Hemoglobin Status of the Hospital Admitted Patients: A Cross-Sectional Study in A District Hospital of Bangladesh

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Abstract

Introduction: Anemia is a global public health concern, especially in lower and middle income countries like Bangladesh. The present study aimed to find out the hemoglobin level and prevalence of anemia among the patients admitted in a district hospital of Meherpur, Bangladesh.

Methods: This cross sectional study was conducted among 500 patients admitted to Medicine and Gynecology department of Meherpur General Hospital. After enrollment, 2-3 ml of blood sample was collected in EDTA tubes from each patients and hemoglobin level was determined using an automated hematology analyzer for determination of anemia as defined by the WHO. All statistical analyses were carried out using SPSS version 24.0 for a significant p-value <0.05.

Results: The mean (SD) age of the participants was 48.6 (18.9) years and almost 57% of them were female. Mean (SD) of the Hb level among the participants was 9.8 (1.7) g/dL which was significantly higher among men compared to women (10.1 mg/dL vs 9.5mg/dL). Overall prevalence of anemia was 93.8% (mild 25%, moderate 54% and severe 15%) and the prevalence was comparatively higher among women (96% vs 91%). Female sex and older age were significant risk factors of moderate to severe anemia among the participants though other variables like comorbidities and chronic NSAID use were not revealed as significant.

Conclusion: Anemia prevalence was very high among the patients admitted in Meherpur district hospital, especially among female and elderly patients. So, routine assessment and proper management of anemia of the hospital admitted patients is crucial for better treatment outcome.

Keywords: Anemia, Hemoglobin, NSAID, Comorbidity, Bangladesh

Introduction

Anemia is a condition in which hemoglobin (Hb) concentration and/or number of red blood cell are lower than normal and insufficient to meet an individual’s physiological needs.1 The top three contributing causes globally are iron deficiency, vitamin deficiency, and hemoglobin disorders like thalassemia, respectively.2 However, iron deficiency anemia (IDA) itself contributes to more than half of the anemia cases worldwide.3 According to the report of a global burden of disease study, more than 1.74 billion people from all over the world are suffering from anemia which corresponds to almost one-fourth of the total population.2 Global prevalence of anemia is highest among under-five children and pregnant women.

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However, the population group with the most significant number of individuals affected is non-pregnant women. The lower and middle-income countries of Western Sub-Saharan Africa, South Asia, and Central Sub-Saharan Africa have the highest anemia burden. Bangladesh is a lower-middle-income country in South Asia, having more than 160 million people. Nationally representative Bangladesh Demographic and Health Survey (BDHS) conducted in 2011 reported that 42% of the women of reproductive age were anemic. Some other studies conducted during recent years reported similar numbers which is mostly more than 40%. The rates in the urban population are slightly lower compared with rural areas (36% vs 45%), but are high enough to pose a considerable problem. Anemia was most prevalent in the northern part of the country (50% and 44% in Rangpur and Rajshahi division). In other divisions, it ranged from 37% in Khulna to 46% in Barisal division. In fact, hospital admitted patients are more vulnerable to suffer from anemia due to different chronic diseases, micronutrient deficiencies or infections. As a result, it is important to understand the pattern of anemia among the hospitalized patients for quality patient care and better treatment outcome. There are very limited studies which explores the frequency of anemia among hospital admitted patients in the northern region and hence, the present study aimed to find out the hemoglobin level and prevalence of anemia among the patients admitted in a district hospital of Meherpur, Bangladesh.

Materials and Methods

The present cross-sectional study was conducted in Meherpur general Hospital from June to December 2020. All the patients admitted in the Medicine and Gynecology department of the hospital was the study population. Patients aged ≥13 years, admitted to the aforementioned department, able to conduct the laboratory tests and conscious to provide consent were included in the study. Patients aged <13 years, unconscious, and unable to conduct the laboratory tests were excluded from the study. Systematic random sampling method was used to include patients in the study. All statistical analyses were carried out using SPSS version 24.0. Frequency distribution with percentage was used to describe categorical variables and mean with SD was used to describe continuous variables. Chi-square test and independent t-test were used for comparison between groups in case of categorical and continuous variables respectively. Logistic regression model was used to determine the risk factors of moderate to severe anemia among the participants. All statistical tests were interpreted at 95% confidence interval with a significant p-value of <0.05.

**Definition of anemia:** According to the WHO guideline. Hemoglobin levels at sea level (g/dL)

| Population           | Non-anemia | Anemia               |                |              |              |
|----------------------|------------|----------------------|----------------|------------|------------|
|                      |            | Mild                 | Moderate       | Severe     |            |
| Men                  | ≥13.0      | 11.0-12.9            | 8.0-10.9       | <8.0       |            |
| Non-pregnant women   | ≥12.0      | 11.0-11.9            | 8.0-10.9       | <8.0       |            |
| Pregnant women       | ≥11.0      | 10.0-10.9            | 7.0-9.9        | <7.0       |            |

**Results**

Total 500 patients were included in the present study. Their mean (SD) age was 48.6 (18.9) years. More than half (57%) of the participants were female, 11.4% participants had history of chronic non-steroidal anti-inflammatory drug (NSAID) use. Diabetes mellitus was the most prevalent comorbidity among the participants (17%) followed by hypertension (16.6%) and peptic ulcer disease (9%) (Table 1).
Table 1: Socio-demographic and clinical characteristics of the participants (n=500)

| Characteristics                                      | n  | %   |
|------------------------------------------------------|----|-----|
| **Age group (years)**                                |    |     |
| 13-17                                                | 20 | 4.0 |
| 18-30                                                | 93 | 18.6|
| 31-40                                                | 82 | 16.4|
| 41-50                                                | 81 | 16.2|
| 51-60                                                | 90 | 18.0|
| 61-70                                                | 91 | 18.2|
| 71-80                                                | 30 | 6.0 |
| >80                                                  | 13 | 2.6 |
| **Gender**                                           |    |     |
| Male                                                 | 215| 43.0|
| Female                                               | 285| 57.0|
| **History of chronic NSAID use**                     |    |     |
| No                                                   | 443| 88.6|
| Yes                                                  | 57 | 11.4|
| **History of comorbidities**                         |    |     |
| Diabetes mellitus                                     | 84 | 16.8|
| Hypertension                                          | 83 | 16.6|
| Peptic ulcer disease                                  | 44 | 8.8 |
| Osteoarthritis                                        | 27 | 5.4 |
| Hemorrhoid                                            | 20 | 4.0 |
| Chronic obstructive pulmonary disease                 | 17 | 3.4 |
| Asthma                                               | 16 | 3.2 |
| Rheumatoid arthritis                                  | 14 | 2.8 |
| Low back pain                                         | 12 | 2.4 |
| Chronic kidney disease                                | 9  | 1.8 |
| Ischemic heart disease                                | 7  | 1.4 |
| Pulmonary tuberculosis                                | 7  | 1.4 |
| Diagnosis                        | N  | Mean |
|---------------------------------|----|------|
| Pregnancy                       | 5  | 1.0  |
| Anal fissure                    | 4  | 0.8  |
| Dysfunctional uterine bleeding  | 4  | 0.8  |
| Fibroid uterus                  | 4  | 0.8  |
| FTP                             | 3  | 0.6  |
| Benign enlargement of prostate  | 3  | 0.6  |
| Abortion                        | 3  | 0.6  |
| Stroke                          | 2  | 0.4  |
| Hypothyroidism                  | 2  | 0.4  |

Figure 1: Hb level according to sex among the participants (N=500)

Mean (SD) of the Hb level among the participants was 9.8 (1.7) g/dL. Mean Hb level was higher among the male participants compared to their female counterpart (mean 10.1, SD 1.8 among male and mean 9.5, SD 1.5 among female, p-value of independent t-test <0.001). (Figure 1)

A total of 93.8% participants were suffering from some sort of anemia as defined by the WHO guideline. Among the participants almost 25% were suffering from mild anemia, 54% from moderate anemia and 15% from severe anemia (Figure 2).
Prevalence of anemia was significantly higher among the female participants (96.1%) compared to male participants (90.7%). The prevalence did not differ significantly according to the participants’ age or comorbidities (p-value 0.437 for age and 0.278 for comorbidities). Patients having history of chronic NSAID use had a slightly higher prevalence of anemia compared to their counterparts (96.5% vs 93.5%) though it was not statistically significant (Table 2).

**Figure 2:** Prevalence and severity of anemia among the participants

Prevalence of anemia was significantly higher among the female participants (96.1%) compared to male participants (90.7%). The prevalence did not differ significantly according to the participants’ age or comorbidities (p-value 0.437 for age and 0.278 for comorbidities). Patients having history of chronic NSAID use had a slightly higher prevalence of anemia compared to their counterparts (96.5% vs 93.5%) though it was not statistically significant (Table 2).

**Table 2:** Prevalence of anemia according to severity among the participants (N=500)

| Characteristics          | No anemia | Mild | Moderate | Severe | p-value |
|--------------------------|-----------|------|----------|--------|---------|
| **Age (years)**          |           |      |          |        |         |
| 13-17                    | 4 (20.0)  | 6 (30.0) | 9 (45.0) | 1 (5.0) | 0.437   |
| 18-30                    | 6 (6.5)   | 21 (22.6) | 49 (52.7) | 17 (18.3) |        |
| 31-40                    | 6 (7.3)   | 16 (19.5) | 49 (59.8) | 11 (13.4) |        |
| 41-50                    | 6 (7.4)   | 19 (23.5) | 47 (58.0) | 9 (11.1)  |        |
| 51-60                    | 5 (5.6)   | 28 (31.1) | 46 (51.1) | 11 (12.2) |        |
| 61-70                    | 1 (1.1)   | 27 (29.7) | 48 (52.7) | 15 (16.5) |        |
| 71-80                    | 2 (6.7)   | 5 (16.7) | 17 (56.7) | 6 (20.0)  |        |
| >80                      | 1 (7.7)   | 2 (15.4) | 7 (53.8) | 3 (23.1)  |        |
| **Gender**               |           |      |          |        | <0.001  |
| Female                   | 11 (3.9)  | 43 (15.1) | 181 (63.5) | 50 (17.5) |        |
| Male                     | 20 (9.3)  | 81 (37.7) | 91 (42.3) | 23 (10.7) |        |
| **History of comorbidities** |         |      |          |        |         |
| Yes                      | 18 (5.5)  | 88 (26.8) | 171 (52.1) | 51 (15.5) | 0.278   |
| No                       | 13 (7.6)  | 36 (20.9) | 101 (58.7) | 22 (12.8) |        |
| **History of chronic NSAID use** |       |      |          |        |         |
| Yes                      | 2 (3.5)   | 8 (14.0) | 39 (68.4) | 8 (14.0)  | 0.107   |
| No                       | 29 (6.5)  | 116 (26.2) | 233 (52.6) | 65 (14.7) |        |

P-value was determined using chi-square test

The logistic regression model demonstrated that risk of suffering from moderate to severe anemia increases among elderly participants. Participants aged between 61-70 years had 3 times higher risk of
moderate to severe anemia (aOR 3.36, 95% CI 1.13-9.93), while those aged between 71-80 years had a 6.5 times higher risk (aOR 6.59, 95% CI 1.78-24.43), and those aged more than 80 years had almost 8 times higher risk (aOR 7.83, 95% CI 1.52-40.19). Similarly, female participants were at 4.6 times higher risk of suffering from moderate to severe anemia compared to male participants (aOR 4.65, 95% CI 2.93-7.37). However, history of having comorbidities and chronic NSAID use were not revealed as significant risk factors of high grade anemia (Table 3).

**Table 3: Risk factors of moderate to severe anemia among the participants (logistic regression model)**

| Characteristics                  | aOR (95% CI)     | p-value |
|----------------------------------|------------------|---------|
| **Age (years)**                  |                  |         |
| 13-17                            | Ref.             |         |
| 18-30                            | 1.96 (0.69-5.59) | 0.205   |
| 31-40                            | 2.84 (0.96-8.39) | 0.058   |
| 41-50                            | 2.45 (0.84-7.18) | 0.101   |
| 51-60                            | 2.40 (0.82-7.02) | 0.110   |
| 61-70                            | 3.36 (1.13-9.93) | 0.028   |
| 71-80                            | 6.59 (1.78-24.43)| 0.005   |
| >80                              | 7.83 (1.52-40.19)| 0.014   |
| **Sex**                          |                  |         |
| Male                             | Ref.             |         |
| Female                           | 4.65 (2.93-7.37) | <0.001  |
| **History of comorbidities**     |                  |         |
| No                               | Ref.             |         |
| Yes                              | 1.02 (0.63-1.65) | 0.938   |
| **History of chronic NSAID use** |                  |         |
| No                               | Ref.             |         |
| Yes                              | 1.71 (0.78-3.70) | 0.175   |

*aOR = adjusted odd’s ratio*

**Discussion**

The present study provides an insight into the hemoglobin status, and prevalence of anemia among the hospital admitted patients of the Meherpur district. The National Micronutrients Status Survey conducted during 2011-12 reported that the mean Hb concentration was 12.4 g/dL (95% CI 12.3-12.6 g/dL) among the non-pregnant women and 11.5 g/dL (95% CI 11.3-11.7 g/dL) for preschool children of Bangladesh (10). Among the participants of our study, the mean (SD) of the Hb level was 9.8 (1.7) g/dL with significantly lower Hb level in females (mean 10.1, SD 1.8 among males and mean 9.5, SD 1.5 among females), which is relatively lower compared to the national report. Though there is a lack of nationally representative studies on the prevalence of anemia, the Demographic and Health Survey (BDHS) conducted in 2011 reported that 42% of the women of reproductive age were anemic.
(primarily mild to moderate anemia). On the contrary, our data revealed that a total of 94% of participants were suffering from some sort of anemia, which is much higher compared to the BDHS report (mild 25%, moderate 54%, and severe 15%). In addition, the prevalence of anemia was significantly higher among the female participants (96%) compared to male participants (91%).

According to the finding of our study, the risk of anemia increases with age, and elderly patients aged more than 80 years are at the highest risk. This finding is similar to a study that reported a significantly lower level of Hb concentration among the elderly population of Bangladesh. Anemia is expected in the elderly worldwide, and its prevalence increases with age, with the highest prevalence in men 85 years and older. Though we could not find out the cause of anemia in our study, it was reported that the most common causes of anemia in the elderly are chronic disease and iron deficiency. In addition, different studies conducted mostly among reproductive women of Bangladesh reported that lower educational qualification, lower socioeconomic status, having multiple children, and poor nutritional status (low BMI) were significant predictors of anemia in this country.

Different clinical trials evidenced that long-term use of NSAIDs has been associated with clinically significant decreases in hemoglobin concentration (>2 g/dL) and independent of acute bleeding events (16–19). However, in our study, patients with a history of chronic NSAID use had a slightly higher prevalence of anemia than their counterparts (96.5% vs. 93.5%) though it was not statistically significant (OR 1.71, 95% CI 0.78-3.70, p-value 0.175). Some limitations of the study would be worth mentioning. As the study included only admitted patients of a district hospital, the result cannot be generalized for the overall population of Bangladesh. Moreover, detailed socio-demographic data of the patients was not taken in our study, so evaluation of the risk factors of anemia was not possible. Despite these limitations, the study provides an overall picture of the hemoglobin status and prevalence of anemia among hospital-admitted patients of the Meherpur district.

**Conclusion**

Our study demonstrated that the Hb level was quite low among the patients admitted in Meherpur district hospital. Moreover, prevalence of anemia was quite high among these patients, especially among female and elderly patients. So, routine assessment and proper management of anemia of the hospital admitted patients with different diagnoses is crucial for better treatment outcome.

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