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ROLE OF ANEMIA AS AN ETIOLOGICAL FACTOR AND PRBC TRANSFUSION AS A PREVENTIVE MEASURE AMONG CRITICALLY ILL PATIENTS AND ITS CONTRIBUTION TO ICU RELATED MORBIDITY.

Internal Medicine

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ABSTRACT

The World Health Organization (WHO) defines anemia as a hemoglobin <13 g dl for adult males and <12 g dl for adult non pregnant females. Anemia of Chronic Disease (ACD) refers to hemoglobin <12 g/dl associated with chronic infections and inflammatory disorders and malignancies. Anemia is a commonly encountered clinical problem in the critically ill. Ninety-five percent of critically ill patients who stay in the intensive care unit (ICU) for 72 hours or greater suffer from anemia and approximately 40% of them receive packed red blood cell (PRBC) transfusions.

Aim Of The Study: To study the role of anemia as a morbidity factor in critically ill patients admitted in ICU and PRBC transfusion role in morbidity at a tertiary care Hospital.

Method: It was a prospective observational study carried out over a period of one year from JAN 2021 TO JAN 2022. The study was carried out in the department of General Medicine, MAMS, Hyderabad. Total of 100 participants were included in this study. Both the sex was considered. Written informed consent form was taken from all the participants' included in this study. The data is stored in MS Excel spreadsheet and statistical analysis performed using open source 'R' programming language.

Result: In this study 72 patients (72%) had fever and 30 patients were Pale, 29 patients with pedal edema and 6 patients are with icterus. 48(48%) patients had diabetes mellitus, 34(34%) patients had hypertension, 12 patients had chronic obstructive pulmonary disease, 8 patient's hypothyroidism, and 21 (13%) patients ischemic heart disease.

Conclusion: Anemia cause is multifactorial. Available treatments for critically ill patients are not sufficient, therefore RBC transfusion must be done to prevent it.

KEYWORDS

Anemia, ICU Morbidity, RBC Transfusion.

INTRODUCTION:

Anemia is very common in critically ill patients, almost 95% of patients admitted to intensive care units (ICU) are found to have hemoglobin levels below normal. As a consequence, critically ill patients receive large numbers of red blood cell (RBC) transfusions. Studies demonstrate that 50% of all patients admitted to the ICU and 85% who stayed for more than 1 week received at least 1 RBC unit.[1] Anemia in critically ill pediatric patients is common.

The etiology is multifactorial and includes diminished erythropoietin activity, poor iron use by the body, and blood loss (both iatrogenic and non-iatrogenic).[2] In critical illness and injury, anemia results from two fundamental processes: a shortened RBC circulatory life span and diminished RBC production. Causes of shortened life span include hemolysis, phlebotomy losses, oozing at injury sites, invasive procedures, and gastrointestinal bleeding. Diagnostic phlebotomy in the critically ill represents a mean daily loss of 40 to 70 ml of blood, exceeding the normal healthy replacement rate of blood sent for analysis, less than 2% is actually assayed with modern laboratory instrumentation.[3]

New emerging treatments for anemia of inflammation directly address the hepcidin pathway. There are multiple approaches to decrease hepcidin over expression: antihepcidin antibodies, short interference RNA and antisense oligonucleotides against hepcidin, hepcidin-binding Spiegelmers and proteins, and bone morphogenetic protein-6 pathway inhibitors to suppress hepcidin expression, with some in clinical trials.[4]

Severe anemia could result in a decline in oxygen delivery, and hence, it may affect heart, kidney, metabolic pathway, and brain function among critically ill patients. As a result, anemia could be associated with worse outcomes during critical illnesses. The role of anemia in the prognosis of critically ill patients' remains debated. While anemia has been reported to be associated with prolonged length of ICU or hospital stay and increased mortality rate among critically ill patients suffering from sepsis, cardiogenic shock or trauma in some studies. In some other investigations these outcomes were not observed in patients with chronic obstructive pulmonary disease (COPD), cancer, and burn casualties.[5]

METHOD:

It's a prospective observational study**.** The study was carried out for a period of one year from JAN 2021 to JAN 2021.The study was carried out in the Department of General Medicine, MAMS, Hyderabad. Total of 100 patients were included in this study. Permission from the institutional ethical committee was obtained for the study. Among 100 patients 38 females and 62 male patients were included. Selection of cases was based mainly on clinical identification. Symptoms such as pale skin, hair loss, yellowing of eyes, muscle weakness, increase in heart rate etc. Relevant past history was recorded. The patients enrolled for the study were subjected to routine investigations which included complete blood count, hemogram, urine examination and blood biochemistry. Data collected at ICU admission included demographics such as type of admission, type of surgery, primary diagnostic category, co morbidities, history of anemia, recent acute blood loss. Investigations such as complete blood count, serum iron, serum ferritin, serum transferring, bone marrow sideroblasts etc.. were carried out. Data collected using preprinted case report forms.

The data is stored in MS Excel spreadsheet and statistical analysis performed using open source 'R' programming language.

Inclusion Criteria:

Age below 61 years included
Patients of either sex included (males and females)

Exclusion Criteria:

. Patients not willing to participate**.**
. Patients older than 61 years.

RESULTS:

Table 1-Age Composition Of Study

Age group in years	Male	Female	Total
	Frequency	Frequency	
≤ 20	0(0%)	3 (3%)	3
21-40	6(6%)	11 (11%)	17
41-60	33(33%)	15 (15%)	48
≤ 61	23(23%)	9 (9%)	32
Total	62 (62%)	38 (38%0	100

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In our study , a majority of patients 48 were in the age group of 41-60 years, 32 patients were in >61 age group ,17 patients were in 21-40 years age group, 3 patients were in <20 age group

Table 2-Sex Distribution Of Study Cases

SEX DISTRIBUTION		Frequency
Sex	Male	62(62.0%)
	Female	38(38.0%)
	Total	100

In this study 72 patients (72%) had fever and 30 patients were Pale, 29 patients with pedal edema and 6 patients are with icterus.

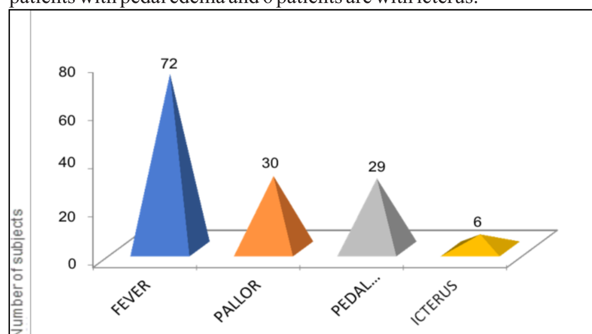

Figure 1-Physical Examination Findings In Critically Ill

48(48%) patients had diabetes mellitus, 34(34%) patients had hypertension, 12 patients had chronic obstructive pulmonary disease, 8 patient's hypothyroidism, and 21 (13%) patients ischemic heart disease.

Table 3 – Different Types Of Anemia In Study Cases

TYPE OF ANEMIA		Frequency
PERIPHERAL SMEAR	Normocytic	65 (65%)
	Macrocytic	15(15%)
	Microcytic	20(20%)
	Total	100

In this study, majority of the critically ill patients 65 had normocytic normochromic anemia, 20 patients had microcytic hypochromic anemia, and 15 patients had macrocytic anemia on peripheral blood smear.

Table 4 - Primary Diagnosis In The Critically Ill Patients

		Frequency
PRIMARY DIAGNOSIS	AECOPD	13(13%)
	CCF	5 (5%)
	CVA	25 (25%)
	DENGUE	12(12%)
	HEMORRHAGE	2 (2%)
	MENINGITIS	8 (8%)
	PNEUMONIA	16(16%)
	SEPSIS	1(1%)
	UROSEPSIS	18 (18%)
	Total	100

In this study, majority of patients belonged to sepsis group with primary diagnosis of urosepsis 18 patients, acute exacerbation of COPD 13 Patients , pneumonia 16 patient, dengue fever 12 patients, meningitis 8 patients, the remaining patients were in non-sepsis group with diagnosis of CVA 25 patients and CCF 5 patients.

Table 5 – Blood Transfusion Done In Critically ILL Patents

		Frequency
BLOOD TRANSFUSION	NO	56 (56%)
	YES	44(44%)
	Total	100

In our study, 44 critically ill patients required blood transfusion during MICU stay.

Table 6- Distribution Of Mortality In Critically ILL Patients

		Frequency
CRITICALLY ILL PATIENTS	Death	29 (29%)
	Improved	71 (71%)
	Total	100

Table 7: Sepsis-wise Comparison Of Condition On Discharge

Condition	SEPSIS	NO SEPSIS	TOTAL
IMPROVED	48 (70.6%)	23 (72%)	71
DEATH	20 (29.4%)	9 (28%)	29
TOTAL	68	32 (50%)	100

DISCUSSION:

Scharte M et al have concluded Anemia in intensive care unit patients resembles the anemia of chronic disease, being characterized by diminished erythropoietin production relative to decreased hematocrit, altered iron metabolism, and impaired proliferation and differentiation of erythroid progenitors in the bone marrow. Inflammatory mediators play a major role in the development of insufficient erythropoiesis and altered iron metabolism. Furthermore, a pro inflammatory milieu promotes structural and functional alterations of erythrocytes, and possibly impairing micro vascular perfusion.[6]

In our study, 100 patients were admitted to medical ICU, 38 patients were females and 62 patients were males .A majority of patients 48 were in the age group of 41-60 years, 32 patients were in >60 years age group, 17 patients were in 21- 40years age group, 3 patients were in <20 years age group. The mean age of study group was 48 years. This demographic data was similar to the data of another study by Vinh Nguyen Ba[7] where the mean age was 58yrs and males were more in number.

In our study, out of 100 patients, 34 patients already had anemia at the time of admission to ICU and majority of female patients 24 (70.6%) compared to 10(29.4%) male patients were already anemic. This can be explained as prevalence of anemia is high among females in our country, similar as compared to the study Walsh et al.[8] showed that 87% were anemic, with 24% of men and 28% of women discharged with [Hb] <90 g/L.

In this study, majority of patients belonged to sepsis group with primary diagnosis of urosepsis 18 patients, acute exacerbation of COPD 13 patients, pneumonia 16 patients, dengue fever 13 patients and meningitis in 8 patients. The remaining patients were in non-sepsis group with diagnosis of CVA 25 patients and CCF in 5 patients. These results were similar to a study done by Baugman et al.[9]

In our study, 44 critically ill patients required blood transfusion during their MICU stay. The results are comparable to study done by Munoz M et al.[10] where 40% to 70% patients received blood transfusion.

In our study, total number of deaths in critically ill patients was 29. Among 20 deaths, 20 were in sepsis group and 9 were in non-sepsis group. These results are comparable to Sharma et al. study[11] where the mortality was 40%. The lesser mortality is explainable as most of the dengue patients recovered well.

In this study, majority of the critically ill patients 65 had normocytic normochromic anemia, 20 had microcytic hypo chromic anemia, and 15 had macrocytic anemia on peripheral blood smear. On day 1 of admission to ICU, the mean Hb level among 61 sepsis patients was 11.56(SD 1.75) mg% and among 39 non sepsis patients was 12.07(SD 1.28) mg%. On day 3 of ICU stay, the mean Hb level among 61 sepsis patients was 9.49(SD 1.95) mg% and among 39 non sepsis patients was 10.88 (SD 1.75) mg%, these mean values are comparable to values obtained in Naveen et al. study[12]

CONCLUSION:

Anemia is a common complication in critically ill patients. It has an impact on patient morbidity and mortality. Blood transfusion results in various complications and infections, hence all attempts must be made to prevent and apply restrictive transfusion. Providing early nutrition and some transfusion strategies helps us to overcome the burden of anemia.

Disclosures:-

There was no funding from any organization. The authors have no conflict of interest to disclose the study

Ethical Approval:

The study is based on the data of our hospital ICU patients,hence necessary ethical approval was taken at the Institutional Ethics committee with due submission of proper proforma .

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