

Prevalence of Anemia among Elderly Persons Residing in Old Age Homes in National Capital Territory, Delhi, India

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Abstract

Background: Anemia is a common morbidity in elderly persons (aged 60 years or above). In India, in recent years, the number of old age homes (OAHs) and the residents living in them has increased significantly. **Objective:** The aim of this study was to estimate the prevalence of anemia among elderly persons living in OAHs. **Methods:** This was a cross-sectional study among individuals living in OAH in Delhi, India. Using combination of location and type of OAH, 28 clusters of almost equal sizes were created, of which 13 clusters were randomly selected, and all elderly persons living therein were selected for the study. Sociodemographic profile was recorded using a self-designed, semistructured interview schedule. Hemoglobin (Hb) was estimated using HemoCue Hb 201+ system. Binary Logistic regression was used to assess the socioeconomic determinants of anemia. **Results:** The study included 334 elderly persons, with a mean (standard deviation [SD]) age of 75.2 (8.6) years and mean (SD) Hb of 11.6 (1.7) g/dL. The mean (SD) Hb in men was 12.1 (1.7) g/dL compared to 10.9 (1.5) g/dL among women ($P < 0.0001$). The overall prevalence of anemia was 68.7% (95% confidence interval 63.9, 73.4); among those who were anemic, 47.4% had mild anemia, 47.0% had moderate anemia, and 5.6% had severe anemia. The prevalence of mild anemia was 45% in men compared to 24.8% in women. The odds of anemia among ≥ 80 years was 2 times that among 60–69 years ($P < 0.029$). **Conclusions:** The prevalence of anemia among elderly persons in OAHs is high in Delhi, India and increased with age.

Key words: Anemia in aged, hemoglobin, India, old age homes, prevalence

INTRODUCTION

Anemia is a common morbidity in elderly persons (aged 60 years or above). Contemporary understanding is that aging is a result of dysregulation of homeostasis. The complex signaling pathway that ensures homeostasis includes hormones, immune-regulating mechanisms, and oxidative stress/antioxidant equilibrium. Alteration in any of them can cause anemia. Once anemia sets in, it affects the distribution of oxygen, thereby causing further dysregulation, leading to frailty and disability. Anemia in elderly may result in a number of adverse health outcomes, including functional dependence and increased risk of therapeutic complications, falls, dementia, and death.^[1] Anemia can have more severe complications in elderly persons than in younger adults and can greatly hamper their quality of life. Appropriate early identification and treatment can help prevent such adverse outcomes. Anemia in elderly persons is often overlooked as symptoms of anemia, for example, weakness, fatigue, and shortness of breath are thought

to be due to aging leading to its misdiagnosis. Therefore, early detection of anemia in elderly is necessary to prevent delay in diagnosis of potentially treatable conditions.

Anemia, though fairly prevalent in elderly persons, is often missed, especially in routine clinical examinations.^[2,3] In India, the absolute number of elderly person is high. Between 1961 and 2011, the absolute number of elderly persons increased more than 4 fold from 24.7 million to 103.8 million.^[4] In terms of proportion, it increased from 5.6% in 1961 to 8.6% in 2011.^[4] Identification of anemia, and subsequent simple interventions even at primary care level, can reduce the adverse effects of anemia among elderly persons.

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In India, in recent years, the number of old age homes (OAHs) and the residents living in them has increased significantly. Residents of OAH are likely to be different from community dwelling elderly. It is not known if they are more likely to suffer from anemia as compared to their counterparts living in home environment. Hence, our objective was to estimate the prevalence of anemia among elderly persons living in OAHs in Delhi, India.

MATERIALS AND METHODS

Study design

This was a cross-sectional survey conducted among elderly persons aged 60 years and above living in OAHs of the National Capital Territory (NCT) of Delhi, India. Data were collected from May 2015 to October 2015.

Study area/setting

For the purpose of this study, we divided the NCT of Delhi into five zones. We collected preliminary information about the OAHs on selected parameters including their location, type, and border strength. This information was collected by either contacting the OAH telephonically or making visits to the center if required. This information gave us data for creation of the sampling frame. There were 36 OAHs in Delhi wherein their zone-wise distribution was north (13), east (2), west (6), south (11), and central (4). The OAHs were classified as charitable - one managed by a registered charitable trust (23), private - owned by a person or a group of persons (6), government - managed by state government or municipal corporation (4), and NGO - managed by a registered nongovernmental organization (3). The number of people living in an OAH, that comprised a cluster, varied, and hence, the OAHs where a lesser number of people were staying, i.e., clusters with smaller sizes, were merged together. The aim was to have the cluster sizes of around 35–40 so that all the clusters were more or less equal in size. Based on a combination of zone and type of OAH, 28 clusters of almost equal sizes were created.

Sample size and sampling technique

Of these 28 clusters, 13 were selected randomly. All elderly persons living in selected clusters were approached for recruitment into the study. Persons aged 60 years or more and living in OAHs were included in the study, while those elderly persons who were unable to comprehend or give answers were excluded from the study. Using the prevalence of anemia among elderly as 30% as reported by Malhotra *et al.*^[5] in their community-based study, with a relative precision of 20%, applying a design effect of 1.5, the minimum sample size required was 336, which with a nonresponse rate of 5% was increased to 354. We considered the design effect because the elderly persons staying in the same OAH would have a greater likelihood to be somewhat similar to one another. Since no prior information is available on the design effect among OAH settings, we considered 1.5 as a conservative measure.

Study tools and technique

A self-developed, semistructured interview schedule was used to record the sociodemographic profile and availability of medical care services. Hemoglobin (Hb) estimation was done using HemoCue Hb 201+ system (HemoCue AB, Kuvettgatan, Sweden). We defined anemia according to the World Health Organization, cutoff for Hb among elderly persons, i.e., a Hb level of <13 g/dL in men, and 12 g/dL in women at the sea level.^[6,7] The interview and measurement of Hb level were done by a single investigator.

Ethics approval was obtained from the Institute Ethics Committee of the All India Institute of Medical Sciences, New Delhi, India vide letter number IESC/T-415/28.11.2014, dated February 05, 2015. Informed consent was obtained from all participants following administration of the participation information sheet. Results of the Hb tests were immediately provided to them. Those elderly persons who had comorbidity were counseled, and if required, medications were prescribed. If further management was required, elderly persons were referred to an appropriate health facility.

Statistical analysis

Data were entered in Epi Info 7.1, (Centre for Disease Control and Prevention, Atlanta, USA) and analyzed using Stata version 12 (Stata Statistical Software: Release 12. College Station, TX: StataCorp LP).^[8] Continuous variables were expressed as mean with standard deviation (SD). The prevalence is expressed as percentages with 95% confidence interval (CI). Binary logistic regression was used to assess the socioeconomic determinants of anemia.

RESULTS

Of a total of 341 elderly persons approached for the study, 335 consented to participate (nonresponse rate of <2%). One woman with a Hb of 3.7 g/dL was considered an outlier and excluded from further analysis. The mean (SD) age of participants was 75.2 (8.6) years. There were a total of 129 (38.5%) men [Table 1].

Overall, the Hb level ranged from 3.7 to 15.4 g/dL with mean (SD) of 11.6 (1.7) g/dL and median of 11.6 g/dL. Hb levels ranged from 7.3 g/dL to 15.4 g/dL in men and 3.7 g/dL to 15.0 g/dL in women, with a mean (SD) of 12.1 (1.7) g/dL and 10.9 (1.6) g/dL in men and women, respectively. The difference in means of Hb among men and women was statistically significant. The median of Hb was 12.4 g/dL in men, while it was 11.1 g/dL in women.

The prevalence of anemia in men and women was 65.1% and 70.9%, respectively, with an overall prevalence of 68.7% (95% CI 63.9%, 73.4%) [Table 1]. Among those who were anemic, 47.4% had mild anemia, 47.0% had moderate anemia, and 5.6% had severe anemia (not shown in table). The overall prevalence of mild, moderate, and severe anemia among elderly persons was 31.3%, 32.5%, and 3.9%, respectively. The prevalence of mild anemia was almost double in men as

compared to women whereas the prevalence of moderate anemia was more than double in women as compared to men [Table 2].

Sex had no statistically significant effect on overall prevalence of anemia in binary logistic regression. Increasing age was a significant predictor of being anemic; compared to the age group of 60–69 years, the odds of having anemia was 1.65 at 70–79 years, which further increased to 1.97 at age 80 years and above. The presence of health insurance was another variable which was found significantly associated with being nonanemic [Table 3].

DISCUSSION

We report an overall prevalence of anemia of 68.7%, among elderly persons staying in OAHs in Delhi, India with the prevalence being a little higher among women (70.9%), compared to men (65.1%). We used the following MeSH terms in different combinations, with no time period limit for carrying out a PubMed search: “Homes for the Aged”[Majr], “Anemia”[Mesh], “Aged”[Majr], “India”[Mesh], “Prevalence”[Mesh]. However, we could not find any study on prevalence of anemia in OAH setting. Therefore, we refer to community-based studies to further compare the perspective of our study findings.

A total of eight studies had reported community-based prevalence of anemia among elderly in India.^[5,9-15] Parekh *et al.*^[12] from western India reported too low a prevalence of 3.9%, while Punia *et al.*'s study^[11] from North India found that almost all study participants (96%) had anemia. Three studies from southern Indian states reported prevalence rates between 17.7% and 38.2%.^[5,9,13] Agarwalla *et al.*^[10] from Assam in northeastern India reported a higher prevalence of 45.5%, while Swamy *et al.*^[14] from northern India reported still higher prevalence of 68.8%.

Three of these eight studies had not reported appropriately the inclusion criteria, thus making the interpretation of results difficult.^[11-13] Moreover, three of eight studies were not primarily designed for estimating anemia among elderly persons;^[5,12,14]

the reported findings were result of subgroup analysis. The estimated prevalence of anemia was therefore imprecise and could have been affected by factor of chance in those studies. Only three studies^[5,10,11] had calculated the required sample size.

The studies had used different methods for Hb estimation. While two studies did not mention the method of Hb estimation,^[9,12] one study had used cyanmethemoglobin method,^[11] and the rest used Sahli's method for estimating Hb. The abovecited reasons make a direct comparison with our study, difficult.

Anemia in aged is mainly caused by a gradual decrease in erythropoietin production by the kidneys; nonetheless, the decrease in Hb levels and consequent anemia in this age group should not be presumed to be a part of normal aging and should be adequately investigated and managed. This is important because studies have shown that in approximately 50% of elderly persons who had anemia, the reason is either iron deficiency,^[16] cobalamin deficiency,^[17] or chronic renal insufficiency.^[18] We recommend that future studies should address the causes of anemia.

The prevalence of anemia among residents of OAHs in Delhi was almost two to three times higher as compared to that among community-dwelling elderly persons. Often considered as a benign harbinger of getting old, anemia is not only a comorbid condition but also an ominous predictor of host of adverse health outcomes for the elderly persons. The risk of mortality among elderly persons increases with “any” level of anemia. Chaves *et al.* reported that the age and sex-adjusted hazards ratio for mortality were significantly higher among mildly anemic versus nonanemic individuals.^[19] At the same time, the increasingly poorer grade of anemia is associated with adverse health conditions. This highlights the need for increasing efforts to detect and treat anemia among residents of OAHs.

We found that “having a health insurance” had protecting effect against anemia among elderly persons in OAHs. It is possible that these elderly persons who had health insurance were more concerned about their health status. They may have had more

Table 1: Distribution of anemia among elderly persons (n=334)

Categories	Men (n1=129), n (%)	Women (n2=205), n (%)	Total, (n=334), n (%)	P
Normal	45 (34.9)	60 (29.3)	105 (31.4)	0.282*
Anemia	84 (65.1)	145 (70.7)	229 (68.6)	
Hb mean (SD)	12.1 (1.7)	10.9 (1.5)	11.6 (1.7)	<0.0001 [#]

*Pearson χ^2 for 1 degree of freedom=1.1583, [#]Independent samples *t*-test, Ho: diff=0, *t*=-6.42, degrees of freedom 332. SD: Standard deviation, Hb: Hemoglobin

Table 2: Distribution of severity of anemia among elderly persons by sex

Category	Men (n1=129), n (%)	Women (n2=205), n (%)	Total (n=334)	Chi square P
Normal	45 (42.9)	60 (57.1)	105	<0.0001
Mild anemia	58 (53.2)	51 (46.8)	109	
Moderate anemia	21 (19.4)	87 (80.6)	108	
Severe anemia	5 (41.7)	7 (58.3)	12	

Table 3: Association of anemia among elderly persons, with sociodemographic variables

Independent variables	n (% with anemia)	AOR (95% CI)	P [#]
Sex			
Women	205 (70.7)	Reference	-
Men	129 (65.1)	0.77 (0.48-1.24)	0.282
Age (years)			
60-69	88 (59.1)	Reference	-
70-79	142 (70.4)	1.65 (0.94-2.88)	0.079
80 and above	104 (74.0)	1.97 (1.07-3.63)	0.029
Education			
Illiterate	27 (55.6)	Reference	-
Primary	14 (64.3)	1.44 (0.38-5.45)	0.591
Primary completed	53 (66.0)	1.56 (0.60-4.01)	0.361
High school completed	124 (71.8)	2.03 (0.87-4.77)	0.103
Graduate/above	116 (69.8)	1.85 (0.79-4.34)	0.159
Occupation in past			
Professional	73 (71.2)	Reference	-
Teacher/clerk/business	113 (65.5)	0.77 (0.40-1.45)	0.414
Skilled worker	37 (54.0)	0.48 (0.21-1.08)	0.076
Homemaker or stayed at home	111 (74.8)	1.20 (0.62-2.32)	0.595
Type of family in past			
Nuclear	282 (68.1)	Reference	-
Nonnuclear	52 (71.1)	1.16 (0.60-2.21)	0.662
Current marital status			
Never married	43 (70.0)	Reference	-
Married	55 (58.2)	0.60 (0.26-1.40)	0.239
Widow/widower	223 (71.8)	1.10 (0.54-2.24)	0.792
Divorced	13 (53.9)	0.50 (0.14-1.79)	0.292
Health insurance			
No insurance	223 (72.7)	Reference	-
Health insurance present	111 (60.4)	0.57 (0.35-0.93)	0.023
Source of current income			
Pension	116 (64.7)	Reference	-
Savings	97 (67.0)	1.11 (0.63-1.96)	0.710
Given by children	53 (79.2)	2.09 (0.97-4.49)	0.059
Property	38 (79.0)	2.05 (0.86-4.88)	0.105
Others	30 (56.7)	0.71 (0.32-1.62)	0.420
Receives pension			
No	200 (70.5)	Reference	-
Yes	134 (65.7)	0.80 (0.50-1.28)	0.352

[#]P value considered significant at a level of <0.05. OR: Odds ratio, AOR: Adjusted OR, CI: Confidence interval

frequent health checkup and were prescribed treatment for anemia, if detected. Hence, the prevalence of anemia among those who had health insurance was lower compared to those who had no health insurance.

Although the mean Hb was significantly different between men and women, sex did not have any influence on the prevalence of anemia in elderly persons staying in OAHs. Increase in age was a significantly strong predictor of anemia among this population. With aging, the red blood cell production is compromised due to reduced ratio of bone marrow to fat cells and reduced marrow response when stimulated with

erythropoietin.^[20,21] Thus, age itself could cause anemia. Since we did not collect dietary information, we are unable to comment whether there was progressive decline in consumption of iron-rich food with advancing age. Therefore, the anemia could have been due to biological reasons alone or may have been coupled with poorer dietary iron with advancing age.

At present, under the National Programme for Health Care among Elderly of the Government of India, the strategy is focused on either establishing or upgrading geriatric departments in medical colleges or creating geriatric care units at district level hospitals. There is no provision of care component for the residents of OAHs. With increasing number of elderly persons living in OAHs and high rate of anemia among them, public health programmes for care among elderly should incorporate a separate mechanism to control this problem.

We tried to overcome the deficiencies identified in previously published literature. Our study was primarily designed for elderly persons and had the required sample size; Hemocue was used for measurement of Hb level in our study, which is considered to be valid and reliable tool for estimation of Hb in field-based studies. The reported sensitivity of Hemocue method is 0.75 and specificity is 1.0 when cyanmethemoglobin method is used as gold standard.^[22] We therefore feel that our findings are valid.

We measured the prevalence of anemia among elderly persons living in OAHs in Delhi. The robust sampling strategy ensured that the findings are generalizable to all elderly living in OAHs in Delhi. The nonresponse rate was <2%. The Hemocue used for estimating the Hb was calibrated, as part of annual calibration of hospital instruments, but not specifically for this study. We had not examined the peripheral blood smear. Therefore, we are unable to comment on type of anemia among these elderly residents of OAHs.

CONCLUSIONS

Almost two-third of elderly persons living in OAH were anemic. We recommend that a mechanism ought to be established to promptly detect and treat anemia among them.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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