

Research Article

To study prevalence of incipient iron deficiency in primary hypothyroidism

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Received: 06 January 2014

Accepted: 02 February 2014

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ABSTRACT

Background: Hypothyroidism, affects around 1% of general population. Anemia in association with hypothyroidism has been studied since 1881. Iron deficiency has multiple adverse effects on thyroid metabolism. It decreases circulating thyroid hormone concentration, blunts thyrotrophic response to TRH, decreases serum T₃. Objective of current study was to find prevalence of iron deficiency in primary hypothyroid.

Methods: In our study 70 patients were selected, out of which 50 were females and 20 were males, who were suffering from hypothyroidism. Iron deficiency in the study group was confirmed at baseline using multiple iron status indicators (serum ferritin, serum iron, TIBC & percentage Saturation). These patients were between age group 18-65 years.

Results: In our study only 14 patients (20%) manifested with anemia (which was defined as Hb<12gm/dl), where as the prevalence of iron deficiency (with or without anemia) was 34.2%, in which 28.5% were females and 5.70% were males, thus showing that prevalence of iron deficiency (with or without anemia) can be higher than iron deficiency anemia itself, which is supported by literature.

Conclusion: Iron deficiency was present in a significant portion of patients with primary hypothyroidism. It also concluded that frequency of iron deficiency (with or without anemia) was higher than iron deficiency anemia.

Keywords: Hypothyroid, Iron deficiency, Prevalence

INTRODUCTION

Reduced production of thyroid hormone is central feature of the clinical state termed as hypothyroidism. Hypothyroidism is common, affecting 1% of general population and about 5% of individuals over age 60 years.¹ Primary hypothyroidism is the etiology in approximately 99% cases of hypothyroidism, with less than 1% due to TSH deficiency or other causes.² Single best screening test for hypothyroidism is serum TSH, which is increased in primary hypothyroidism but is low or low normal with pituitary insufficiency, the FT₄ may

be low or low-normal.¹ Hypothyroidism can affect all organ systems, and these manifestations are largely independent of all underlying disorders but are a function of the degree of hormone deficiency.² Metabolic abnormalities associated with hypothyroid include dilution hyponatremia and anemia.³ Anemia may occur before any other manifestation of thyroid disease appears. An important observation is that anemia in hypothyroidism is often not diagnosed because hypothyroids have a lower volume of plasma which causes a false high estimation of haemoglobin in blood.⁴ Three major types of anemia are usually considered:

Normochromic normocytic, hypochromic microcytic and macrocytic. There is hypoplasia of all myeloid cell lines in hypothyroidism and all haematological parameters return to normal when a euthyroid state is achieved.⁵ Macrocytic anemia is caused by malabsorption of vitamin B₁₂, folic acid, pernicious anemia and inadequate nutrition. Normocytic anemia arises due to thyroid hormones deficit itself not followed by nutritive deficit.⁴ Microcytic anemia is usually ascribed to malabsorption of iron and menorrhagia, in hypothyroidism iron malabsorption occurs secondary to achlorhydria.⁶ Previously published studies suggested that there is a relationship between hypothyroidism and low iron, B₁₂, and folic levels.⁷ A growing number studies have demonstrated direct role of thyroid hormone in human erythropoiesis and in increased production of erythropoietin.⁸ Iron deficiency anaemia coexisting with primary hypothyroidism results in a hyper adrenergic state. If both iron and ferritin are low, taking thyroid hormone, especially any with T₃, will cause intolerable anxiety, and again one will return to their previous lower dose. Correction of iron deficiency in such patients who are intolerant to thyroxin sodium therapy may result in tolerance to this agent.⁹

Objective

To study the prevalence of incipient iron deficiency in primary hypothyroid patients.

METHODS

The patients were recruited for study from emergency ward, indoor wards of general medicine and outdoor patients. Patients of all age groups and either gender who present with clinical suspicion of hypothyroidism or already diagnosed were included in the study and were evaluated for iron deficiency over a period of one year.

Inclusion criteria

- Patients with primary hypothyroidism (Newly diagnosed or previously on treatment).

Exclusion criteria

- Multifactorial anemia or anemia due to other reasons, including hemolytic anemia's.
- Iron-deficiency anemia requiring urgent intervention or patients already on iron supplements.
- Acute/subacute blood losses from the respiratory, gastrointestinal, or genitourinary system.
- Presence of any comorbid disease like renal insufficiency/failure, coronary heart disease, uncontrolled hypertension, diabetes mellitus.
- Anemia in Subclinical hypothyriod patients.

The institutional review board approved the study protocol.

All the participants who were included in the study were explained the purpose of the study and written consent was obtained from them. A detailed history was taken, and a physical examination was done. A detailed nutritional history and drug history (especially Aspirin or NASID intake was taken to rule out any nutritional cause for iron deficiency, or occult GI blood loss or prolonged intake of proton pump inhibitors (which may hypochlorhydria/achlorhydria) was taken. Baseline investigation including liver and renal function test were done. Serum B₁₂ & folic acid levels were measured. All patients had peripheral blood smear examination, including a stool examination for ova or parasites, and for occult blood. Colonoscopy, UGI endoscopy, USG abdomen, gynaecological and genitourinary examinations were performed as necessary at the appropriate departments. In specific iron profile and bone marrow examination in certain cases where ever required was done. Patients with iron deficiency defined as serum ferritin <15µg/l, TIBC >360µg/dl, % saturation <15% and serum iron <30µg/dl. Primary hypothyroidism defined as TSH >4.0µIU/ml (0.4-4.0) and FT₄ levels <0.89ng/dl (0.89-1.76ng/dl), according to laboratory values in hospital.

RESULTS

Total numbers of patients included in study were 70. Prevalence of hypothyroidism was higher in females. In our study we found that the prevalence of iron deficiency in primary hypothyroid was 34.2%. It was higher among females 28.5% than males. Out of total 70 hypothyroid patients, patients who manifested with anemia were 20%, where as prevalence of iron deficiency was 34.2% showing that frequency of iron deficiency (with or without anemia) is higher than iron deficiency anemia.

Table 1: Showing distribution of hypothyroid according to gender.

	Male	Female	Total
No. of hypothyroid patients. (%)	24 (34.2%)	46 (65.7%)	70 (100%)

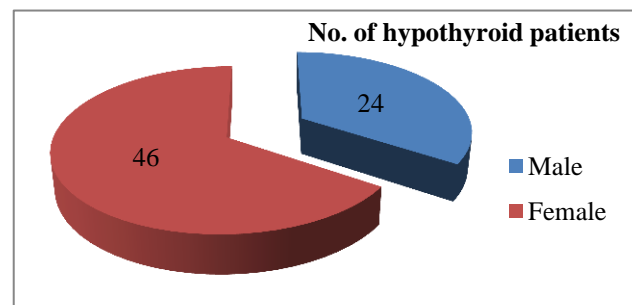


Figure 1: Showing distribution of hypothyroid according to gender.

Table 2: Showing prevalence of iron deficiency anaemia.

	Hb <12gm/dl	Hb >12gm/dl	Total
No. of hypothyroid	14	56	70
Percentage	20%	80%	100%

Anaemia was defined arbitrarily with HB <12gm/dl.

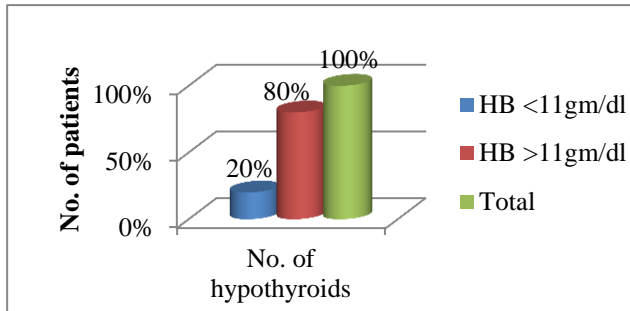


Figure 2: Showing prevalence of iron deficiency anaemia.

Table 3: Gender specific prevalence of iron deficiency with or without anaemia.

Iron deficiency	Male No. (%)	Female No. (%)	Prevalence
Present	4 (5.7%)	20 (28.57%)	34.5%
Absent	20 (28.5%)	26 (32.7%)	65.7%

Total no. of patients who were iron deficient were 34.2%, in which 28.57% were females and 5.7% were males.

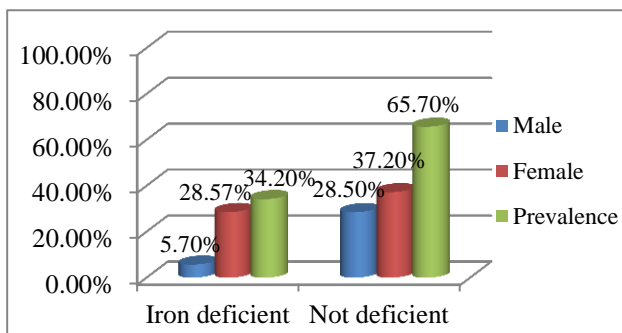


Figure 3: Showing prevalence of iron deficiency with or without anaemia.

DISCUSSION

Hypothyroidism is common, affecting 1% of general population and about 5% of individuals over age 60 years.¹ Both hypothyroidism and hyperthyroidism are 5 or more times common in women than in men.¹⁰ Anemia in association with hypothyroidism has been studied since 1881.¹¹ There are very limited number of studies investigating the relation of iron deficiency and thyroid

hormones in humans. In fact this study will one of first few studies to determine prevalence of iron deficiency (with or without anemia) in primary hypothyroidism. Hypothyroidism can affect all organ systems, hematopoietic system is the primary one among these affected systems and anemia is the most important one.² Anemia may occur even before any other manifestation of thyroid disease appears, at the same time or late in the course of hypothyroidism. Three major types of anemia are usually considered: Normochromic normocytic, macrocytic and hypochromic microcytic. Iron deficiency in general population can be because of so many reasons. Hypothyroidism is one of the causes of iron deficiency.¹² The first stage in iron deficiency is negative iron balance, during this period, iron stores reflected by the serum ferritin level or the appearance of stainable iron on bone marrow aspirations decreases. As long as the serum iron remains within the normal range, hemoglobin synthesis is unaffected despite the dwindling iron stores.¹³ In hypothyroidism iron deficiency anemia is usually ascribed to malabsorption of iron and menorrhagia.⁶ Thyroid hormones influence on haematopoiesis involves an increased production of erythropoietin or haematopoietic factors by nonerythroid cells.¹⁴ Anemia is diagnosed in 20-60% patients with hypothyroidism. Horton et al. reported in there series 26%. In our study only 14 patients (20%) manifested with anemia (which was defined as HB<12gm/dl), where as the prevalence of iron deficiency (with or without anemia) was 34.2%, in which 28.5% were females and 5.70% were males, thus showing that prevalence of iron deficiency (with or without anemia) can be higher than iron deficiency anemia itself, which is supported by literature. A high rate of association between hypothyroid and anemia was found in Iranian population. Forty three of seventy (64.5%) had concurrent anemia. The frequency microcytic iron deficiency anemia was found to be 14.3% in males & 85.7% in females.¹⁵ Iron deficiency has multiple adverse effects on thyroid metabolism.¹⁶ It decreases circulating thyroid hormone concentration likely through impairment of haem dependent c peroxidase iodination of the thyroglobulin and coupling of the iodotyrosine residues, blunts thyrotrophic response to TRH, decreases serum T₃ and T₄ and slow turnover of T₃ and may reduce T₃ binding.¹⁷ Studies have shown that plasma T₄ and T₃ levels in both basal conditions and after cold stress were lower in women with iron deficiency anemia compared to the controls.¹⁸ As discussed both iron deficiency and hypothyroid affect each other's metabolism. Also incipient iron deficiency may be present before it manifests as anemia. Thus simultaneous correction of both should be done earlier in order to achieve adequate response which may not be achieved if only one is corrected. The aim of this study was to find prevalence of incipient iron deficiency among primary hypothyroids, as early iron replacement along with levothyroxine in iron deficient patients will provide desirable therapeutic response to levothyroxine as well as prevent ineffective iron therapy. Further studies are needed to highlight this topic.

CONCLUSION

In our study we found that the prevalence of iron deficiency anemia in primary hypothyroid was 20%, where as prevalence of iron deficiency was 34.2% showing that frequency of iron deficiency (with or without anemia) is higher than iron deficiency anemia itself. To conclude this study shows that prevalence of iron deficiency is seen in relatively higher frequency in primary hypothyroidism, which mandates measurement iron profile in primary hypothyroid patients. Simultaneous correction of both iron deficiency and hypothyroidism should be done as both effects each other's metabolism. It will be difficult to achieve euthyroidism or correct iron deficiency anemia if only one is corrected.

ACKNOWLEDGMENTS

I sincerely thank Dr R. P. Kudyar for his valuable guidance throughout the study.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the institutional review board

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DOI: 10.5455/2320-6012.ijrms20140518

Cite this article as: Banday TH, Bhat SB, Bhat SB, Shah N, Bashir S. To study prevalence of incipient iron deficiency in primary hypothyroidism. Int J Res Med Sci 2014;2:472-5.