



## ORIGINAL ARTICLE

## Hematologic Changes in Patients with Graves' disease in Gorgan During 2014-2015

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## ABSTRACT

**Background:** The most common cause of hyperthyroidism in areas without iodine deficiency is Graves' disease. There are reports of some hematological alterations in hyperthyroidism. This study was designed to measure the hematologic profile in the patients with Graves' disease before and after the treatment. **Methods:** In this cross-sectional study, 100 patients were selected with convenience sampling that diagnosed as autoimmune Graves' disease in our academic endocrinology clinic during 2014-2015. Inclusion criteria included autoimmune hyperthyroidism in patients who were referred to this center during the study period. Patients who refused to take part in the research, had recent infections disease, malignancies, surgical procedures, severe trauma, received immunosuppressive drugs or corticosteroids, high erythrocyte sedimentation rate (ESR) values during the last six months, and not responded to treatment with methimazole were excluded from the study. The simple sampling technique was used to select the patients. A complete blood count (CBC) was taken before and after treatment. The P-value less than 0.05 was considered as the statistical significance level. All data were analyzed using the Statistical Package for the Social Sciences 16.0 (SPSS Inc., Chicago, IL, USA) software. **Results:** One hundred patients with a mean age of  $38 \pm 9.8$  years were included. There were no significant changes in the white blood cells (WBC) count, red blood cells (RBC) count, and platelets. Mild anemia ( $Hb=12.16 \pm 1.23$ ) present before treating the hyperthyroidism that was significantly improved after treatment ( $P=0.000$ ). **Conclusions:** Our results showed that the only significant hematologic change in patients with Graves' disease was mild anemia that improves after treating the underlying thyroid disorder.

## INTRODUCTION

Hyperthyroidism (Graves' disease) is an endocrine disorder with about 2% prevalence in females and 0.2% in males (1-3) and an estimated annual incidence rate of 20 per 100,000 population (2,3). However, in regions without iodine deficiency, Graves' disease is the most common cause of hyperthyroidism, constitutes about 80% of hyperthyroidism cases, while hyperfunctioning autonomous adenomas are the most common cause in regions facing iodine deficiency (2,3). Thyroid function disorders are among the most common endocrine diseases (4,5). All body tissues need thyroid hormones for normal development, differentiation, metabolic balance, and physiological function (4,5). Hematological abnormalities have frequently been reported in thyroid disorders. Anemia is the most prevalent disorder being defined in 20-60% of the patients with hypothyroidism (5). Anemia may occur for several reasons, including abnormality of the formation and reduced half lifetime of

the red blood cells (RBCs) or increased osmotic fragility of RBCs (4).

There are contradictory evidences regarding hematological parameters in hyperthyroidism (4,6,7). Although early reports showed that Graves' disease is also associated with hematological disorders, anemia is not frequently observed in this group, and erythrocytosis is seen more common. Furthermore, hematological parameters mostly return to normal when euthyroid state achieved [5], although some other studies reported contradictory results (4,6).

Furthermore, the number of leucocytes may increase, remain normal, or may decline slightly when thyroid disorders present. A relative reduction in the neutrophils and increase in eosinophils and mononuclear cells may be observed in hyperthyroidism (8,9).

Based on the previous studies, there are thyroid stimulating hormone (TSH) receptors on myeloid and lymphoid

cells, and these findings support the ability of TSH to influence the performance of lymphocytes (10).

Regarding the high prevalence of thyroid disorders in Iran (11), this study was designed to measure the hematological changes in people with autoimmune hyperthyroidism before and after treatment in Gorgan city, Northeast of Iran.

## METHODS

### Ethical Considerations

The study protocol was approved by the ethical committee of Golestan University of Medical Sciences. Informed consent was taken from all participants. Patients were free to leave the study at any stage without influencing their treatment course.

### Study Population

In this cross-sectional study, 100 patients were recruited from those referred to the Sayyad-e-Shirazi academic hospital and private clinics in Gorgan city who were diagnosed with Graves' disease during 2013-2014.

Clinical examination of the thyroid gland, checking blood pressure, heartbeat, and the eyes (to find active symptoms of Graves' ophthalmopathy) were done by internal medicine specialists and highly specialized endocrinologists. Initial complete blood count (CBC) was performed in all patients including white blood cell (WBC) count, RBC count, hematocrit (HCT), hemoglobin (Hb), and platelets.

Demographic characteristics of the patients and results of their clinical examination have been recorded in a checklist.

### Inclusion and Exclusion Criteria

Inclusion criteria included autoimmune hyperthyroidism in patients who were referred to our center during the study period. Patients who refused to take part in the research, had recent infection diseases, malignancies, surgical procedures, or severe trauma, received immunosuppressive drugs or corticosteroids, high erythrocyte sedimentation rate (ESR) values during the last six months, and not responded to treatment with methimazole were excluded from the study. The simple sampling method was used to select the patients.

### Statistical Analysis

Data analysis was performed using the descriptive and correlation test. The P-value less than 0.05 was considered as a minutest value for statistical significance level. All data were analyzed using the Statistical Package for the Social Sciences 16.0 (SPSS Inc., Chicago, IL, USA) software.

## RESULTS

The mean age of the patients was 38±9.8 years. Eighty-two (82%), 15% and 3% of the patients were Fars, Turkmen and Sistani ethnicities, respectively.

The mean TSH levels before and after treatment were 0.06 (0.3) and 2.2 (0.9) mU/L, respectively (P=0.000). There were no significant changes in the WBC count after treatment with methimazole (P= 0.96). Only three patients had WBC count of more than 10,000 before treatment (that dropped to below 10,000 after treatment).

The mean Hb level has been significantly raised after treatment (P=0.000) Table 1.

There were no considerable changes (requiring treatment) in platelet count of the studied patients with Graves' disease.

## DISCUSSION

Present results indicated mild anemia in about 40% of the studied population with Graves' disease, but no considerable reductions in the number of RBC count were observed in this study. There has been seen no significant disorders or changes in WBC count or platelet count before and after treatment.

These results have been reported in other studies to some extent; some were in agreement with us and other revealed different results.

A significantly high prevalence of anemia (40% in females with thyroid disorders) has been reported in other studies associated with decreased number of RBCs, Hb concentration, packed cell volume (PCV), and mean corpuscular hemoglobin (MCH). Microcytic hypochromic and normocytic normochromic anemia were the most common detected types of anemia (5).

Anemia was the pioneer of hematologic disorders in other similar studies. In a study by Gianoukakis et al. on 87 newly diagnosed Graves' cases, anemia was reported in 33% of subjects. In 22% of all cases, anemia was exclusively related to thyroid dysfunction (41.6% of men compared to 17.5% of women). Antithyroid therapy for about 4 months resulted in normalization of Hb levels in 8 out of 9 cases (10.7 ± 0.8 g/dl to 13.5 ± 1.3 g/dl) (1).

Regarding the statistically significant difference in RBC count, MCH, mean corpuscular hemoglobin concentration (MCHC), RBC distribution width (RDW), Hb, and HCT between hyperthyroid and hypothyroid cases, Dorgalaleh et al. suggested evaluating thyroid hormones in patients with unknown hematological dysfunctions (12).

Jafarzadeh et al. showed a significantly lower mean count of RBC and some RBC-related indices (HCT and Hb) in the hypothyroid group compared to the euthyroid group. Also, the mean MCV was significantly lower in hyperthyroid cases in comparison with the euthyroid group (13). This com-

**Table 1.** Changes in RBC count, Hb and HCT levels in patients with Graves' disease (before and after treatment)

	Before treatment	After treatment	P-value
RBC count (million/mm <sup>3</sup> )	4.61±0.53	4.57±0.49	0.299
Hb (g/dl)	12.16±1.23	12.61±1.09	0.000
HCT (%)	38.16±3.87	38.63±3.40	0.057

parison was not available in our study, and we just enrolled Graves' cases with no control group.

### Limitations of the Study

Our studied population was just included patients with Graves' disease with no controls or hypothyroidism cases that could make it a little difficult to expand the results to larger populations with different types of thyroid disorders.

### CONCLUSIONS

Our results showed that the only significant hematologic change in patients with Graves' disease is mild anemia that improves after treating the underlying thyroid disorder.

### ACKNOWLEDGMENT

This paper was extracted from a doctorate thesis dedicated to gain MD degree, in Golestan University of Medical Sciences.

### AUTHORS CONTRIBUTION

All authors contributed equally in this study.

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