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Prevalence of Anemia among Community Dwelling Elderly in Dakahlia as a Representative of Rural Areas in Egypt and Its Impact on Their Functional Status

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Abstract

Background: Anemia is a common problem with serious consequences in older person but is often overlooked despite considerable evidence that low hemoglobin levels indicate physiologic decline in these patients. Multiple studies demonstrate that anemia is an independent risk factor for increased morbidity and mortality, and decreased quality of life in community-dwelling older persons. Increasing functional deterioration is associated with decreasing hemoglobin concentration in an inverse and linear manner. *Aim*: to assess the prevalence of anemia in free-living elderly subjects living in an urban community of Meet Abbad-Nabaroh, Dakahlia. Egypt and its impact on their functional level. *Methodology*: A cross-sectional study was done including 93 elderly ≥ 60 ys old, both males and females recruited from Meet Abbad-Nabaroh, Dakahlia, Egypt. All subjects underwent a complete medical history taking, clinical evaluation then blood hemoglobin level was measured, and anemia was defined according to the World Health Organization definition of anemia (hemoglobin level less than 13 g per dL [130 g per L] in men and less than 12 g per dL [120 g per L] in women). *Results*: The study revealed that the prevalence of anemia is 15.05% among the studied participants (14.5% among the male group and 16.1% among females), 14% had mild anemia and 1% had moderate anemia, with significant increase with age as there was significant difference ($p = 0.042$) between the different age groups of the studied participants, also history of blood loss and anemia showed positive significant correlation (p-value = 0.001), and highly significant correlations between intake of non steroidal anti inflammatory drugs (NSAID) and anemia (p-value = 0.000). The impact of anemia on functional status and risk of fall respectively showed significant difference between anemic and non anemic as regards instrumental activity of daily living (IADL) ($p = 0.007$), and timed up and go test (p-value = 0.01), also there is significant corre-

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lation between anemia and mini mental state examination (MMSE) (p-value 0.046) with worse performance among the anemic ones. *Conclusion & Recommendation*: anemia represents a health problem of significance among the community dwelling elderly with bad drawback on their functional level; their need for health & community services has a financial impact so this problem needs more assessment for better prevention and treatment.

Keywords

Anemia, Community Dwelling Elderly, Functional Status

1. Introduction

Anemia is a common condition at all ages, but this is especially true among the older population since the prevalence of anemia rises with advancing age [1] [2] using the World Health Organization definition of anemia (hemoglobin level less than 13 g per dL [130 g per L] in men and less than 12 g per dL [120 g per L] in women) [3]. And according to the results of some epidemiologic studies, the prevalence of anemia among adults increases sharply after the age of 60 [4]-[6]. And due to the rising tendency of the aging population, the prevalence of anemia is also expected to rise in the future.

Prevalence figures of anemia in the elderly vary among different countries. Guralnik J.M. *et al.*, 2004 [7] reported anemia prevalence of 11% and 10.2% in free-living men and women aged 65 years and above in the United States. Another study carried out in the Netherlands showed that 28% and 17% of men and women aged 85 years and above were anemic [8]. In South Africa, [9] documented a prevalence of13.9% in a population of elderly persons of mixed ancestry (Afro-Euro-Malay).

Although it was previously believed that decline in hemoglobin level might be a normal consequence of aging, evidence has accumulated that anemia does reflect poor health and increased vulnerability to adverse outcome in older persons [7], accumulating that evidence exists on the consequences of anemia in the elderly, ranging from a general perspective regarding its negative impact on quality of life [10], to specifics such as diminished cognitive function [11] and decreased physical performance and muscle strength [12]. Studies showed that anemia impaired both cognitive functions and daily living activities in the elderly [11] [13].

So anemia should be treated properly among the elderly but in order to establish a proper diagnostic and treatment strategy, the assessment of the magnitude of this problem among the elderly population in rural area is important since studies have been conducted in urban areas more rather than in rural areas [14].

However, the prevalence and etiology of anemia in free-living elderly people of developing countries is not well established. In Egypt studies assessing the prevalence of anemia among urban community dwelling elderly were lacking; therefore the aim of this study was to assess the prevalence of anemia among community dwelling elderly living in Meet Abbad-Nabaroh-Dakahlia.

2. Patients and Method

Study design: cross-sectional study

Setting: the participants were recruited from Meet Abbad-Nabaroh-Dakahlia, where 150 elderly are living there according to [15], but only 93 elderly participated in the current study. Regarding the remaining 57 elderly who did not share as (7 died during the period of the research, 10 had sever cognitive impairment and the remaining 40 refused to participate).

Subjects: ninety three elderly 60 years and older, both males & females.

Methodology: All subjects were subjected to the following:

1) A *concent* to participate in the study was taken.

2) *Comprehensive geriatric assessment* including: Careful history taking, physical examination which includes: measurement of weight, height, waist to hip ratio and body mass index (BMI), assessment including:

a) Assessment of cognitive function using minimental state examination (MMSE) [16] arabic version [17].

b) Assessment of mood using geriatric depression scale GDS [18] arabic version [19].

c) Assessment of function using activity of daily living (ADL) [20] and instrumental activity of daily living

(IADL) [21], timed up and go test [22].

And d-assessment of nutritional status by (MNA) mini nutritional assessment and BMI considered nut. Assessment [23] with measurement of the Body Mass Index (BMI) and Waist Hip Ratio (WHR).

3) *Laboratory investigation*:

Serum hemoglobin (Hb) level was measured using BMS haemoglobinometer manufactured by American Optical Company in USA, CAT 1010 and SER. NO 23335. It has specificity of 96% and sensitivity of 77.5%. The average error was between 5% and 6% of the laboratory Hb value (0.6 g/dl). It is concluded that the BMS machine, besides being easy to use and giving a rapid result, is also sufficiently accurate for clinical practice [24].

Statistical analysis Statistical presentation and analysis of the present study was conducted, using the mean, standard error, unpaired student t-test, chi-square, and Linear Correlation Coefficient by SPSS V17.

Ethics: The study was approved by the scientific board of Geriatrics and Gerontology department, faculty of medicine Ain Shams University.

3. Results

Characteristics of the Studied Participants

Among the studied participants it was found that 69.89% of the participant were young old (60 - 74 years, n = 65) while (30.1%, n = 28) were old (above 74 years old), only one elderly male was above 85 years old. Regarding gender distribution 62 (66.67%) of the participants were females, while males represented (33.33%, n = 31). Regarding marital status (n = 50, 53.76%) of participants were widow, (44.09%, n = 41) were married, (1.08%, n = 1) was single, and (1.08%, n = 1) was divorced, while smoking habits showed that smokers represent (10.75%, n = 10) and non smokers represent (89.25%, n = 83), regarding educational level (75.27%, n = 70) were illiterate, (18.28%, n = 17) can read and write, while (1.08%, n = 1) had 1ry education, (3.23%, n = 3) had 2ry education and (2.15%, n = 2) had high education.

The prevalence of anemia among the studied participants was 15.05%, 14.5% (9\62) of the females were anemic while 16.1% (5\31) of the males were anemic. 13 (13.98%) of the participants had mild anemia (Hb from 10 to 11.99 g·%) and only 1 (1.08%) had moderate anemia (Hb from 7.1 to 9.99 g·%), while no participant had severe anemia (Hb less than 7 g·%). **Table 1**

By comparing between anemic (n = 14) and non anemic (n = 79) regarding demographic data, there was a statistically significant difference between both groups regarding age (p-value 0.042) with mean age (71 +/− 7.9) among the anemic group & (6.7 +/− 6.3) among the non anemic ones as in **Table 2** But no statistically significance difference between both groups regarding gender with p-value (0.838), smoking with (p-value 0.636), Educational level with p-value (0.094), and Marital status with p-value (0.941), **Table 2**.

Comparison between these 2 groups regarding past medical history showed that there is statistically significant correlation (p-value = 0.001) between presence of anemia and history of blood loss, also with the use of NSAID drugs as there is highly significant correlations between intake of NSAID and presence of anemia (p-value = 0.000), but no significant correlation between other past medical history and anemia as shown in **Table 3**.

Assessment of the nutritional status of both groups showed that regarding BMI and MNA the mean and SD of

Table 1. Prevalence of anemia among community dwelling elderly in Meet Abad nabaroh Dakahlia.

	HB1	
	N	**%**
Anemic (Hg < 12 mg/dl)	14	15.05
Non anemic (Hg ≥ 12 mg/dl)	79	84.95
Total	93	100.00
Chi-square X^2	45.430	
p-value	0.000	

Table 2. Comparison between anemic and non anemic as regard personal characteristics of the participants.

HB1	Age		T-test	
	Range	Mean ± SD	T	p-value
Anemic	60.0 - 85.0	71.000 ± 7.981	2.062	0.042*
Non anemic	60.0 - 80.0	67.063 ± 6.321		

		HB1						Chi-square	
		Anemic		Non anemic		Total		Chi-square	
		N	%	N	%	N	%	X^2	p-value
Gender	Male	5	35.71	26	32.91	31	33.33	0.042	0.838
	Female	9	64.29	53	67.09	62	66.67		
Special habit	Smoker	1	7.14	9	11.39	10	10.75	0.224	0.636
	Non smoker	13	92.86	70	88.61	83	89.25		
Educational level	Illiterate	11	78.57	59	74.68	70	75.27		
	Can read and write	1	7.14	16	20.25	17	18.28		
	1ry education	1	7.14	0	0.00	1	1.08	7.923	0.094
	2ry education	1	7.14	2	2.53	3	3.23		
	High education	0	0.00	2	2.53	2	2.15		
Marital status	Married	6	42.86	35	44.30	41	44.09		
	Single	0	0.00	1	1.27	1	1.08		
	Widow	8	57.14	42	53.16	50	53.76	0.395	0.941
	Divorced	0	0.00	1	1.27	1	1.08		

Table 3. The comparison between anemic and non anemic as regard past medical history.

	HB1						Chi-square	
	Anemic		Non anemic		Total		Chi-square	
	N	%	N	%	N	%	X^2	p-value
HTN	5	35.71	35	44.30	40	43.01	0.358	0.550
DM	2	14.29	22	27.85	24	25.81	1.142	0.285
LCF	3	21.43	15	18.99	18	19.35	0.045	0.831
Chronic renal impairment	0	0.00	1	1.27	1	1.08	0.179	0.672
OA	2	14.29	15	18.99	17	18.28	0.176	0.675
Gastritis	2	14.29	8	10.13	10	10.75	0.214	0.643
COPD	1	7.14	7	8.86	8	8.60	0.045	0.833
Cardiac diseases	2	14.29	9	11.39	11	11.83	0.095	0.757
No problems	3	21.43	7	8.86	10	10.75	1.957	0.162
History of blood loss	3	21.43	1	1.27	4	4.30	11.746	0.001*
NSAID	10	71.43	18	22.78	28	30.11	13.373	0.000*

HTN = hypertension, DM = diabetes mellitus, LCF = liver cell failure, QA = osteoarthritis, COPD = chronic obstructive pulmonary disease, NSAID = non steroidal inflammatory drugs.

anemic elderly is lower than those non anemic elderly, but this is of no statistical significance, but as regards WHR the 2 groups are nearly equal as shown in **Table 4**.

While by comparing both groups (anemic versus non-anemic) as regard functional status and risk of falls, there is statistically significant difference between both groups as regard MMSE, IADL and timed up and go test with (p-value 0.074, 0.007 & 0.01) respectively, but no statistically significant correlation with ADL & GDS as shown in **Table 5** & **Table 6**.

Table 4. Comparison between anemic and non anemic as regard nutritional assessment tools.

	HB1			
	Anemic	Non anemic	T-test	
	Mean ± SD	Mean ± SD	T	p-value
WHR	1.017 ± 0.082	1.002 ± 0.091	0.578	0.564
Body mass index	25.357 ± 3.692	27.228 ± 5.835	−1.156	0.251
Mini nutritional assessment	10.571 ± 2.793	11.291 ± 2.231	−1.070	0.288

WHR = waist hip ratio.

Table 5. Comparison between anemic and non anemic as regard functional states.

		HB1						Chi-square	
		Anemic		Non anemic		Total			
		N	%	N	%	N	%	X^2	p-value
	Independent	10	71.43	67	84.81	77	82.80		
ADL	Assisted	3	21.43	11	13.92	14	15.05	2.612	0.271
	Dependant	1	7.14	1	1.27	2	2.15		
	Independent	6	42.86	60	75.95	66	70.97		
IADl	Assisted	6	42.86	18	22.78	24	25.81	9.941	0.007[*]
	Dependant	2	14.29	1	1.27	3	3.23		
	0 - 10 sec	4	28.57	13	16.46	17	18.28		
Timed up and go test	11 - 20 sec	1	7.14	40	50.63	41	44.09	9.168	0.010[*]
	>20 sec	9	64.29	26	32.91	35	37.63		

ADL = activities of daily living, IADL = instrumental activities of daily living.

Table 6. Comparison between anemic and non anemic as regard mini-mental states examination (MMSE) and geriatric depression scales (GDS).

		HB1						Chi-square	
		Anemic		Non anemic		Total			
		N	%	N	%	N	%	X^2	p-value
GDs	**Depressed**	7	50.00	28	35.44	35	37.63	1.074	0.300
	Not depressed	7	50.00	51	64.56	58	62.37		
MMSE	**Impaired**	2	14.29	2	2.53	4	4.30	3.992	0.046[*]
	Not impaired	12	85.71	77	97.47	89	95.70		

GDS = geriatric depression scale, MMSE = mini mental state examination.

4. Discussion

In the current study the prevalence of anemia among elderly living in Meet Abbad-Nabaroh-Dakahlia was about 15% (14.5% of the females and 16.1% of the males) based on the WHO criteria for defining anemia, about 14% had mild anemia and 1% had moderate anemia, that is to say that about 93% of the anemic participants had mild anemia and 7% had moderate anemia.

Studies estimating prevalence of anemia among elderly in developing countries, including Egypt, are lacking, a cross sectional study done by [25] on 175 participants 60 years and older selected from geriatric clubs from Cairo and Giza governorates in Egypt, revealed that the prevalence of anemia in geriatric clubs was (24%), which is much higher than that in our study (15.05%), this difference may be due to different demographic characteristic of the participants of both studies including that in the current study the participants had more homogenous criteria.

Another higher prevalence of anemia than the current study was found among older Japanese by [26] [27] in Japanese and was 17.9% in women 60 years or older and in Taiwanese was (18.8%) among elderly populations. [28].In contrast the current prevalence is relatively high compared to other studies which estimates prevalence of anemia in developed countries, as the prevalence of anemia in community dwelling elderly American aged 65 years old was 10.6% [7], while the prevalence of anemia in community dwelling elderly Italian aged 65 years old was 11% [29]. But Differences in the age of participants and the study settings make direct comparisons impossible.

While the result of *Hee-Seon Kimand Byung-Kook Lee*., 2008 [14] was relatively similar to the the current study that the prevalence of anemia among rural older subjects was 12.5% (10.8% in men and 13.6% in women).

The current study showed that showed that prevalence of anemia significantly increased with increasing age that mean age was higher among the anemic group with p-value: 0.042, this agree with the result of Tettamanti *et al*., 2010 [30] that showed that prevalence of mild anemia and anemia significantly increased with increasing age (p < 0.0001).

As regard gender differences, prevalence among male participants (16.1%)was higher than females (14.5%), so prevalence of anemia increases in males than females and this agreed with other studies as [25], that was done in Egypt to assess the prevalence of anemia among elderly (60 years and older) recruited from geriatric clubs in Cairo and Giza governorates, which found significant statistical relation between anemia and gender, that males had higher prevalence (39.3%) of anemia than females (21.1%), also *Tettamanti et al*., 2010 [30] found that 1243 out of 8744 elderly living in Biella Italy were found to be anemic with a significantly higher frequency (p = 0.0001) in men than in women as 14.1% of male were anemic while 12.6% of female were anemic, another study found that 11.0% of men and 10.2% of women age 65 and older living in United states are anemic according to the WHO criteria [7].

On the contrary some studies had found the prevalence of anemia in elderly women higher than elderly men as a study done on 1716 community residents aged 60 years or older, anemia represents 10.2% in men and 14.1% in women [31], also another study on 1016 community-dwelling individuals, >85 years of age 17% of men and 28% of women [8], and study on 1016 subjects, 67 - 96 years of age 6.1% of men and 10.5% of women were anemic [32].

The differences between studies regarding gender prevalence of anemia needs to be further assessed and explained on physiological bases, as there is some explanations for this difference, men have a higher prevalence of anemia than women in most studies simply because the WHO definition is 13 g/dL in men and 12 g/dL in women [7], It is useful to question whether, 15 years and more after menopause, it is reasonable that women should continue to have lower hemoglobin levels than men, although higher testosterone levels in men do stimulate higher hemoglobin levels [33]. Ultimately, research on the association between low hemoglobin values and poor health outcomes will help determine whether women with hemoglobin levels between 12 and 13 g/dL experience adverse consequences.

The current study shows that there is no statistically significant difference in frequency of anemia among participants as regard their past medical history, except those who have history of blood loss as there is significant correlation (p-value = 0.001), also who use non steroidal anti inflammatory drugs (NSAID) drugs as there is highly significant correlations between intake and anemia (p-value = 0.000).

Multiple studies showing significant relation between history of blood loss and anemia, also absence of

symptoms do not exclude absence of the disease, as a study done on 48 patients with asymptomatic iron deficiency anemia shows that 29% had upper GIT lesions 33% had lower GIT lesions and 6% had both. [34].

In the current study comparison between anemic and non anemic participants as regard functional assessment tools, found significant difference in instrumental activity of daily living (IADL), that about 57% of the anemic group were assisted and dependent in IADL while only 24% of the non anemic group and this was statistically significant p = 0.007. Also about 64% of the anemic group had impaired timed up and go test while only 34% of the non anemic and this was significant p = 0.01, we can assume that even mild anemia, as 93% of the anemia is mild, in elderly can cause functional impairment and can increase risk of falls.

Penninx and colleagues found that decrements in performance of three different timed functional tests (standing balance, five repetitions of sitting and rising from a chair, and an 8-foot walk) roughly correlated with declining hemoglobin concentrations in community-dwelling elderly men and women [12].

This agree with other epidemiologic studies which found an association between anemia, even mildly low hemoglobin level and a worse outcome of activities of daily living (ADL), instrumental activities of daily living (IADL) [35], and increased Falls. [36].

And agree also with *Susan D. et al.*, 2006 [37] found clear association between anemia and both physical function. That at baseline, there was more impairment in functional status (both Katz ADL and IADL) among those with anemia than in those with no anemia. The difference between the anemic and non-anemic groups is statistically significant for baseline Katz and IADL.

And agree with *Terekeci H.M. et al.*, 2010 [13] found more impairment in functional status (Katz ADL) in anemic than non-anemic group.

In the current study there was a statistically significant difference between anemic and non anemic participants as regard mini mental states examination (MMSE), it was found that about 14% of the anemic group had impaired MMSE while only 3% of the non anemic were impaired (p = 0.046), that is to say even mild anemia can cause diminished cognitive function.

This agree with [38] who conclude A significant positive association was shown between anemia and global cognitive decline as well as the incidence of dementia.

Also agree with *Terekeci HM et al.*, 2010 [13] found more impairment in cognition (MMSE) (17.9 +/− 6.4 vs 21.7 +/− 6.7) in anemic than non-anemic groups, respectively.

And agree also with *Susan d. et al.*, 2006 [37] who concluded that a significant difference between anemic and non anemic group as regard cognition with lower scoring among the anemic group.

Assessment of the nutritional status of both groups showed that regarding BMI and MNA the mean and SD of anemic elderly is lower than those non anemic elderly, but this is of no statistical significance, but as regards WHR both groups were nearly the same, this partially agree with Hee-Seon Kim and Byung-Kook Lee., 2008 [14] who found that anemic subjects showed lower anthropometric status than non anemic ones with statistically significant difference as regard BMI (p-value 0.005).

Accumulating evidence exists on the consequences of anemia in the elderly, ranging from a general perspective regarding its negative impact on quality of life [10], to specifics such as diminished cognitive function [11]

Ultimately, clinical trials of anemia correction is necessary to prove that mild anemia itself has an independent adverse effect on outcomes relevant to older people, including quality of life, ability to maintain moderate to high levels of physical activity, maintenance of functional status, particularly related to mobility, and including cognitive function.

Our study has some limitations, first the relatively small number of participants, second some further investigations might be needed to know type of anemia.

5. Conclusion and Recommendation

According to WHO definition of anemia, the current study revealed that the prevalence of anemia is 15.05% among the studied participants with significant increase with age groups. And it exerts negative impact on both cognition and physical activity of the participants.

As anemia among the elderly is not merely a medical disorder but has its significant drawbacks on their functional level and this will increases their need for societal and governmental resources, so this disorder needs more investigation for both:

-The underlying cause of anemia which should be identified and treated whenever possible. *AND:*

-The impact on the functional level in order to improve the outcome of treatment.

Conflict of Interest

On behalf of all authors, there is no conflict of interest.

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