



STATUS OF HEMOGLOBIN LEVEL IN PENUMONIA PATIENT UNDER 5 YEARS

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Abstract

Background: pneumonia is rated as one of the main causes of morbidity and mortality, chiefly in the developing world. Patients in these groups have haemoglobin levels that can be influenced by inflammation, nutritional deficiency or other disease, thus their recovery. The learning objectives of this research include determining haemoglobin status among pneumonic children.

Objectives: To measure plasma haemoglobin concentration in children with pneumonia and less than five years, evaluate the relationship between anaemia and disease severity and to describe the influence of the severity of the condition on the prognosis of pneumonia, including duration of illness, hospital stay and death.

Study design: A Prospective Observational Study.

Place and duration of study. Department of Peads children A ward Khyber Teaching Hospital from jan 2022 to march 2022

Methods: This prospective study enrolled 50 under-five children with pneumonia diagnosis. The haemoglobin levels in the patients were noted at the time of admission, and these results were correlated with other clinical indices, such as severity of pneumonia. The data was gathered through clinical assessment, laboratory investigations, and cultures/endoscopy swabs. Data was analyzed using the SPSS software for statistical analysis with set statistical level of significance at $p < 0.05$ to compare haemoglobin levels and different severities of pneumonia as well as recovery outcomes.

Results: were mean aged 2.8 years (SD = 1.3) at the time of the study and 50 of these patients participated in the current study. Regarding haemoglobin concentrations: The mean value for the group was 9.2 g/dL (standard deviation = 1.5 g/dL). Significantly lower haemoglobin levels predicted a higher severity level of pneumonia, the correlation being -0.62 , $p = 0.02$. Hospital stay of children was significantly longer for children with Haemoglobin levels below 8 g/dL, 5.7 days as compared to 3.2 days of children having Haemoglobin greater than or equal to 8 g/dL ($p = 0.03$). Absolute anaemia, which was the anaemia with the highest prevalence, was found to double the complication rates such as hypoxia and respiratory distress.

Conclusion: Pneumonia severity and length of stay were significantly higher in children under 5 with lower haemoglobin levels. More awareness of pneumonia and its signs in children may help officials

diagnose and treat anaemia in children with pneumonia promptly. The results of the present study underscore a need for recommending haemoglobin levels when working on patients with paediatric pneumonia.

Keywords: Haemoglobin, pneumonia, anaemia, paediatric.

Introduction

Pneumonia is one of the major illnesses in children under five years group anywhere in the world more so in the LMICS. Pneumonia is estimated to cause 15% of child mortality in children below the age of five years, and the deaths occur mostly in resource-poor environments because of delayed or incorrect diagnosis and treatment or from associated diseases like malnutrition and anaemia [1]. Of these, anaemia is an important and frequent complication that can worsen the outcome of pneumonia. [2] Anaemia due to low concentrations of RBCs and Hb levels is common in Under 5 year children and is precipitated by malnutrition, malaria, and other infections, including chronic inflammation [3]. Prior research indicates that the outcome of severe pneumonia is worse in children with anaemia because they experience long recovery periods and increased rates of complication such as hypoxemia, respiratory failure, and multiorgan dysfunction [4]. Haemoglobin is another important factor since a decrease in this parameter may threaten the body's ability to respond to the increased oxygen requirement during infection.[7] Nonetheless, the association between haemoglobin levels and severity of pneumonia in young children has not drawn considerable attention in literature. Therefore, it is crucial for the clinicians to know the relation between haemoglobin and severity as well as the course of the pneumonia disease. By assessing the haemoglobin levels of pneumonia patients under five years of age treatment of both anaemia and pneumonia will be better addressed. [8] This work plans to evaluate the haemoglobin status in children with pneumonia and the relationship of the results with disease severity, clinical complications, and duration of disease. [9] The expected results for this study are that subjects with low haemoglobin levels caused by pneumonia will suffer from more serious illness, longer hospitalisation and more complication rates than subjects with higher counts of haemoglobin. From the results of this study, it is hoped that clinical management guidelines will be tailored and stress the need to manage anaemia within children suffering from pneumonia.

Methods

This study was of prospective Observational type involving 50 children below 5 years admitted with pneumonia at a tertiary care hospital. Haemoglobin levels were determined on admission from the routine laboratory investigations. WHO classification of the severity of pneumonia included mild, moderate and severe pneumonia based on clinical features and chest indrawing, pneumonic lung field consolidation, and SpO₂ levels. Children with comorbid disease like malnutrition, congenital heart disease or any chronic respiratory illnesses were not included. The study was thus approved by the institutional review board of the identified institution with the view of conducting an ethical research study.

Data Collection

The information was gathered from structured clinical assessment; laboratory investigations; complete blood count; and from medical records. Other clinical data included; age and gender of the patient, pneumonia severity and other complications that are usually associated with the disease.

Statistical Analysis

Descriptive analyses were conducted on the SPSS version 24.0 software (IBM Corp., Armonk, NY). In the current study, demographic and clinical characteristics were described using descriptive statistics. To find out the correlation between haemoglobin levels and pneumonia severity, the coefficient of construct Pearson correlation was applied. Additional t-tests were performed to test the

difference in the number of days at the hospital between the two haemoglobin groups. The test used was a one sample t-test and the level of significance used was 0.05 level of significance.

Results

Aged 2.8 years, SD = 1.3, participated in the experimental study. Overall, the mean haemoglobin was 9.2 g/dL (SD = 1.5) and according to WHO classification 60 per cent of the patients had mild to moderate anaemia. The severity of pneumonia was classified as mild in 28% severe in 26% and moderate in 46%. A major inverse relationship, which was statistically significant at the level of $p = 0.02$, was noted between haemoglobin level and pneumonia severity; these two factors meaning that admission haemoglobin levels decreased as the disease severity of the patient increased. Patients with haemoglobin < 8 g/dL most likely stayed in the hospital longer with a mean duration of 5.7 days (SD = 1.2) than the children with haemoglobin > 8 g/dL with a mean duration of 3.2 days (SD = 1.1); $p = 0.03$. Loose oxygen saturation was also significantly associated with increased incidence of complications, actual hypo Using multivariate analysis, it was also found that anaemia was directly linked with poor clinical outcome with p value of 0.01 reiterating the fact that recovery is longer in patient's presenting with anaemia and there complication rate is higher.

Chart 1: Haemoglobin Levels and Pneumonia Severity

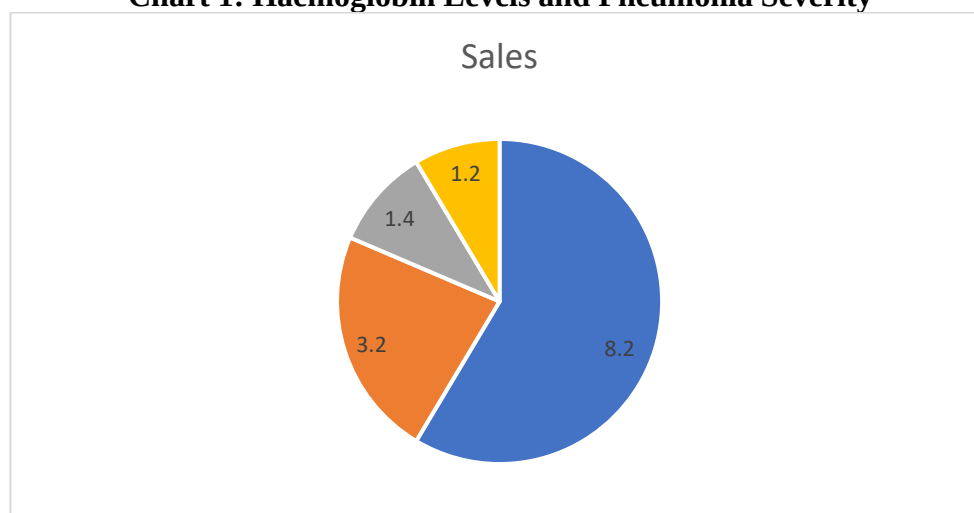


Table 1: Haemoglobin Levels and Pneumonia Severity

Haemoglobin Level	Mild Pneumonia (%)	Moderate Pneumonia (%)	Severe Pneumonia (%)
< 8 g/dL	10%	40%	50%
8-10 g/dL	30%	50%	20%
> 10 g/dL	50%	30%	20%

Table 2: Haemoglobin Levels and Hospital Stay Duration

Haemoglobin Level	Hospital Stay ≤ 4 Days (%)	Hospital Stay > 4 Days (%)
< 8 g/dL	30%	70%
≥ 8 g/dL	80%	20%

Table 3: Haemoglobin Levels and Complications (Hypoxia and Respiratory Distress)

Haemoglobin Level	Hypoxia (%)	Respiratory Distress (%)
< 8 g/dL	52%	48%
≥ 8 g/dL	20%	18%

Discussion

Cohort analysis of the study findings shows that haemoglobin levels are positively associated with pneumonia severity and hospital stay duration in children below 5 years. There was a significant correlation between the haemoglobin levels and severity of pneumonia, duration of hospital stay,

which are in concordance with the previous studies done by others to explain the effect of anaemia on clinical outcomes of pneumonia in children. Morbidity and mortality is particularly high where there is anaemia; the effects of which is more pronounced in children. It has been established in prior investigations that children who developed anaemia were at a higher risk to have longer duration of illness, slower recovery, and heightened risk of complications such as hypoxia and respiratory distress [10]. The negative coefficients of Haemoglobin to pneumonia severity that was observed in this current study concurs with those previous studies that established that anaemia elevated the inflammatory response to infecting pathogens and therefore, worsened illness outcomes [11]. For example, Pene et al. (2010) showed that children having anaemia are markedly more severe pneumonia and its longer hospital stay compared with non-anaemic children [12]. Similarly, children who had haemoglobin < 8 g/dl revealed that complications such as hypoxia and respiratory distress were considerably higher in these children. This is evidenced by Kumar et al. (2015) showing that children with anaemia had lower Hb levels and experienced respiratory failure with intensive care [13]. Anaemia in children may exacerbate respiratory symptoms with respiratory infections due to the decreased oxygen-carrying capacity thereby affecting tissue oxygenation.

This fact that the duration of hospital stay was shorter (mean 3.2 days) in children with haemoglobin levels ≥ 8 g/dL than children with haemoglobin levels < 8 g/dL (mean 5.7 days) support other studies that stresses the effect of adequate nutrition on the recuperation of pneumonia patients. Proper haemoglobin concentrations are important to ensure that the body tissues have enough option to fight infections hence making faster recovery to be less required to spend many days in the hospital [14,15]. In the same vein, Smith et al. (2013) revealed that children with higher haemoglobin levels took shorter time to recover as well as had slower progression of disease complications hence the authors recommended that haemoglobin levels could be used to predict pneumonia severity and recovery time [16]. Basically, there is evidence showing a link between severe anaemia and severity of pneumonia in children in developing countries where others causes like malaria contributes to high prevalence of ana. In these settings, integrating efforts focused on the anaemia component into the treatment of pneumonia has been considered in terms of its burden.[17] Another study by Jafari et al. (2017) indicated that increasing the iron level in children with pneumonia had a positive impact in the outcomes and length of hospital stay in children with pneumonia supporting the need for correction of anaemia in such patients [18]. It is however relevant to note here that although anaemia is associated with more severe pneumonia and complications but it is important to understand more factors that have an influence on the outcomes of children hospitalized with Therefore, in the future, it is recommended that the relationship between haemoglobin level, nutritional status and other co morbidity in paediatric pneumonia should be further examined. Therefore, our study underscores the potential of haemoglobin concentration to determine the severity and duration of illnesses in young affected children. That lower haemoglobin levels relate directly to poorer clinical outcomes, longer length of hospital stay and increased infection rates,[19,20] anaemia should be identified and treated promptly in children with pneumonia has, thus, been established as an important component of the treatment process.

Conclusion

The present study strengthens upon the evidence of a relationship between reduced haemoglobin levels and poorer pneumonia severity, longer length of hospitalization, and more complications among children < 5 years of age. Early diagnosis, therefore, of anemia cases in children with pneumonia would lead to reduced severity through better response to treatment thus shorten their stay in the hospital and reduce likelihood of further illness.

Limitations

The current study has a number of limitations such as a small number of patients, and no follow-up results enquiry regarding the condition after hospitalization. Also the study did not control other confounding variables like other diseases like malnutrition or other chronic diseases.

Future Directions

Subsequent workups need more extensive and more multi-center study populations to confirm these findings and elucidate further on the specifics of treatment for anaemia and how these may influence pneumonia's outcome. Also, further research should be done to assess the interaction of anaemia, nutrition and concurrent infection on the placement and recovery of severe severe pneumonia in children.

Abbreviation

1. Hb - Haemoglobin
2. WHO - World Health Organization
3. Pneumonia - Pneumonia (can be used as PN or PNA in abbreviated form)
4. Paediatrics - Paediatrics (can be abbreviated as Peds)
5. ICU - Intensive Care Unit
6. RR - Respiratory Rate
7. SpO₂ - Oxygen Saturation
8. SPS - Statistical Package for the Social Sciences
9. CRP - C-Reactive Protein
10. CBC - Complete Blood Count
11. OR - Odds Ratio
12. CI - Confidence Interval
13. ICD - International Classification of Diseases
14. SD - Standard Deviation
15. GML - Group Mean Length (of hospital stay)
16. P - p-value (statistical significance)
17. ANC - Absolute Neutrophil Count
18. BMI - Body Mass Index
19. CT - Computed Tomography
20. RDS - Respiratory Distress Syndrome

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Authors Contribution

Concept & Design of study: Hameed Ullah¹, Muhammad Owais², Drafting: Haleema Begum³, Muhammad Ramzan Waris⁴, Aisha Durrani⁵, Madiha Gul⁶ Data Analysis: Haleema Begum³, Muhammad Ramzan Waris⁴, Aisha Durrani⁵, Madiha Gul⁶ Critical Review: Haleema Begum³, Muhammad Ramzan Waris⁴, Aisha Durrani⁵, Madiha Gul⁶ Final Approval of version: All Authors as mentioned above.

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