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A CROSS-SECTIONAL ANALYTICAL STUDY OF MICROCYTIC HYPOCHROMIC ANEMIAS WITH EVALUATION OF THE ASSOCIATION BETWEEN IRON DEFICIENCY ANEMIA AND HELICOBACTER PYLORI IN A TERTIARY CARE CENTRE

Pathology

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ABSTRACT

Background: Microcytic hypochromic anemia is the most common morphological type of anemia encountered in clinical practice, particularly in developing countries. Iron deficiency anemia (IDA) is the predominant cause; however, increasing evidence suggests an association between Helicobacter pylori infection and refractory IDA. **Objective:** To study the clinico-hematological profile of microcytic hypochromic anemia and to evaluate its association with Helicobacter pylori infection. **Materials and Methods:** A cross-sectional analytical study was conducted on 809 patients aged ≥15 years with microcytic hypochromic anemia. Hematological parameters, serum ferritin levels, and Rapid Urease Test for H. pylori were evaluated. Statistical analysis was performed using SPSS. **Results:** Females constituted 69.8% of cases. Severe anemia was observed in 76.5%. Serum ferritin levels were significantly lower in H. pylori–positive patients ($p<0.05$). **Conclusion:** A significant association exists between Helicobacter pylori infection and iron deficiency anemia. Early detection and treatment may improve outcomes.

KEYWORDS

Microcytic Hypochromic Anemia, Iron Deficiency Anemia, Helicobacter Pylori, Serum Ferritin.

INTRODUCTION

Anemia is a major public health problem worldwide, particularly in developing countries, and is associated with significant morbidity and mortality. Among the various morphological types, microcytic hypochromic anemia is the most common, especially in the Indian population. It is characterized by reduced hemoglobin concentration and decreased red blood cell size, commonly resulting from iron deficiency.

Iron deficiency anemia (IDA) is the leading cause of microcytic hypochromic anemia and may arise due to inadequate dietary intake, malabsorption, chronic blood loss, or increased physiological demand. Women of reproductive age are disproportionately affected due to menstrual blood loss and increased iron requirements. Early diagnosis and identification of the underlying etiology are essential for effective management.

Recent studies have highlighted the role of Helicobacter pylori infection as an important contributing factor in iron deficiency anemia. H. pylori is a gram-negative, spiral-shaped bacterium that colonizes the gastric mucosa and is implicated in chronic gastritis, peptic ulcer disease, and gastric malignancies. Chronic infection may impair iron absorption by causing gastric mucosal inflammation, reduced gastric acidity, and sequestration of iron by the organism.

Several mechanisms have been proposed to explain the association between H. pylori infection and iron deficiency anemia, including chronic occult gastrointestinal blood loss, decreased dietary iron absorption, and altered iron metabolism. Eradication of H. pylori has been shown to improve hemoglobin levels and iron stores in affected individuals.

Given the high prevalence of anemia and H. pylori infection in India, understanding their association is of considerable clinical importance. This study was undertaken to evaluate the clinico-hematological profile of microcytic hypochromic anemia and to assess the association between iron deficiency anemia and Helicobacter pylori infection in patients attending a tertiary care centre.

Objectives

1. To study the clinico-hematological profile of patients with microcytic hypochromic anemia attending a tertiary care centre.
2. To evaluate hemoglobin levels and red blood cell indices in patients diagnosed with microcytic hypochromic anemia.
3. To determine serum ferritin levels and assess their association with Helicobacter pylori infection in iron deficiency anemia.

MATERIALS AND METHODS

Study Design, Study Setting and Study Duration

A cross-sectional analytical study was conducted in the Upgraded Department of Pathology, Osmania Medical College and Osmania General Hospital, Hyderabad. The study was carried out over a period of two years after obtaining approval from the Institutional Ethics Committee.

Study Subjects

The study population included clinically diagnosed cases of microcytic hypochromic anemia attending the outpatient and inpatient departments of Osmania General Hospital. Patients aged 15 years and above who fulfilled the inclusion criteria were enrolled after obtaining informed consent.

Inclusion Criteria

Patients were included in the study if they met the following criteria:

- Age ≥15 years
- Hemoglobin level <12 g/dL in females and <13 g/dL in males
- Peripheral smear showing microcytic hypochromic anemia
- Patients who provided informed written consent

Exclusion Criteria

Patients were excluded from the study if they:

- Were aged <15 years
- Did not give consent
- Had hematological malignancies
- Had a history of previous gastrointestinal surgery
- Showed macrocytic or normocytic normochromic anemia on peripheral smear
- Were expected to have poor cooperation during the study

Sample Size

All consecutive cases of microcytic hypochromic anemia received during the study period and fulfilling the inclusion criteria were included in the study. A total of 809 cases were analyzed.

Methodology

A detailed clinical history was obtained from all patients, including presenting complaints, dietary habits, menstrual history in females, and gastrointestinal symptoms such as abdominal pain, melena, and

hematemesis. A thorough physical examination was performed, and findings were documented.

Venous blood samples were collected in EDTA and plain vacutainers under aseptic precautions. Hematological parameters including hemoglobin concentration, red blood cell count, red cell indices (MCV, MCH, MCHC), and peripheral smear examination were performed using automated hematology analyzers. Serum ferritin levels were estimated using a chemiluminescent immunoassay (CLIA) analyzer.

Patients presenting with gastrointestinal symptoms underwent upper gastrointestinal endoscopy. Gastric biopsy specimens were subjected to Rapid Urease Test (RUT) for detection of Helicobacter pylori. Association between iron deficiency anemia and H. pylori infection was evaluated in RUT-positive patients.

Study Tools

The study utilized:

- Clinical proforma for data collection
- Automated hematology analyzers (SYSMEX XN-1000 and MINDRAY BC-6000)
- CLIA biochemistry analyzer
- Rapid Urease Test kits

Statistical Analysis

Data were entered in Microsoft Excel and analyzed using SPSS software. Descriptive statistics were expressed as frequencies and percentages. Appropriate tests of statistical significance were applied, and a p-value <0.05 was considered statistically significant.

Ethical Considerations

Ethical clearance was obtained from the Institutional Ethics Committee prior to the commencement of the study. Written informed consent was obtained from all participants. Confidentiality of patient data was strictly maintained throughout the study.

RESULTS

A total of 809 cases of microcytic hypochromic anemia were included in the present study.

Age and Sex Distribution

Out of 809 patients, 564 (69.8%) were females and 245 (30.2%) were males, showing a clear female predominance. The majority of cases were observed in the 21–40 years age group, followed by the 41–60 years age group.

Table 1: Distribution of Study Subjects According to Age and Sex

Age group (years)	Males n (%)	Females n (%)	Total n (%)
15–20	28 (3.5)	74 (9.1)	102 (12.6)
21–40	92 (11.4)	268 (33.1)	360 (44.5)
41–60	84 (10.4)	168 (20.8)	252 (31.2)
>60	41 (5.1)	54 (6.6)	95 (11.7)
Total	245 (30.2)	564 (69.8)	809 (100)

Severity of Anemia

Based on hemoglobin levels, anemia was graded into mild, moderate, and severe categories. Severe anemia was observed in 619 cases (76.5%), followed by moderate anemia in 152 cases (18.8%) and mild anemia in 38 cases (4.7%).

Table 2: Distribution of Cases According to Severity of Anemia

Severity of anemia	Hemoglobin (g/dL)	Number of cases n (%)
Mild	10–12	38 (4.7)
Moderate	7–9.9	152 (18.8)
Severe	<7	619 (76.5)
Total	—	809 (100)

Serum Ferritin Levels

Serum ferritin estimation revealed low ferritin levels in the majority of cases, confirming iron deficiency anemia as the predominant etiology of microcytic hypochromic anemia in the study population.

Association Between Helicobacter Pylori Infection and Iron Deficiency Anemia

Out of the total study population, patients presenting with gastrointestinal symptoms underwent upper gastrointestinal endoscopy and Rapid Urease Test (RUT). A significant proportion of these patients tested positive for H. pylori.

Table 3: Association of Serum Ferritin Levels with RUT Status

RUT status	Number of cases	Mean serum ferritin (ng/mL) ± SD
RUT Positive	112	8.6 ± 3.2
RUT Negative	68	18.9 ± 5.4

Patients who were RUT positive showed significantly lower serum ferritin levels compared to RUT-negative patients. The difference was found to be statistically significant ($p < 0.05$), indicating a strong association between H. pylori infection and iron deficiency anemia.

Comparison of Hematological Parameters in RUT Positive and Negative Patients

Red blood cell indices such as mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), and mean corpuscular hemoglobin concentration (MCHC) were lower in RUT-positive patients when compared to RUT-negative patients.

Table 4: Comparison of Hematological Parameters Based on RUT Status

Parameter	RUT Positive (Mean ± SD)	RUT Negative (Mean ± SD)
Hemoglobin (g/dL)	6.2 ± 1.1	8.1 ± 1.4
MCV (fL)	63.4 ± 6.8	72.6 ± 7.2
MCH (pg)	18.2 ± 2.6	22.4 ± 3.1
MCHC (g/dL)	28.6 ± 2.1	31.2 ± 2.4

The observed differences in hematological parameters were statistically significant, reinforcing the association between H. pylori infection and iron deficiency anemia.

DISCUSSION

Microcytic hypochromic anemia is the most frequently encountered type of anemia in clinical practice, particularly in developing countries like India. The present study assessed the clinico-hematological profile of microcytic hypochromic anemia and evaluated its association with Helicobacter pylori infection in a tertiary care centre.

In this study, a clear female predominance was observed, with the majority of patients belonging to the reproductive age group. This finding is consistent with other Indian studies and may be attributed to menstrual blood loss, nutritional deficiency, and increased iron requirements in women. Severe anemia constituted the largest proportion of cases, reflecting delayed presentation and limited awareness regarding early detection of anemia.

Serum ferritin levels were found to be reduced in the majority of patients, confirming iron deficiency anemia as the predominant etiology of microcytic hypochromic anemia. Serum ferritin serves as a reliable marker of iron stores, and its reduction indicates depleted body iron reserves.

A significant association was observed between Helicobacter pylori infection and iron deficiency anemia. Patients who tested positive for H. pylori by Rapid Urease Test showed significantly lower serum ferritin levels compared to RUT-negative patients, with the difference being statistically significant. This finding supports the role of H. pylori infection in the pathogenesis of iron deficiency anemia.

The association between H. pylori infection and iron deficiency anemia may be explained by chronic gastritis leading to impaired iron absorption, reduced gastric acidity, utilization of iron by the organism, and chronic occult gastrointestinal blood loss. Lower hemoglobin levels and red blood cell indices observed in RUT-positive patients further indicate more severe iron deficiency in the presence of infection.

The findings of the present study highlight the importance of considering H. pylori infection as a contributory factor in patients with iron deficiency anemia, particularly those presenting with gastrointestinal symptoms or poor response to iron therapy.

CONCLUSION

Iron deficiency anemia remains the most common cause of microcytic hypochromic anemia, with a higher prevalence among females and individuals in the reproductive age group. The present study demonstrates a significant association between Helicobacter pylori infection and iron deficiency anemia.

Patients with H. pylori infection showed significantly lower serum ferritin levels and more severe hematological abnormalities compared to non-infected individuals. Early detection and eradication of H. pylori infection, along with appropriate iron supplementation, may improve iron status and reduce the burden of refractory anemia.

Routine evaluation for H. pylori infection should be considered in patients with iron deficiency anemia, especially in those presenting with gastrointestinal symptoms or inadequate response to conventional iron therapy.

REFERENCES

1. World Health Organization. Iron deficiency anaemia: assessment, prevention and control. A guide for programme managers. Geneva: WHO; 2001.
2. Cappellini MD, Musallam KM, Taher AT. Iron deficiency anaemia revisited. J Intern Med. 2020;287(2):153–170.
3. Short MW, Domagalski JE. Iron deficiency anemia: evaluation and management. Am Fam Physician. 2013;87(2):98–104.
4. DeLoughery TG. Microcytic anemia. N Engl J Med. 2014;371(14):1324–1331.
5. Annibale B, Capurso G, Chistolini A, et al. Gastric cancer and iron deficiency anemia: role of Helicobacter pylori infection. Aliment Pharmacol Ther. 2001;15(8):1219–1226.
6. Hershko C, Ronson A. Iron deficiency, Helicobacter pylori infection and gastritis. Acta Haematol. 2009;122(2–3):97–102.
7. DuBois S, Kearney DJ. Iron-deficiency anemia and Helicobacter pylori infection: a review of the evidence. Am J Gastroenterol. 2005;100(2):453–459.
8. Choe YH, Kim SK, Hong YC. Helicobacter pylori infection and iron deficiency anemia in adolescents. J Pediatr. 2003;142(2):136–140.
9. Ciacci C, Sabbatini F, Cavallaro R, et al. Helicobacter pylori impairs iron absorption in infected individuals. Dig Liver Dis. 2004;36(7):455–460.
10. Muhsen K, Cohen D. Helicobacter pylori infection and iron stores: a systematic review and meta-analysis. Helicobacter. 2008;13(5):323–340.
11. Ioannou GN, Rockey DC, Bryson CL, Weiss NS. Iron deficiency and gastrointestinal malignancy: a population-based cohort study. Am J Med. 2002;113(4):276–280.
12. Kumar V, Abbas AK, Aster JC. Robbins and Cotran Pathologic Basis of Disease. 10th ed. Philadelphia: Elsevier; 2020.