be identified. In an individual patient it may be that some decline in haemoglobin occurs as part of normal ageing, but that disease may also contribute to the development of anaemia.

Anaemia of chronic disease, or anaemia of chronic inflammation, is the term associated with some chronic medical conditions, such as chronic renal disease and rheumatoid arthritis. Older people who suffer such chronic conditions might be expected to be anaemic, just as younger patients are. However, it is not always appreciated that older patients who suffer other medical problems, for example cognitive impairment, have a worse prognosis if they are also anaemic. It is not surprising that anaemia is associated with heart failure or myocardial infarction or death, but the reasons underlying the association between anaemia and other morbidity are less tangible.

However, there is relatively lack of interest in identifying the burden of the disease among elderly in India. This may be due to belief that anemia is not a significant health issue in this group as the prevalence may be low in males, and cessation of menstruation in females would compensate for inadequate bio-availability of micronutrients. This misconception reflects as conspicuous lack of studies regarding prevalence of anaemia among senior citizens in India. In a database published by WHO [9] regarding studies on prevalence of anemia compiled more than 100 studies conducted in India from 1958 to 2003. The perusal of the database reveals that only three studies included individuals above the age of 50 years. Similarly National Family Health Survey-3 (NFHS-3) [4] reported the level of haemoglobin up to age of 50 in females, and 55 among males.

The present study was undertaken to study the prevalence of anemia among elderly aged 60 and above with an aim to bring to centre-stage the importance of anaemia among this demographic group.

MATERIALS AND METHODS-

In this study, all patients who attended between May 2017 and April 2018 to the Geriatric Clinic of the Patna Medical College,Patna, India, were included. The data was analyzed retrospectively. Patients included in the study were aged 65 years or over.

Anemia Associated with Iron Deficiency. Patients with Hb levels under 12 g/dL (women) and 13 g/dL (men) and a TSAT value<20% were considered to have anemia associated with iron deficiency.

Three subcategories were defined.

Anemia related to absolute iron deficiency (iron deficiency anemia, IDA) was characterized by a decreased serum ferritin level (<30 μg/mL) in combination with low serum CRP levels (≤0.5 mg/dl).

Anemia caused by inflammation (AI) was defined by high ferritin levels (>100 μg/mL) and increased CRP (≥0.5 mg/dL).

Patients with ferritin levels between 30 μg/mL and 100 μg/mL and high CRP levels (≥0.5 mg/dL) were classified as having mixed anemia (IDA/AI).

Anemia due to Factors Other Than Iron Deficiency.
Patients with Hb levels under 12 g/dL (women) and 13 g/dL (men) and a TSAT value ≥ 20% were considered to have anemia caused by factors other than iron deficiency. Four subcategories were defined.

(i) Anemia secondary to cobalamin deficiency was diagnosed if the serum level was<150pg/ml
(ii) Anemia secondary to folic acid deficiency was diagnosed if the serum level was<2mcg/L
(iii) Anemia of chronic renal insufficiency (CRI) was classified by creatinine values >1.2 mg/dL in females and >1.5 mg/dL in males [11–13].
(iv) Anemia secondary to other etiologies was defined as unexplained anemia (UA) [6]. See Figure 1.

Statistical Analysis. The primary objective of this study was to determine the prevalence of anemia and of different etiological subtypes of anemia in a geriatric patient population. Descriptive statistics were attained through the calculation of arithmetical means, standard deviations, and minimum and maximum values of all data. To test the significance of all categorical variables, the Chi-squared test (Pearson) was performed. Arithmetical means were calculated with - tests for dependent and independent samples, and correlations were determined using the Spearman Rho method. All outcomes with a minimum of μ <0.05 were considered significant.

RESULTS

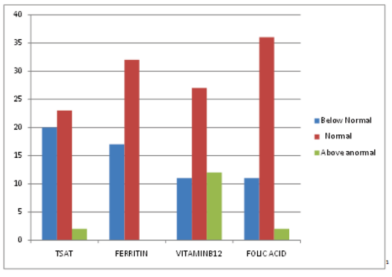
During the period studied, 200 patients (58 men and 142 women) who were attended to the geriatric clinic were therefore included in the study. The average age was 83.6 ± 6.9 years (range 65–101 years). The patients were divided into three

Table 1: Anemia subtypes according to main reason for hospitalization.

	All patients n(%*)	All anemic patients n(%*1)	IDA n(%*1)	IDA/AI n(%*1)	AI n(%*1)	B_{12}/folic acid deficiency n(%*1)	Renal anemia n(%*1)	UA n(%*1)
Fractures	75 (40.76)	55 (43.90)	0 (0)	4 (8.18)	16 (28.18)	4 (7.27)	5 (9.09)	26 (47.27)
Cardiovascular disease	35 (19.02)	20 (57.14)	2 (7.50)	3(15.00)	8 (37.50)	2 (7.50)	3 (17.50)	3 (15.00)
Disturbance of gait and mobility	32 (17.39)	13 (40.63)	1 (3.85)	2 (19.23)	1 (11.54)	1 (7.69)	2 (19.23)	5 (38.46)
Digestive tract diseases	7 (4.08)	7 (86.67)	1 (7.69)	2 (15.38)	2 (30.77)	1 (15.38)	2 (30.77)	0 (0)
Disorders of the musculoskeletal apparatus	7 (3.80)	7 (92.86)	0 (0)	1 (7.69)	1 (23.08)	2 (23.08)	3 (46.15)	0 (0)
Neoplasma	7 (3.80)	5 (71.43)	0 (0)	1 (10)	3 (60.00)	1 (20)	1 (10)	0 (0)
Infectious diseases	4 (2.45)	4 (77.78)	1 (14.29)	1 (28.57)	1 (28.57)	1 (14.29)	1 (14.92)	0 (0)
Injuries	4 (2.45)	2 (44.44)	0 (0)	1 (50.00)	0 (0)	1 (25.00)	1 (25)	0 (0)
Other reasons	12 (6.25)	9 (78.26)	1 (5.56)	2 (16.67)	2 (22.22)	2 (11.11)	2 (22.22)	2 (22.22)
		121 (100)	3 (2.90*2)	16 (12.86*2)	32(28.22*2)	12 (9.96*2)	19 (16.18*2)	36 (29.88*2)

observational groups according to age: 65 to 75 years, 76 to 85 years, and over 85 years of age, representing 12.10%, 36.79%, and 51.11% of the study population, respectively. The most frequent main causes of hospitalization in this geriatric patient group were fractures (39.4%, $n = 75$), cardiovascular disease (18.4%, $n = 35$), and disturbances of gait and mobility (16.8%, $n = 32$). Other reasons for admission were digestive tract diseases (3.9%, $n = 7$), disorders of the musculoskeletal apparatus (3.7%, $n = 7$), neoplasms (3.7%, $n = 7$), infectious diseases (2.4%, $n=4$), and injuries (2.4%, $n=4$), with a further 6.0% ($n = 12$) admitted for other reasons.

Table 1 shows the distribution of these conditions according to specific anemia subtypes. On average, the patients had eight additional diagnoses concurrent to the primary diagnosis, and mean duration of stay in the clinic of all study subjects was 22 days. The main demographic characteristics of the patients are summarized in Table 2.



Anemia-related laboratory parameters at time of Visit

(TSAT = Transferrin saturation)

Of those patients whose Hb values were available ($\mu = 193$), 66.3% (74.8% of men and 62.9% of women) were anemic. There was no correlation between age and Hb level. While only four patients (1.5%) were found to be severely anemic, 37 (13.5%) had moderate anemia and the remaining 85.1% were categorized as having mild anemia.

Table 2: Iron parameters in all patients subdivided into age groups.

	Number of patients		Mean ± SD		Median		Min.		Max.	
	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male
Hb (g/dL)										
65–75 years	17	10			11.5	11.6	9	8.5	19.5	16.5
76–85 years	48	30			11.6	11.4	8.1	9.1	19.7	16.2
>85 years	74	15			11.4	12.4	8.1	8.9	16.9	16.2
Serum iron (mg/dL)										
65–75 years	16	9			3	5	1	1	8	9
76–85 years	49	28			4	5	1	1	9	8
>85 years	71	13			5	4	1	1	9	8
Serum ferritin (g/L)										
65–75 years	17	11			116	314	29	41	1131	905
76–85 years	46	23			201.5	253	18	56	2026	1435
>85 years	71	13			212	216	7	38	1352	1250
TSAT (%)										
65–75 years	18	11			15	18.5	4	4	60	35
76–85 years	50	31			18	20	3	6	87	67
>85 years	76	15			17	18	5	6	52	79
CRP (mg/dL)										
65–75 years	18	10			2.3	0.65	0.2	0.2	28.7	7.4
76–85 years	63	41			1.7	0.95	0	0.2	28.7	30
>85 years	76	14			1.9	0.7	0	0	49	9.8

The total number of patients diagnosed with anemia was 118, of whom 77 (65.0%) were defined as having iron deficiency anemia, with TSAT values<20%Absolute IDA was found in only 3 (4.6%) of these patients, while 16 (21.4%) had a combination of IDA and AI. The majority of patients with IDA ($\mu = 95$, 61.7%) were diagnosed with AI, indicated by high CRP and ferritin levels. Decreased levels of vitamin B12 or folic acid were determined as the cause of anemia in 15 patients (5.9% and 6.8%, resp.). In a further 23 (19.4%) study subjects, anemia was found to be the result of chronic renal insufficiency. The remaining patients fell into none of these categories and were therefore classified as having "unexplained anemia." The mean serum ferritin level of 315.7 μg/L fell within the normal reference range. Serum ferritin values were, however, increased in the majority of study subjects (64%), while 35% were found to have normal serum ferritin levels.

DISCUSSION

Anemia is a common condition in the elderly, and is known to be associated with increased morbidity and mortality. The present study was specifically aimed at investigating the epidemiology and etiology of anemia in geriatric population. Blood samples were retrospectively analyzed for the purpose of the study. The most striking conclusion drawn is the high prevalence of anemia across the board in elderly patients attending to hospital owing to a wide range of different disorders. Two-thirds of the patients studied were found to be anemic on admission. Although one other study, also focusing on geriatric inpatients, has shown a similar prevalence of anemia [7], most research involving elderly subjects has found the prevalence to be lower [6, 10, 14]. This discrepancy may be accountable to the fact that, in contrast to the current study with its population of elderly patients attending a tertiary care hospital , most other studies have examined ambulant patients or older people in the community [15, 16]. Geriatric persons with health problems severe enough to result in hospital admission are more likely than the geriatric population as a whole to suffer from acute infection and also to have an increased risk of blood loss due to surgery. Thus, hospitalized patients are at a higher risk of developing anemia [17]. Anemia was found in most cases to be mild, with an Hb level > 10 g/dL, in accordance with previously published results [6, 18]. However, even mild anemia is frequently associated with negative outcomes with regard to mortality and morbidity in the elderly [2, 19] and should therefore not be accepted as a normal physiological response to the aging process. Furthermore, the etiological origins of anemia must be determined in all cases in order to facilitate the choice and implementation of effective therapy. It might be seen as a limitation of the present study that reasons for hospital admission were not taken into account. However, wedeliberately chose to include all geriatric patientsattending to our clinic, independent of grounds for hospitalization, in order to gain a broader perspective on the prevalence and causes of anemia in elderly patients. No statistically significant correlation was detected between patients' age and Hb values. This is not in keeping with results of previous research, which have suggested an age-related decrease in Hb levels [6]. Again, this may relate to the specific elderly population included, since all study subjects had serious health issues (and thus, presumably, an increased risk of anemia), whereas in the geriatric population as a whole, the prevalence of serious illness increases with age. Thus, in terms of general state of health, the older the hospitalized patients are, the more representative they can be considered to be of the general population in that age group. As a consequence, what might be considered an innate "bias" of our population towards seriously ill patients (in comparison to studies involving nonhospitalized geriatric persons) is not independent of age, but probably more pronounced in the context of the younger geriatric population. Determination of the underlying cause of anemia in geriatric persons is complicated by comorbidity and polypharmacy, which are particularly common among the elderly [5]. This must also be taken into account when classifying and comparing the results. Nonetheless, anemia in the elderly can generally be categorized into four major types: anemia related to nutrient deficiencies (iron, cobalamin, and folic acid), anemia related to chronic inflammation, anemia due to renal insufficiency, and unexplained anemia [6]. Of 118 patients considered to be anemic, 77 (65.0%) had TSAT values<20%and were therefore diagnosed with iron deficiency anemia. In terms of the classification of anemia, the most common etiological subtypes were anemia of inflammation or a mixed form resulting from AI and IDA. Only a few studies have investigated the etiologic profile of anemia in hospitalized patients in the age range from 65 to 101 years [7, 14]. Comparing our results to previous studies is complicated by differences in anemia classification. However, inflammation seems to be the predominant cause of anemia

in the observed population, with nutritive factors playing only a limited role [14]. In elderly persons, the causes of anemia vary depending on their clinical setting. AI and IDA are, however, the most common forms of anemia both in community-dwelling and in hospitalized geriatric patients [14]. In our study, IDA was less prevalent than expected in light of results obtained in prior studies. Only 4.6% of our study subjects with iron deficiency associated anemia were found to have absolute iron deficiency anemia (IDA), in comparison to 17% in previous reports [6]. A possible explanation for this discrepancy might be the higher mean age (83.6 years) of our patients compared to populations of similar studies, whose mean ages were between 77 and 80 years [13]. Furthermore, we had a high number of comorbidities in our study population. A recent study with a comparable prevalence of comorbidities disclosed an IDA rate of 31% [7]. Sixty-two percent of patients with iron deficiency-related anemia were diagnosed with AI. Petrosyan et al. reported a similar prevalence rate (60%) of AI in a comparable study population [7]. Prevalence rates in community-dwelling elderly persons, however, may be considerably lower. For example, the NHANES (National Health and Nutrition Examination Survey) III demonstrated a prevalence of 24% for this type of anemia in a community-dwelling elderly population [6]. Considerable differences in prevalence may be accountable to the setting (community-dwelling elderly, nursing home residents, or hospital patients), variations in mean age of the study population, and the resultant respective variations in the number of comorbidities and chronic conditions. While AI predominantly occurs as a consequence of chronic or long-term illness or infection, it is also associated with malignancy and inflammatory disorders. These are conditions whose prevalence increases with advancing age and which are more likely to be encountered in a hospitalized setting. Since fractures were the most frequent main cause of hospitalization in our study population, these patients came into the rehabilitation ward. Since an increase in inflammation parameters (CRP and ferritin) is to be expected under these circumstances, this represents an additional explanation for the high prevalence of AI in our study . Studies of noninstitutionalized older persons have demonstrated higher and lower prevalences of IDA and AI, respectively . In our study, anemia of mixed etiology resulting from iron deficiency and chronic inflammation was also analyzed. Sixteen patients (21.43%) were found to have combined IDA and AI. Anemia due to deficiencies of vitamin B12 or folic acid was found in 5.91% and 6.75% of patients, respectively. Other studies showed higher prevalence rates of 10–20% for cobalamin and 21% for folic acid deficiency [7]. Guralnik et al. determined anemia secondary to folic acid or cobalamin deficiency in 14% of their elderly population [6]. However, comparison of these results is of limited value, as different diagnostic criteria were used. Anemia of chronic renal insufficiency (CRI) was defined by creatinine values >1.2 mg/dL in females and >1.5 mg/dL in males. Twenty three (19.41%) of the elderly patients assessed were found to have CRI-related anemia. While previous studies have reported a prevalence of 8–17.5% for anemia resulting from renal insufficiency, most of these studies used a glomerular filtration rate (GFR) of<30ml/min as the defining criterion for chronic kidney disease [7].While GFR is indeed considered a better parameter for the diagnosis of chronic renal insufficiency, the present study, due to its retrospective design, was only able to assess chronic renal illness on the basis of the available creatinine values. The results of the studies are therefore not directly comparable. The patients that fell into none of the given etiological subgroup categories were therefore classified as having unexplained anemia. Possible underlying mechanisms for unexplained anemia include physiological changes such as higher circulating levels of proinflammatory cytokines, myelodysplasia, decreased androgen levels, and a decrease in the proliferative capacity of bone marrow stem cells [6].

Our study has strengths and limitations. The most limiting factor is the retrospective design of the study. Consequently, only those laboratory parameters which were collected as clinical routine on admission were available to be assessed. Important strengths of the study are the large study population ($n = 200$), the wide spectrum of reasons for admission and of underlying disease or condition, and the use of a variety of different iron and inflammation parameters as assessment criteria for the classification of different causes of anemia. Conclusive evidence from a large number of studies has confirmed that adequate treatment of iron deficiency significantly improves rates of mortality and morbidity in patients suffering from a wide range of conditions, including chronic heart failure , coronary heart disease , chronic kidney disease , cancer , and rheumatoid arthritis . Nevertheless, screening and treatment of ID continue to be widely neglected in the routine management of geriatric patients.There is clearly a need for greater awareness of the high prevalence of anemia in the elderly and of its significance in terms of poorer outcomes, prolonged hospital stays, and increased mortality. Our study underlines the importance of routine screening and individual assessment of the etiological causes of anemia in geriatric patients, allowing the timely initiation of optimal and appropriate therapy. In addition, the perioperative administration of intravenous iron is advisable in order to reduce anemia-related complications and minimize transfusion requirements. Rather than relying on a single biomarker, screening should include a range of parameters including TSAT, serum ferritin, and CRP. A new generation of intravenous iron preparations allows rapid single-session doses of up to 1,000 mg, thus offering an excellent option for effective treatment and prevention of iron deficiency in all patients, including the elderly [38]. Dosage can be calculated using standard calculation methods such as the Ganzoni formula.

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