Derangement in renal & liver function in geriatric population with anaemia - A cross sectional study

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Abstract: *Background:* Across the globe several studies have shown different etiologies of anemia in old age, likely to belief anemia is not a consequence of senescence. *Objectives:* Primary objective was to estimate prevalence of Renal & Hepatic impairment and secondary objective was to determine any association between Renal or Hepatic impairment with variable degrees of anemia. *Methods:* This was a cross-sectional descriptive observational study. 278 samples were included of above 60yrs old suffering from Anemia. Prevalence of kidney & liver disease was calculated in percentages. Association between kidney and liver disease with severity of anemia was measured by prevalence ratio. *Result:* The prevalence of derangement in renal and hepatic function were found 14.1% (95%CI: 10.5,18.9) and 6.1% (95%CI:3.3,8.9) respectively. Prevalence ratio of moderate to severe anemia with impaired renal function in comparison to healthy kidney function is 1.6(95%CI: 1.2,2.2) and this same ratio with deranged hepatic function is 1.7(95%CI:1.1,2.6). *Conclusion:* The magnitude of kidney and liver disease in our study population was found to be above 10% and 5% respectively, and also have an association with severity of anemia. Hence anemia should always be looked for & renal & hepatic functions need to be monitored in the geriatric population.

Keywords: Impaired renal function, Deranged hepatic function, Geriatric, Anemia.

Introduction

Anemia is one of the common public health problem in geriatric population, particularly in developing nations, with highest prevalence in Africa and south-east Asia [1] It has been estimated that the world population will increase 3.7 times over the duration from 1950 to 2050, whereas the number of people over 60 yrs will be multiplied by the factor 10 [2]. The increasing trend of prevalence of anemia with aging has led to speculation that anemia is an inevitable consequence of aging. But an etiology is identified in approximately 80 percent of elderly patients, ranging mostly from chronic inflammatory disease and iron deficiency to Vitamin B deficiency, folate deficiency, gastrointestinal bleeding and myelodysplastic syndrome [3].

Our present study is an attempt to find out the magnitude of chronic renal and hepatic impairment in the anemic geriatric population, visiting a Kolkata based tertiary care centre. Early detection of the undiagnosed anemia or compromised renal & hepatic function might be beneficial for the betterment of the quality of life of the geriatric population.

Material and Methods

The present study was conducted in the Central and OPD Laboratory of Medical College Kolkata during the period of November 2021 to April 2022. Institutional ethical clearance was taken prior to the study [Ref No. MC/KOL/IEC/NON-SPON/1248/1/22. Dated: 03/01/2022].

Study Design: This is a Hospital based Descriptive cross sectional study.

Study population: 278 numbers of Elderly Patients (60 years or above) with defined Anemia, attending central laboratory of Medical College Kolkata.

Inclusion criteria: Age: ≥60 years; Hb level hemoglobin <7.4 mmol/L in women and <8.1 mmol/L in males to define anemia.

Exclusion criteria: Patients suffering from bleeding or inherited coagulation disorder, hematological malignancy, or receiving chemotherapeutic drug, having history of blood transfusion in past 3 months.

Sampling technique: Sampling was done by Non-probability Convenient sampling.
Sample size: 278

Calculation: N= $4\sigma^2/d^2$
σ= 3.77 i.e. the standard deviation of RDW in anemic elderly patients found by the previous study by Munesh et al[4] d=allowable error=12% of σ.

Methodology: Blood for complete hemogram was analyzed at 6 Part Automated Cell Counter and Renal & Hepatic parameters were analyzed at Auto Analyzer KONELAB 600i Prime.

Statistical Analysis: The data obtained were placed into a Microsoft excel sheet and then mathematical calculations were done by Microsoft Excel.

The study population has been divided into two groups depending on their Hb level; Moderate to Severe anemia was defined as Hb <6.2 mmol/L and Mild anemia as Hb <(6.2-7.4) mmol/L for women, (6.2- 8.1) mmol/L for men respectively. Study population has also been divided into three separate decades as 60-70 yrs, 71-80yrs and >80yrs of age groups. The type of anemia is defined as Normocytic (MCV: 80-100 fl), Microcytic (MCV:<80 fl) and Macrocytic (MCV: >100 fl). Impaired renal function was stated when serum Urea & Creatinine was greater than 10mmol/L and 177µmol/L respectively.

Impaired hepatic function was stated when any of the following parameters have been deviated from these values: Total biIirubin > 34.2 µmol/L, Direct biIirubin > 17.1 µmol/L, AST >135 U/L (3 times the upper cut-off range), ALT >105 U/L (3 times the upper cut-off range), ALP > 400 U/L, Total Protein <60gm/L, Albumin <30gm/L. The prevalence is measured in percentage along with 95% confidence interval. Prevalence ratio with

95% confidence interval was calculated to determine any association between Renal & Hepatic impairment with severity of anemia.

Results

Among the 278 anemic geriatric population, the proportion of 60-70 yrs old people was found 63.3% (176 in numbers); among them Male:54%, Female:46%, 71-80 yrs old people were 28.8% (80 in number); among them Male:61.2%,Female:38.8% and people >80 yrs old were 7.9% (22 in number); among them Male:68.2%,Female:31.8% [Figure 1].

Fig-1: Bar diagram showing distribution of Study population according to different age groups
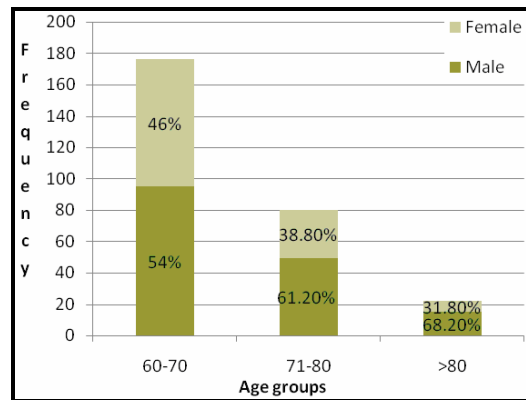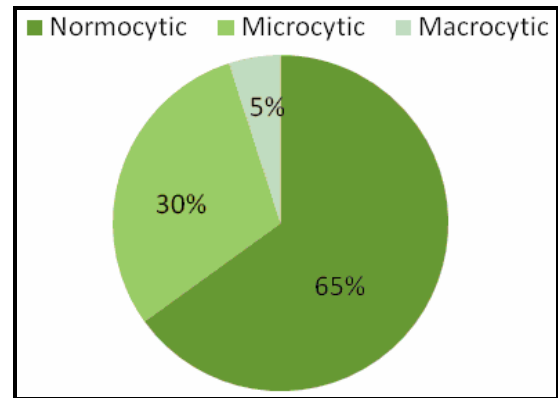

Fig-2: Pie diagram showing proportion of Normocytic, Microcytic & Macrocytic anemia in the study population

Proportion of Normocytic, Microcytic & Macrocytic anemic population was found to be 65.1%, 29.9% & 5.0% respectively [Figure 2]. The proportion of population having Mild anemia was 64.4% (58.8,70.0), and Moderate to Severe anemia was 35.6%(29.9,41.3), [Figure 3]. Their age wise distribution was found as follows:- 60-70yrs [Moderate to

Severe: 26.8%(20.3,33.3); Mild: 73.2% (66.7,79.7)], 71-80yrs [Moderate to Severe: 45.0% (35.0,55.0); Mild:55.0%(44.2,65.8)], >80yrs [Moderate to Severe: 72.8%(54.2,91.4); Mild: 27.2%(8.6,45.8)] [Table 1].

Fig-3: Pie diagram showing proportion of variable degrees of anemia in the study population
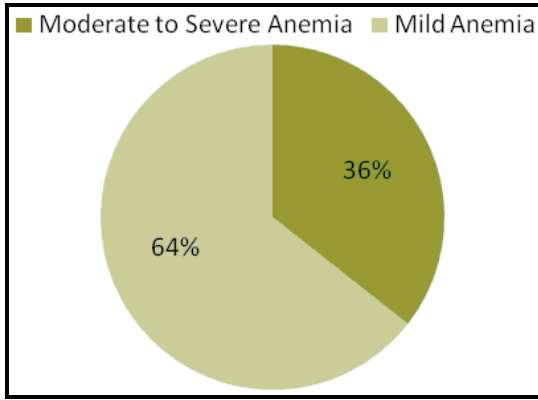
The prevalence of Impaired Renal Function among those anemic geriatric population was

found to be 14.7% (10.5,18.9); that is 41 among 278 people. [Male:39%,Female:61%] [Figure 4]. Age wise distribution of the prevalence was found as 60-70yrs 8.5% (4.4,12.6) ; 71-80yrs 15.0%(7.2,22.8) ; >80yrs 63.6%(53.3,73.9) [Table 2] [Figure 5].

The prevalence of Impaired Hepatic Function among those anemic geriatric population was found to be 6.1%(3.3,8.9); that is 17 among 278 people. [Male:71%,Female:29%] [Figure 4]. Age wise distribution of the prevalence was found as 60-70yrs 4.5%(1.6,7.4) ; 71-80yrs 6.3%(1.0,11.6);>80yrs 18.2% (2.1,34.3) [Table 2] [Figure 5].

The Prevalence Ratio of Moderate to Severe anemia in geriatric people with Impaired renal function in comparison to mild anemic population was found 1.6(95% CI:1.2,2.2) and this Prevalence Ratio in those people with Impaired hepatic function was found 1.7(95% CI:1.1,2.6).

Table-1: Age wise prevalence of different degrees of anemia in study population				
Different age groups	**Mild Anemia**		**Moderate to Severe Anemia**	
	Percentage	**95% CI**	**Prevalence**	**95% CI**
60 – 70 yrs	73.2	66.7,79.7	26.8	20.3,33.3
71 - 80 yrs	55.0	44.2,65.8	45.0	35.0,55.0
>80 yrs	27.2	8.6,45.8	72.8	54.2,91.4

Fig:-4: Bar diagram showing prevalence of deranged Renal & Hepatic function in the study population
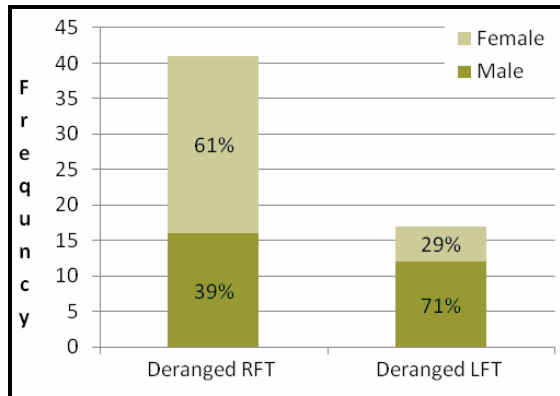

Fig-5: Bar diagram showing prevalence of deranged Renal & Hepatic function in different age groups among the study population
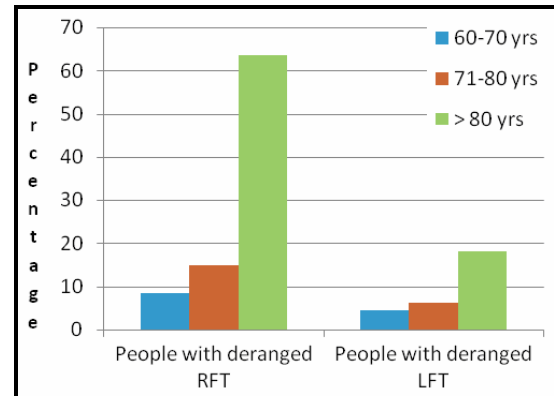
Table-2: Total and Age wise prevalence of deranged renal & liver function status in study population				
	Deranged RFT		**Deranged LFT**	
Total prevalence	14.7% (95% CI: 10.5,18.9)		6.1% (95% CI: 3.3,8.9)	
Prevalence in different age groups	**Percentage**	**95% CI**	**Percentage**	**95% CI**
60-70 yrs	8.5	10.5,18.9	4.5	1.6,7.4
71-80 yrs	15.0	7.2,22.8	6.3	1.0,11.6
>80 yrs	63.6	53.3,73.9	18.2	2.1,34.3

Discussion

In our study, Normocytic anemia was the most predominant one followed by Microcytic and then Macrocytic anemia.[Figure 2] This finding came along the expected line as similar picture has been reported in different studies [3, 5-7]. Mild anemia was more common findings in our study [Figure 3] than Moderate to Severe anemia which is in corroboration with a study performed in Iran.[8] But point to be notified here is, the proportions of Moderate to Severe anemia was shown to rise with every decades of age [Table 1].

The prevalence of impaired renal function (14.7%) was found to be relatively higher in comparison to the proportion of compromised hepatic function status (6.1%) in our study population. In this regard the striking part is the reverse gender distribution between impairment in Renal function (Male: 39% & Female: 61%) and in Hepatic function (Male:71% & Female:29%). [Figure 4] However the magnitude of prevalence was found to increase with the growing age in case of both renal and hepatic impairment.[Table 2,Figure 5]. The degree of reduced kidney function sufficient to cause anemia in older adults is a still evolving area [9-10].

Consequently, there is a need for a better understanding of renal impairment and anemia in geriatric population. In chronic liver disease, anemia may happen due to multiple factors; among them Bleeding is one of the most severe causes of anemia, with a high mortality rate [11]. The liver is the chief organ to regulate systemic iron homeostasis by acting as a sensor and regulator of iron levels [12]

We have also calculated the Prevalence Ratio of moderate to severe anemia in respect to impaired Kidney and Liver function status in geriatric patients to people having healthy kidney and Liver function. And Prevalence ratio is found 1.6 and 1.7 respectively; Indicating that the people having compromised renal function are 1.6 times more likely to suffer from moderate to severe anemia than mild anemia And people with altered hepatic function are 1.7 times more likely to suffer from moderate to severe anemia in comparison to mild anemia. Different studies did multivariate logistic regression to find out independent risk factor for Anemia in geriatric population. The results are very variable till now [13-14].

Limitation of our study:

1. Study population was not divided into different stages of chronic kidney disease by calculating eGFR & chronic liver disease by any of the Scoring system. Because of that, determination of any correlation between severity of anemia with different stages of those diseases could not be done.
2. Being a cross-sectional study, we were only able to calculate the prevalence, Cumulated Incidence or Incidence rate none of them could be measured.
3. CKD & CLD could not be identified as Independent risk factor for variable degrees of anemia in geriatric population, as various confounding factors were not alleviated by Multivariate logistic regression model.
4. Sample size would have been increased in number for more precise estimation of prevalence with narrower confidence interval.

Conclusion

The magnitude of kidney and liver disease in our study population was found to be above 10% and 5% respectively, and also have an association with severity of anemia. Hence anemia should always be looked for & renal & hepatic functions need to be monitored in the geriatric population.

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