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Original Article

Prevalence of Anemia in Community-Acquired Pneumonia Patients

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ABSTRACT

The frequency of anemia in intensive care units is well documented. Less is known, however, about the prevalence of anaemia in hospitalised patients with community-acquired pneumonia, which is one of the common reasons for hospitalisation, affecting both healthy and co-morbid individuals and is usually not accompanied with acute blood loss. **Objective:** To determine the frequency of anemia in patients presenting with pneumonia. **Methods:** This descriptive cross-sectional study was conducted with pneumonia patients at Department of Medicine Pulmonology in HDU/ICU Jinnah Hospital, Lahore curing thr period of three months. The 345 subjects with mean age 44.4 ± 9.4 (range: 20 – 60) years, male to female ratio 1:1.12, diagnosed with pneumonia underwent assessment of hemoglobin levels at presentation. Relationship between anemia and other co-morbidities has been evaluated that included duration of pneumonia, obesity, diabetes mellitus and hypertension. **Results:** The mean duration of pneumonia symptoms was 8.7 ± 6.9 (range: 2-25) days whereas the mean hemoglobin concentration was found 12.3 ± 6.9 g/dL ranged from 7.1 –14.6 g/dL. The prevalence of anemia was found to be 37.7% and 215(62.3%) of the 345 patients have shown normal hemoglobin levels. Female gender, higher age, greater duration of pneumonia symptoms and presence of diabetes mellitus significantly correlated with anemia in pneumonia (p-value < 0.05). Whereas, obesity did not have any significant effects on anemia in pneumonia (p-value > 0.05). **Conclusions:** Anemia was present in significant number of patients with pneumonia and was associated with female gender, Diabetes ,Hypertension and prolonged duration of pneumonia.

INTRODUCTION

Pneumonia is the most common cause of infectious disease-related morbidity and mortality despite advancements in microbiological diagnostic testing, antibiotic therapy, and preventive measures [1]. The main reasons behind the rise in global mortality are the effects of pneumonia on chronic illnesses, the ageing of the population, and the virulence features of the causing bacterium Other then iron, zinc and vitamin d deficiency also play role in weakening of human defence mechanisms [2].The most common cause of pneumonia is pnemococcal pneumonia. When selecting an antibiotic medication, clinicians face numerous obstacles due to the increasing prevalence of multidrug-resistant bacteria, hard-to-treat pathogens, and the emergence of novel diseases [3]. In developing nations, Acute Respiratory Tract (ARI) infections account for one in five childhood deaths; pneumonia causes 90% of these deaths. Severe Community Acquired Pneumonia (CAP) is more common in patients with underlying cardiac disease, lung diseases or previous hospitalization for pneumonia and the overall state of patients even get more worse when these patients became anemic. In vitro decreased red cell mass is associated with impaired phagocytic capacity and decreases cell mediated imunity [4]. Thirty percent of patients with Community Acquired Pneumonia (CAP) or pneumococcal pneumonia have been shown to have low haemoglobin levels [5]. Risk factors(clinical / laboratrical) associated with nosocomial pneumonia development in adult hospitalized patients are severe anemia, severe hypoalbuminemia, altered consciousness, and previous

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use of antibiotics [6]. Anemia's unexplained feature could indicate an underlying ailment or put a person at risk for infection. In the Pneumonia Severity Index (PSI), low hematocrit has been associated with a poor outcome for community-acquired pneumonia. According to the pneumonia prognosis, inpatient CAP patients frequently have low hematocrit and haemoglobin levels, associated with longer stay at hospital [7]. Han *et al.*, reported anemia (hemolytic type) in a patient with Mycoplasma pneumonia, after receiving antimicrobial therapy, lung lesions healed and haemoglobin levels increased [8]. The prevalenceof anaemia among hospitalised patients with less severe conditions or no organ dysfunction is less well-documented.

The current study aims to ascertain the prevalence of anemia and its potential function as a risk factor among hospitalised pneumonia patients.

METHODS

A descriptive cross-sectional study was carried out at the Medical floor, Pulmonology and HDU/ICU of Jinnah Hospital Lahore for a period of three months, after approval from the Ethical Review Board (ERB). The sample size of 345 cases was calculated using WHO Sample size calculator at 5% level of significance and 5% margin of error and 33.9% (97) expected percentage of anemia in pneumonia patients. The sampling was nonprobability, consecutive sampling. Male and female patients between the age of 20-60 years having pneumonia (as per operational definition) were included in the study. The study excludes cases of Cystic fibrosis, bronchiectasis, patients with comorbidities like Coronary Artery Disease (CAD), Chronic Liver Disease(CLD), Chronic Renal Failure (CRF) and bleeding disorders, previously diagnosed cases of brain tumor, tuberculous meningitis, viral or bacterial encephalitis or multiple sclerosis (based on history and medical record), Patients taking iron supplementation, Pregnant ladies and Patients not giving consent of participation. The patients admitted to the medical floor were selected as per inclusion and exclusion criteria. Confidentiality and anonymity-related issues were ensured. The data was collected on a self-designed preform formally approved by the Intuitional Ethical Review Committee. After informed consent the collected venous blood 3 ml samples were sent to the central laboratory of Jinnah Hospital Lahore to determine the hemoglobin levels to diagnose anemia within 24 hours of admission in hospital. The data was collected, compiled and analyzed statistically using SPSS. In order to determine the mean and standard deviation quantitative variables like age, symptom durations, and haemoglobin levels were used. For qualitative variables such as gender, diabetes, hypertension, anaemia (yes/no), frequencies and percentages were computed. Stratification was used to control effect modifiers like age, gender, diabetes, hypertension, aetiology, residential status, and length of symptoms. To investigate the impact on result, the post-stratification chi-square test was implemented. A p-value equal or less than 0.05 was considered as statistically significant.

RESULTS

The table 1 represents the age distribution of population (345 subjects) in the study with average age 44.4 ± 9.4 (range: 20 – 60) years. The highest number of patients were in the age group 41 – 50 years i.e., 165 (47.8%) with male to female ratio 1:1.12.

Table 1: Age Distribution of The Study Population

Age Groups (Years)	Number Of Subjects N (%)
21 – 30	21 (3.1%)
31 – 40	69 (20%)
41 – 50	165 (47.8%)
51 – 60	90 (26.1%)
Total	345 (100%)
Mean Age: 44.4 ± 9.4 years, Range: 20-60 years	

The mean duration of pneumonia symptoms in under investigation population was 8.7 ± 6.9 (full range 2 - 25) days. Majority (29.9%) of the patients fell in the duration of symptom group from 6 -10 days. Forty patients (11.6%) presented to us with pneumonia symptoms prevailing for more than 21 days. Table 2 represents the stratification of patients on basis of presence and absence of obesity, diabetes mellitus and hypertension. The 130 (37.7%) patients were identified to be obese whereas 215 (62.3%) did not fulfill the criteria of being obese. Similarly, 160 (46.3%) of the patients suffered from diabetes mellitus whereas 185 (53.7%) gave negative history about diabetes mellitus. In case of hypertension, 153 (44.3%) of the patients were hypertensive whereas 192 (55.7%) were normotensives.

Table 2: Stratification of Patients Based on Presence or Absence of Obesity, Diabetes Mellitus and Hypertension

Presence (Yes/No)	N (%)
Obesity	
Yes	130 (37.7%)
No	215 (62.3%)
Diabetes Mellitus	
Yes	160 (46.3%)
No	185 (53.7%)
Hypertension	
Yes	153 (44.3%)
No	192 (55.7%)

The average hemoglobin concentration value 12.3 ± 6.9 g/dL was observed for the patients under observation. The details readings are listed in Table 3.

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Table 3: Hemoglobin Concentration of our Study Population

Hemoglobin (g/dL)	Number of Patients N (%)
≤ 10	10 (2.9%)
10.1 – 11.0	22 (6.4%)
11.1 – 12.0	98 (28.4%)
12.1 – 13.0	150 (43.5%)
> 13.0	65 (18.8%)
Mean Hemoglobin Levels: 12.3 ± 6.9 g/dL, Range: 7.1 – 14.6 g/dL	

The prevalence of anemia was found 37.7% whereas 215 (62.3%) of the patients shown normal hemoglobin levels. The stratification of pneumonia patients with anemia diagnosis in context of age group are listed in Table 4. The data in Table 4 presents the effect of age to the prevalence of anemia. Maximum numbers of patients with anemia were in the age group 51-60 years. The 55 (61.1%) pneumonia patients were suffering from anemia in this age group. As far as effect of gender is concerned, the female population showed significantly higher prevalence of anemia than male population 80 (42.6%) in females versus 50 (31.8%) in males and the effect was statistically significant (p-value < 0.05).

Table 4: Relationship Between Anemia and age of The Pneumonia Patients

Age Groups (Years)	Anemia		Number of Subjects (n = 345) N (%)	p-Value
	Yes N (%)	No N (%)		
20 – 30	5 (23.80)	16 (76.10)	21 (6.1%)	0.0589
31 – 40	21 (30.00)	48 (70.00)	69 (20%)	
41 – 50	49 (29.00)	116 (71.00)	165 (47.8%)	
51 – 60	55 (61.00)	45 (39.00)	90 (26.1%)	
Total	130 (37.00)	215 (63.00)	345 (100%)	

Similarly, another statistical significance was observed in the relationship between anemia, in pneumonia patients, and duration of pneumonia symptoms. With increasing duration of pneumonia, lower values of hemoglobin were recorded giving a p-value of 0.00031 as depicted in Table 5.

Table 5: Relationship Between Duration of Symptoms of Pneumonia with Anemia

Age Groups (Years)	Anemia		Number of Subjects (n = 345) N (%)	p-Value
	Yes N (%)	No N (%)		
0 – 5	9 (10.00)	75 (90.00)	84 (24.3%)	0.00031
6 – 10	40 (38.00)	63 (62.00)	103 (29.9%)	
11 – 15	30 (46.00)	35 (54.00)	65 (18.8%)	
16 – 20	26 (49.00)	27 (51.00)	53 (15.4%)	
>20	25 (62.00)	15 (38.00)	40 (11.6%)	
Total	130 (37.00)	215 (63.00)	345 (100%)	

Amongst diabetes, hypertension and obesity, diabetes and hypertension has shown significantly higher prevalence of anemia in pneumonia patients whereas obesity did not reveal any statistically significant relationship with anemia in pneumonia patients as represented in Table 6.

Table 6: Stratification of Anemia in Patients with Respect to Obesity, Diabetes Mellitus and Hypertension

Diseases	Presence (Yes/No)	Anemia		p-Value
		Present N (%)	Absent N (%)	
Obesity	Yes	37.00 (37.7%)	63.00	0.0708
	No	38.00 (62.3%)	62.00	
Diabetes Mellitus	Yes	31.00 (69%)	69.00	0.0042
	No	43.00 (57.7%)	57.00	
Hypertension	Yes	36.00 (64%)	64.00	0.0241
	No	38.00 (55.7%)	62.00	

DISCUSSION

Community Acquired Pneumonia is a leading cause of admissions on medical floor [9]. Anemia can hamper the recovery of pneumonia patients and can be fetal at times. Low hemoglobin concentration has been linked to mortality risk in studies involving CAP patients [10]. There is growing intrest in hemoglobin levels of a person and its deficiency in nutrition and clinical medicine because of its crucial role in celluar function, energy metabolism and innate immunity [11]. it has been observed that a few studies have evaluated impact of baseline hemoglobin levels on different infection or overall imunity of humans.in a meta –analysis. [12] said that hemoglobin levels decrease with increasing age, diabetes, hypertension and with comorbidities and all these are risk factors for developing community acquired pneumonia. According to WHO criteria (Hb <12g/dl in females and <13g/dl in males), the prevalence of anaemia in the general population is 2.9% in men and 7.5% in women; among the elderly,the overall prevalence of anemia was 15.2% (15). Using an optimistic threshold of 12 g/dL for each gender, the results of our study discovered a significantly higher prevalence of anaemia than the overall population. The prevalence of anemia in community acquired pneumoniain our study is 37.7% Taking into account that anaemia is known to be linked to diminished mental and physical capacities as well as an increased risk of death, with each 1 g/dL rise in hemoglobin leads to 6% decrease in frailty [13]. Another study showed that 7–12% of patients had anaemia at presentation [7]. This ratio does not match those found in our investigation. Although Doshi *et al.*, in his study noted low hemoglobin in upto 30% of patients with CAP pnemococal pneumonia [4]. In another study Yanjun *et al.*, says that anemia wih low albumin is associated with severe community acquired pneumonia in pregnant ladies [14]. According to another study, the rapid decrease in haemoglobin levels that took place during the initial few days of the patient's hospital stay is consistent with reported values for intensive care unit patients [15, 16]. When these individuals are not bleeding, their haemoglobin levels can decrease by more than 0.5 g/dL/day. In addition to the dilutional effects of fluids and repeated blood draws,

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there are a number of other possible causes of these low readings, including gastrointestinal stress haemorrhage, surgical procedures, inflammatory cytokine effects, insufficient red cell production, and excessive red cell death [16]. Similar to our research, a study conducted by Michael C *et al.*, in 2010 [17] affirms their conclusion that anaemia was prevalent in hospitalized cases of community-acquired pneumonia (CAP). This was the case not only in patients with severe illness or risk factors for anaemia but also in patients with mild illness and a lack of risk factors. They also state that the development of anaemia was independently related to higher mortality after 90 days in patients with moderate to severe anaemia. However, further research has to be done to determine whether or not the treatment or prevention of CAP-associated anaemia might result in better clinical results. In line with our findings, where patients with diabetes mellitus had a significantly higher prevalence of anaemia in pneumonia, a study conducted by Sijun *et al.*, in September 2020 concluded that the parameter of diabetes mellitus and other comorbidities should be recognized in clinical practice, with active interventions to improve treatment success rates and clinical decision-making guidance [18]. According to a similar study conducted in 2021 by Dong *et al.*, individuals with Type-2 diabetes mellitus (T2DM) who have Severe Community-Acquired Pneumonia (SCAP) had different clinical features including anmia and a greater death rate compared to people without diabetes [19].Another study on the prevalence of anaemia in children, conducted in Bangladesh in 2022 by Mohammod *et al.*, reveals that 1712 (49.4%) of the 3,468 children who were diagnosed with pneumonia also had anaemia [20]. This finding supports the notion that anaemia is not exclusively prevalent among adults with pneumonia; minors also exhibit a similar pattern

CONCLUSIONS

Anemia is significantly prevalent in patients with community acquired pneumonia. The presence of anemia is more related to female gender, hypertension, duration of symptoms of pneumonia and presence of diabetes mellitus. Health policies on anemia screening should be employed to all pneumonia patients to avoid the adverse outcomes associated with anemia in pneumonia. Patients. Recognition, assessment, and management of anemia amongst this vulnerable population should me implemented.

Authors Contribution

Conceptualization: SS
Methodology: MUY
Formal analysis: SS[1], AG, SS[2], AA, MA
Writing, review and editing: SS, MUY

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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