Original Article

Prevalence and Pattern of Anemia in Patients with Primary Hypothyroidism - A Hospital- Based Study

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ABSTRACT

Context: Anemia frequently accompanies hypothyroidism but its prevalence and morphological patterns vary across studies[12].
Aim: To determine the prevalence and pattern of anemia in patients with primary hypothyroidism and compare findings with healthy controls[3].
Methods: Cross-sectional, hospital-based study[4]. Newly diagnosed primary hypothyroid patients aged 18–65 and age/sex-matched euthyroid controls were enrolled. Clinical evaluation, complete blood count with peripheral smear, thyroid function tests and targeted tests to classify anemia were performed[5]. Anemia severity was defined by WHO criteria[4]. Data were analyzed using SPSS; $p < 0.05$ considered significant.
Results: A total of 250 participants were studied (130 cases, 120 controls). Prevalence of anemia among hypothyroid cases was 76.9% (100/130) vs 41.7% (50/120) in controls[56]. Severity in cases: mild 20%, moderate 36%, severe 44%. Peripheral smear morphology among anaemic cases: microcytic hypochromic 38%, normocytic normochromic 25%, macrocytic 18%, dimorphic 13%, others 6%. A significant correlation was observed between severity of anemia and type of hypothyroidism ($p = 0.003$).
Conclusions: Anemia is highly prevalent in patients with primary hypothyroidism compared to euthyroid controls[7–9].

Keywords: hypothyroidism; anemia; prevalence; microcytic; normocytic.

INTRODUCTION

Thyroid hormones regulate erythropoiesis by modulating erythropoietin synthesis and bone marrow activity[29]. Hypothyroidism is associated with a spectrum of hematological abnormalities, most commonly anemia, through multifactorial mechanisms including decreased erythropoietin production, iron deficiency (menorrhagia or malabsorption), and autoimmune associations[8]. Epidemiological studies report variable prevalence of anemia in hypothyroid patients; hospital-based Indian series report figures in the range of 20–80% depending on selection criteria and workup depth[156]. Given this heterogeneity, region-specific data are valuable to guide screening and management strategies. This study evaluated the prevalence, severity and morphological patterns of anemia among patients with primary hypothyroidism in a tertiary care hospital in North India.

MATERIALS AND METHODS

Study design and setting: Cross-sectional, observational, hospital-based study conducted at the Department of General Medicine, Government Medical College, Baramulla.

Participants: Newly diagnosed adult patients (18–65 years) with primary hypothyroidism (overt and subclinical) were recruited as cases. Age- and sex-matched euthyroid healthy volunteers served as controls. Patients with pre-existing anemia under treatment, chronic kidney disease, active bleeding, malignancy, pregnancy, or on thyroid/hematinic therapy were excluded.

Definitions and laboratory methods: Primary hypothyroidism was defined as elevated serum TSH with or without low free T4; subclinical hypothyroidism as elevated TSH with normal free T4; overt hypothyroidism as elevated TSH with low free T4. Serum TSH, free T3 and free T4 were measured by chemiluminescence immunoassay. Complete blood count was performed on an automated 5-part haematology analyzer and peripheral smear interpreted with Leishman/Giemsa stained slides. Iron studies, vitamin B12 and folate were done wherever clinically indicated. Anemia severity was graded according to WHO criteria[4].

Ethical considerations: The study received approval from the Institutional Ethics Committee of Government Medical College, Srinagar S Scientific committee Government medical College, Baramulla. Written informed consent was obtained from all participants.

Statistical analysis:
Data were entered into Microsoft Excel and analyzed using SPSS version 20. Categorical variables are presented as frequencies and percentages; continuous variables as mean ± SD where appropriate. Chi-square test was used for categorical comparisons and Pearson correlation for associations. A p-value < 0.05 was considered statistically significant.

RESULTS
A total of 250 participants were included: 130 patients with primary hypothyroidism (cases) and 120 age- and sex-matched euthyroid controls. Among cases, 70 (53.8%) had overt hypothyroidism and 60 (46.2%) had subclinical hypothyroidism. The gender distribution among cases was 97 (74.6%) females and 33 (25.4%) males; controls comprised 68 (56.7%) females and 52 (43.3%) males.

Prevalence of anemia was significantly higher in hypothyroid cases: 100/130 (76.9%) compared with 50/120 (41.7%) in controls (Table 1 S Figure 1). Severity distribution among anaemic cases was: mild 20 (20%), moderate 36 (36%), and severe 44 (44%) (Table 2). Controls had milder anemia overall.

Peripheral smear morphology among the 100 anaemic cases was: microcytic hypochromic 38 (38%), normocytic normochromic 25 (25%), macrocytic 18 (18%), dimorphic 13 (13%), and others 6 (6%) (Table 3). Severity of anemia correlated significantly with type of hypothyroidism (p = 0.003); gender also showed an association (p = 0.036) while age did not (p = 0.549).

Table 1. Prevalence of anemia in cases and controls.

Group	N	Anaemic, n (%)	Non-anaemic, n (%)
Cases (Hypothyroid)	130	100 (76.9)	30 (23.1)
Controls (Euthyroid)	120	50 (41.7)	70 (58.3)

Table 2. Severity of anemia in cases vs controls

Severity	Cases (n=100) n (%)	Controls (n=50) n (%)
Mild	20 (20.0)	22 (44.0)
Moderate	36 (36.0)	24 (48.0)
Severe	44 (44.0)	4 (8.0)

Table 3. Peripheral smear morphology among anaemic cases.

Morphological type	n (%)
Microcytic hypochromic	38 (38%)
Normocytic normochromic	25 (25%)
Macrocytic	18 (18%)
Dimorphic	13 (13%)
Others	6 (6%)

Table 4. Type of hypothyroidism among cases.

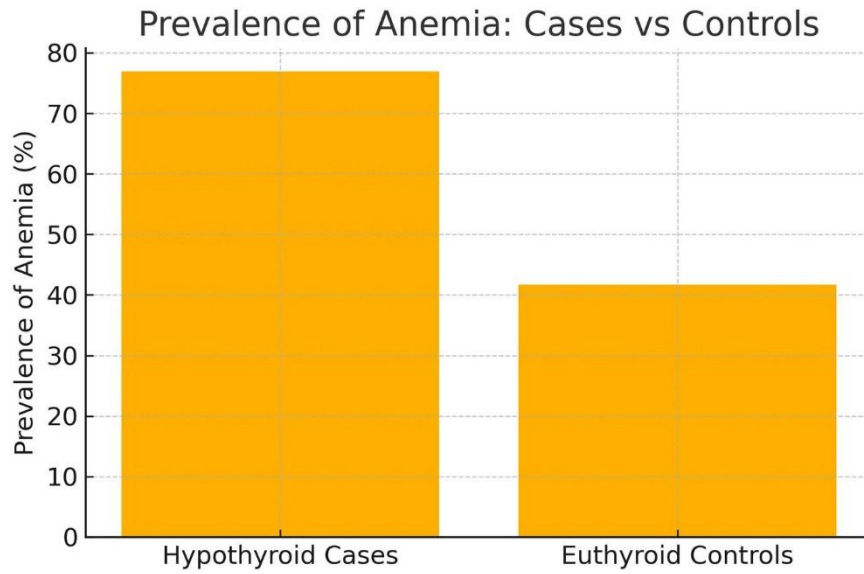| Type of hypothyroidism	n (%)
Overt hypothyroidism	70 (53.8%)
Subclinical hypothyroidism	60 (46.2%)

Figures
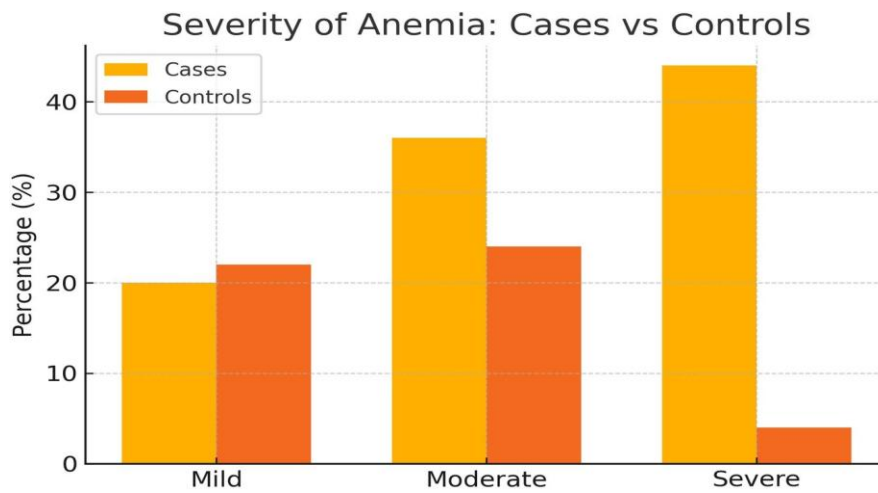
Figure 1. Prevalence of Anemia: Cases vs Controls.

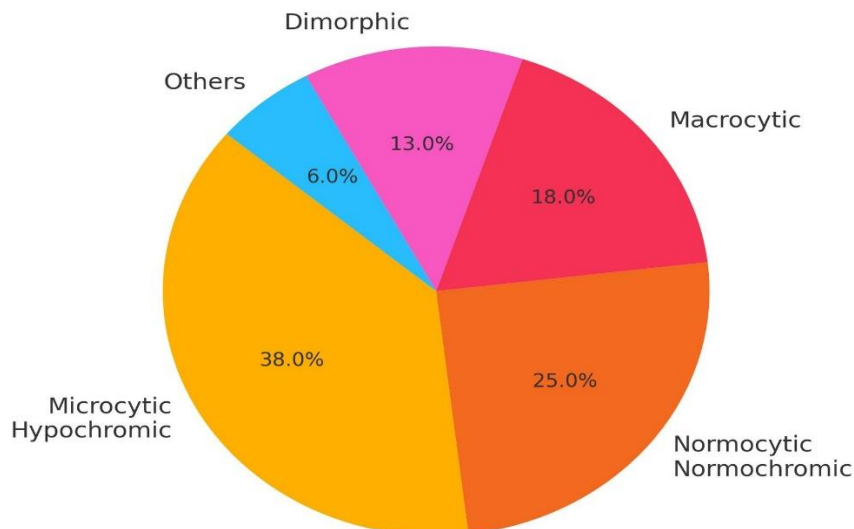**Figure 2. Severity of Anemia: Cases vs Controls.**

Figure 3. Peripheral Smear Morphology in Anaemic Cases.

DISCUSSION

In this hospital-based cohort, anemia was significantly more prevalent among patients with primary hypothyroidism (76.9%) compared to euthyroid controls (41.7%). This high prevalence is in line with several Indian hospital-based reports[156] and supports the notion that thyroid dysfunction contributes meaningfully to hematological morbidity. The predominant morphologies — microcytic hypochromic and normocytic normochromic — suggest that both iron deficiency and hypoproliferative mechanisms (reduced erythropoietin effect) play roles in this population[26]. Overt hypothyroidism showed greater association with severe anemia, consistent with prior observations[37].

Clinical implications: Routine hematological screening should be considered in patients diagnosed with hypothyroidism. Conversely, thyroid function tests should be part of the evaluation in unexplained anemia, especially when conventional causes are not evident.

Strengths and limitations: Strengths include a well-defined control group and peripheral smear-based morphological classification. Limitations are single-center design, lack of universal iron/B12 testing in all participants (tests were done when clinically indicated), and inability to provide longitudinal follow-up to assess response to thyroid replacement therapy.

CONCLUSION

Anemia is common in primary hypothyroidism and often moderate to severe. Microcytic hypochromic and normocytic normochromic patterns predominate. Clinicians should screen for anemia in hypothyroid patients and consider thyroid testing in unexplained anemia.

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