Prevalence of anemia and its associated factors among the elderly in rural Puducherry, South India

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ABSTRACT

Background: Anemia in the elderly can lead to wide variety of complications as it is associated with increase in mortality and morbidity. **Objectives:** The objective of this study is to determine the prevalence of anemia and its associated factors among the elderly in rural Puducherry, South India. **Materials and Methods:** A community-based cross-sectional study was done among 236 elderly during May–June 2017. Information regarding sociodemographic, behavioral, and morbidity profile was collected using pre-tested semi-structured questionnaire. Digital hemoglobinometer was used to assess the hemoglobin level and the World Health Organization recommended cutoff was used to diagnose and categorize anemia. **Results:** Among 236 participants, mean (standard deviation) age was 67.9 (7.8) years. About 65.7% were females; 50% were practicing open-air defecation; 19.5% were current tobacco users, and 14.8% were current alcohol users; less than half were taking green leafy vegetables regularly; 46.3% of the elderly belonged to overweight and obese category. Regarding the morbidity profile, osteoarthritis was the most common morbidity among the participants followed by cataract. The prevalence of anemia among elderly participants was found to be 85.6% (95% confidence interval: 80.5%–89.5%). Majority of them belonged to moderate category. None of the factors explored in the study showed significant association with anemia. **Conclusion:** The current study found that almost nine in ten elderly in rural areas were anemic. Prevalence was slightly higher among the participants in higher age group, females, and those who practicing open-air defecation. Hence, it is important to identify these target population and develop appropriate intervention strategies to prevent anemia among the elderly.

KEY WORDS: Aged; Anemia; Epidemiology; Morbidity

INTRODUCTION

Anemia is a condition of public health concern that affects people of all age groups. The World Health Organization has reported that approximately 1.62 billion individuals around the world suffer from anemia which corresponds to almost one-fourth of the global population.[1] It is generally believed that anemia is more common among younger age group than among the elderly. However, studies around the world have shown that, with an increase in age, the risk of developing anemia also increases drastically.[2] This trend might continue due to an increase in life expectancy in both the developed and developing countries.

Anemia in the elderly can lead to a wide variety of complications as it is associated with an increase in mortality and morbidity either through cardiovascular or neurological

event such as cardiac arrest or stroke. In general population, hemoglobin levels were found to be lower among the elderly when compared to younger age group, for which mechanism has not being clearly understood.[2] The cause for anemia in the elderly could be multifactorial involving nutritional, physiological, or pathological factors.

Studies around the world have reported the prevalence of anemia in the elderly ranging from 12% to 54%.[2-4] In India, prevalence reported was much higher ranging from 30% to 96%.[5-7] Despite the high prevalence of anemia among the elderly reported in multiple studies, early diagnosis of anemia with its cause and prompt management with iron supplements or parenteral iron injection is not done on a routine basis which can prevent life-threatening complications such as stroke and cardiac arrest. The main reason for this trend is because of the misconception that anemia is more common among younger age group, especially among reproductive age group, pregnant women, and younger children.[5] Even in India, most of the nutritional programs and iron supplement initiatives are targeted toward younger age groups particularly women and children. Even though anemia is more common among elderly women, elderly males are also susceptible to anemia and its related complications. There are no national programs addressing anemia for elderly population as a whole.

Few studies estimated the prevalence of anemia among the elderly. There are no periodic estimates since large-scale surveys such as the National Family Health Survey report anemia status among children and women alone. Hence, further research is required to demonstrate the importance of screening for anemia among the elderly. Such early identification can help in providing a prompt referral for the confirmation of diagnosis and its cause and effective curative services for anemia. This is because consequences of anemia can be severe in the elderly population as they are more vulnerable in developing life-threatening cardiac complications leading to severe morbidity and mortality. There has been a scarcity of evidence regarding the associated factors for anemia among the elderly which is important in identifying the target population. Hence, the current study was done with an objective of determining the prevalence of anemia and its associated factors among the elderly in the selected villages of rural Puducherry, South India.

MATERIALS AND METHODS

A community-based cross-sectional study was carried out in the Rural Health Center (RHC) of a tertiary care institute which caters to a population of around 10,000. RHC provides comprehensive primary health care to the whole population residing in the four villages which are similar in terms of sociodemographic and cultural factors. The study was conducted during May–June 2017. Individuals belonging to the age group of 60 years or more in the study area were included in the study.

The sample size was calculated by OpenEpi v 3.01 (v 3.01 updated on 2013, USA) using the prevalence of anemia among thw elderly 29.9% based on a previous study;[5] with relative precision 20% and confidence interval of 95%, the sample size was calculated to be 236.

Primary sampling unit was households. The sample of households needed from each of the four villages was obtained using proportionate stratified sampling. Households were selected from each village through systematic random sampling. One eligible participant was selected from each household using Lot method. Households which were locked even after three visits and those without eligible participant were excluded from the study.

Data were collected by interns posted in the RHC using a pre-tested semi-structured questionnaire. The purpose of the study and procedure involved in the study were explained to the individuals before administration of the questionnaire. Individuals were also assured regarding confidentiality of the information, and data collection was started after obtaining informed consent.

The questionnaire consists of following sections: sociodemographic characteristics, self-reported morbidity profile and behavioural risk factors such as open air defecation, vegetable intake, barefoot walking, tobacco use, alcohol use and history of surgeries in the past; tobacco and alcohol use was classified using the WHO-STEP definition.[8] This questionnaire was standardized for our research by forward translation, expert panel back translation, and pre-testing of the questionnaire. Malnutrition was assessed by measuring body mass index (BMI). Height and weight were measured using standard procedures. BMI status was categorized based on Asia-Pacific guidelines.[9] Hemoglobin was measured using digital hemoglobinometer.

The interns were sensitized regarding the objectives of the study, confidentiality of information, participant's right, and informed consent and were also trained to administer the questionnaire to the individuals. Informed written consent was obtained for educated individuals, and thumb impression were obtained for illiterate after explaining the procedure of the study in their own language. Interns were also trained by the laboratory technician to use digital hemoglobinometer which measures hemoglobin level photometrically by causing lysis of red blood cell wall. Postgraduate residents supervised the data collection procedure by supervisory visits and review of all questionnaires at the end of each day.

The WHO recommended cutoff for hemoglobin level was used to diagnose and categorize anemia. For males, cutoff for the diagnosis of anemia was <13 g/dl; categorization of anemia among males was done using the following cutoffs: 11–12.9 g/dl (mild), 8–10.9 g/dl (moderate), and <8 g/dl

(severe). For females, cutoff for the diagnosis of anemia was <12 g/dl; categorization of anemia among females was done using the following cutoffs: 11–11.9 g/dl (mild), 8–10.9 g/dl (moderate), and <8 g/dl (severe).[10] Deworming was done for all elderly participants in the study. The elderly who were found to be anemic during the study were given iron and folic acid supplementation and then referred to RHC for further diagnostic workup.

Data were entered into EpiData v 3.01 software (EpiData Association, Odense, Denmark), and analysis was done using SPSS version 19.0. Continuous variables were summarized as mean (standard deviation [SD]). Prevalence of anemia was summarized as the proportion with 95% confidence interval. Bivariate analysis (Chi-square test/Fisher's exact test) was used to find the association of sociodemographic factors and anemia. Prevalence ratio with 95% confidence interval was calculated. $P < 0.05$ was considered statistically significant.

RESULTS

In total, 250 individuals satisfying the inclusion criteria were contacted during the study period, of which 236 individuals (94% response rate) were included in the study. The age of the study participants ranged from 60 to 100 years with mean (SD) of 67.9 (7.8) years. Majority (65.7%) of the participants were women.

Regarding the behavioral characteristics, it was found that half of the study participants (50%) were practicing open-air defecation; almost one-fourth did not wear footwear outside the home. Almost one-fifth (19.5%) of the participants were current tobacco users and 14.8% were current alcohol users; less than half were taking green leafy vegetables on a regular basis. Regarding the anthropometric characteristics, almost half (46.3%) of the elderly belonged to overweight and obese category. Regarding the morbidity profile, osteoarthritis (52.5%) was the most common morbidity among the participants followed by cataract (37.3%). More than one-fourth were suffering from hypertension (26.3%) and more than one-fifth had diabetes (21.6%) as depicted in Table 1.

Prevalence of anemia among the elderly participants was found to be 85.6% (95% confidence interval [CI]: 80.5% to 89.5%). Figure 1 shows the categorization of anemia based on the severity among the study participants. Majority (65%) belonged to the moderate category, followed by mild (30%) and severe (5%).

Table 2 depicts the association of sociodemographic, behavioral, and morbidity profile with anemia among elderly population in rural Puducherry, South India. Anemia was more prevalent among participants belonging to the age group more than 70 years, female participants, and elderly practicing open air defecation. However, none of the factors
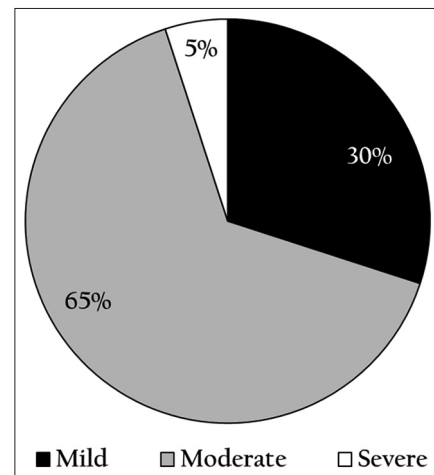
Figure 1: Distribution of study participants based on the severity of anemia (*n* = 236)

Table 1: Sociodemographic, anthropometric, and morbidity profile of elderly population in rural Puducherry, South India (*n*=236)

Characteristics	Frequency, *n* (%)
Age category (in years)	
60–70	167 (70.8)
71–80	56 (23.7)
>80	13 (5.5)
Gender	
Male	81 (34.3)
Female	155 (65.7)
BMI status	
Underweight (<18.50)	39 (16.6)
Normal (18.50–22.99)	87 (36.6)
Overweight (23.00–24.99)	45 (19.2)
Obese (≥25.00)	65 (27.6)
Chronic comorbidity	
Osteoarthritis	124 (52.5)
Cataract	88 (37.3)
Hypertension	62 (26.8)
Diabetes millitus	51 (21.6)
Hypothyroidism	4 (1.7)

BMI: Body mass index

were found to be statistically significant. Anemia was also found to be equally distributed, or there was no significant difference across tobacco users or participants with inadequate vegetable intake and barefoot walkers.

DISCUSSION

The present study conducted in rural Puducherry to determine the prevalence of anemia among the elderly estimated the prevalence to be 86% (95% CI: 80.5% to 89.5%). Majority of them (65%) had moderate anemia. None of the factors explored in the study showed a significant association with

Table 2: Association of sociodemographic, behavioral, and morbidity-related characteristics with anemia among elderly population in rural Puducherry, South India, *n*=236

Characteristics	Anemia, *n*=202 (%)	PR*	95% CI	*P*
Age category (in years)				
60–70	142 (85.0)	Ref	Ref	-
>70	60 (87.0)	1.02	0.91–1.14	0.69
Gender				
Men	66 (81.4)	Ref	Ref	-
Women	136 (87.7)	1.07	0.95–1.21	0.22
Practice of open-air defecation				
No	98 (83.0)	Ref	Ref	-
Yes	104 (88.1)	1.06	0.95–1.17	0.27
Walk barefoot outside the home				
No	48 (85.7)	Ref	Ref	-
Yes	154 (85.6)	0.99	0.88–1.12	0.98
Current tobacco user				
No	164 (86.3)	Ref	Ref	-
Yes	38 (82.6)	0.95	0.82–1.10	0.55

*Prevalence ratio. CI: Confidence interval

anemia among the elderly. This could be due to smaller sample size in the present study.

Studies around the world have reported varying proportion of anemia patients among elderly population ranging from 2.7% to 61%.[11-13] However, studies done in India have found higher proportion of anemia patients ranging from 12% to 96%.[5-7,14] The current study found that 86% of elderly were anemic. A similar study done in Puducherry showed even more higher prevalence where almost all the elderly (96%) in the study area were anemic.[7] Nevertheless, studies done in other rural parts of South India such as Telangana and Tamil Nadu found that around 60% of the elderly were anemic.[5,6] This difference in prevalence can be due to the screening method used in the current study when compared to other South Indian study as the digital hemoglobinometer method used in our study is highly sensitive. This could also be attributed partly to geographical and cultural differences. Prevalence of anemia was found to be slightly higher among females when compared to males in the current study. Similar findings were reported in the studies done in other parts of South India.[5-7] This can be attributed to the nutritional, menstrual, or gynecological problems faced by women during reproductive age group. This can lead to the development of anemia which can persist even after becoming an elderly if no corrective measures were taken.

This study has certain strengths. Since the current study was community based, generalisability will be better when compared to facility-based studies; high response rate and the use of standard WHO classification for diagnosis of anemia were added strengths to the study; participants who were found to be anemic during the study were given iron and folic acid supplementation and then referred back to the rural primary health center for further diagnostic workup. In spite of these strengths, there were certain limitations in the study. Even though hemoglobin estimation for all the participants was done using the same method, errors related to measurement could have occurred. Therefore, clinical evaluation of the patients and repeated measurements of hemoglobin level are required to confirm the diagnosis of anemia. This study has certain implications as it shows that most of the elderly population in the rural areas are anemic. This baseline information is important for the policy makers as more often, and elderly population are neglected in the screening for anemia. More attention is given to women in reproductive age group or pregnant women. Hence, clinical evaluation of all the elderly patients needs to be done from the lowest possible level of health care at the point of contact. In the present study, majority of the participants had moderate anemia which also calls for prompt treatment following screening. Frontline workers such as Anganwadi worker and Midwifery personnel can be trained in the clinical evaluation of anemia as they can do active screening for anemia among all the family members during their home visits. Further large-scale studies for the identification of possible causes of anemia among the elderly and qualitative study involving relevant stakeholders and healthcare workers need to be done to develop effective preventive, promotive, curative, and rehabilitative strategies.

CONCLUSION

The current study found that almost nine in ten elderly people in rural areas were anemic. Majority of them belonged to moderate category, followed by mild and severe anemia. The prevalence of anemia was also found to be slightly higher among the participants belonging to higher age group,

females, and practicing open air defecation. Hence, it is important to identify these target population and develop appropriate intervention strategies to prevent or cure anemia among the elderly.

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