ABO Blood Group and its Unusual Relationship with Thyroid Disorders

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Abstract

Introduction: Thyroid disorders are not so uncommon in India, it is estimated that about 42 million people are suffering from thyroid diseases. ABO Blood group classification is commonly used to denote the presence of one, both, or neither of the A and B antigens on erythrocytes.

Objective: To investigate the correlation of thyroid hormone abnormalities and their preponderance if any, with ABO Blood group antigens.

Methodology: 220 people diagnosed with thyroid gland disorders were divided into three groups based on thyroid hormone levels (Hypothyroid, hyperthyroid and euthyroid) with similar age group, sex ratio and race. ABO antigen based blood groups were assessed for people diagnosed with thyroid gland diseases and analysed.

Result:

ABO Blood Group: Amongst 220 people 68 people (31%) had "A" blood group out of which people with hypothyroidism – 16(24%), with hyperthyroidism - 32(47%) and 20(29%)–euthyroid; 44 people (20%) had "B" blood group out of which people with hypothyroidism – 12(27%), with hyperthyroidism - 16(36%) and 16(36%)–euthyroid; 100 people (45.45%) had "O" blood group out of which people with hypothyroidism – 68(68%), with hyperthyroidism - 24(24%) and 8(8%)–euthyroid; 8 people (3.6%) had AB blood group out of which people with hypothyroidism - 4, with hyperthyroidism - 4 and 0–euthyroid.

Conclusion: Our results indicate that ABO Blood group antigens show a correlation with thyroid hormone disorders. People with BLOOD GROUP "O" are more prone for developing thyroid disorders followed by "A" and "B". Hypothyroidism was found as the most common presentation amongst "O" blood group and Hyperthyroidism amongst "A" and "B" whereas "AB" showed no such preponderance.

Keywords: *ABO Blood grouping, hypothyroidim, thyroid disorders, blood group related diseases.*

Introduction

Thyroid is a highly vascularized endocrine gland that secrets hormones responsible for metabolism–T3 (tri-iodothyronin) and T4 (tetra-iodothyronin)[1]. Secretion of these hormones is controlled by TSH (thyroid stimulating hormone) which is secreted by pituitary gland. There exists a negative feedback mechanism which ensures optimum blood levels of the hormones[1]. When the level of thyroid hormones increases in blood, a negative feedback reduces the secretion of TSH mediated by Trh and vice-versa and hence controls the levels of T3 and T4 within the optimum range[1].

The thyroid hormones act on nearly every cell in

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the body. They increase the basal metabolic rate, affect protein synthesis, help in regulating long bone growth, play a crucial role in neural maturation, their presence increases the body's sensitivity to catecholamines (such as adrenaline). So, any thyroid hormone disorder can affect body functions and increase morbidity in multiple ways.

Thyroid disorders is a general term representing several different diseases involving thyroid hormone levels and the thyroid gland. Thyroid disorders could occur due to various reasons

Etiology[3,4,5,6]

- Genetic - congenital hypothyroidism, congenital hyperthyroidism
- Inflammatory – infective / non infective - thyroiditis
- Autoimmune – hashimoto's thyroiditis
- Neoplastic – benign and malignant tumors
- Nutrient deficiency – Endemic goitre
- Syndromic – Pendred syndrome, Bamforth-Lazarus syndrome and brain – lung – thyroid syndrome.

Person suffering from thyroid disorder caused by any of the stated etiology can be grouped under one of the three categories based on their thyroid hormone levels.

1. Hypothyroid
2. Hyperthyroid
3. Euthyroid status

Back in 1901, Landsteiner was the first to explain about the presence of serologic variation between individuals based on their RBC cell membrane antigens and antibodies present in plasma[7]. He classified people based on their blood group, which depended on their RBC cell membrane agglutinogen – people with Blood group A, B, AB and O[7].

ABO blood group system is controlled by genes located on chromosome number 9 and plays a vital role in modern day transfusion medicine[2]. Alleles which code for antigen A and B show co-dominance and act as dominant allele compared to the O antigen[2]. The presence or absence of the erythrocyte membrane antigen decides the blood group of the individual.

Antigen on the cell membrane is accompanied by the presence of the anti-body in the plasma for the other antigen, for example - people with blood group A, have antigen A on the RBC membrane where as anti-B antibody in the plasma. Similarly people with blood group B have antigen B on the RBC membrane and anti-A antibody in the plasma, people with blood group O have neither A nor B antigen and hence both anti-A and anti-B antibodies are present in their plasma, people with AB blood group on the contrary have both A and B antigen and none of the antibody.

The prevalence rate of thyroid disorders in India is about 3.2%, which appears to be small but given the population of India, it is estimated to be around about 42 million[8]. Thyroid hormones being multifunctional are capable of causing morbidity in multiple ways if present in excess or in less amount. Hormonal imbalance not only affects the directly connected functional systems but also is proven to causes other morbid consequences like

Cardiac illness, mental health issues, myxedema, peripheral neuropathy, infertility, birth defects, osteoporosis and many more[1].

Its already been established that some diseases like salivary gland tumours[10], chicken pox[11], malaria[12], oral cancer[13], haematological malignancies[14], ischemic heart disease[15], dental caries[16], cholera[17] have significant association with blood groups.

The aim of the research was to investigate the correlation of thyroid hormone abnormalities and their preponderance if any, with ABO Blood group antigens. If found significant it could help in identifying population which is prone for developing thyroid disorders based on their blood group.

Materials and Method

It was an Observational study, conducted in patients that presented to the E.N.T OPD in JSS hospital, Mysore. Ethical clearance was obtained from the ethical committee of the institute before commencement of the study.

People with newly diagnosed thyroid disorders irrespective of age and sex and etiology who willing gave consent to be the part of the study were selected. Patients with syndromic association and old cases who were already on treatment were excluded.

All the newly diagnosed thyroid disorder cases were

thoroughly examined and made to undergo relevant investigations like routine blood investigations, thyroid profile, ultrasonography (if required), FNAC (fine needle aspiration cytology) (if required) and Blood grouping (for study purpose).

People were categorised into four different groups based on their blood groups. They were further divided into sub categories based on their thyroid hormone levels and were labelled as new cases with

1. Hypothyroidism
2. Hyperthyroidism or
3. Euthyroid status

Thyroid hormone levels taken as normal range are given below:

Table 1. Reference range for thyroid hormones

TSH	0.4–4.5 mU/L
T4	4.6-12 ug/dl
T3	80-180 ng/dl

People with subclinical hypothyroidism were also considered under hypothyroid category.

Data was analysed using updated version of SPSS software.

Results

Amongst 220 people diagnosed with thyroid disorders,majority was formed by people with "O" blood group, i.e. 100 people (45.45%), followed by "A" and "B" blood groups with AB blood group being least common. (Table 1).

Table 2. Frequency distribution of various blood groups in thyroid disorders.

Blood Group	Percentage	Number of Patients
A	31%	68
B	20%	44
AB	3.60%	8
O	45.45%	100
Total		**220**

100 people out of 220 had "O" blood group, amongst which majority presented with hypothyroidism (68%)."A" blood group was found in 68 people and most common presentation was hyperthyroidism (47%). 44 people out of 220 had "B" blood group and majority of them presented with hyperthyroidism as well (36%). Only 8 people had AB blood group and clinical presentation was equal for both hypothyroidism and hyperthyroidism.(Table 2)

Table 3. Frequency distribution of thyroid hormone level status amongst people with various blood groups.

Blood Group	HYPO	HYPER	EUTHY	Total
A	24%	47%	29%	100%
	16	32	20	
B	28%	36%	36%	100%
	12	16	16	
AB	50%	50%	0%	100%
	4	4	0	
O	68%	24%	8%	100%
	68	24	8	

Out of 220, malignant cases were 36 with highest number being seen in people with blood group A (16), followed by people with blood group O (12) and then B (8).

Most common malignancy was papillary carcinoma (24 cases) followed by medullary carcinoma (8 cases) and 4 cases of the variant -hurthle cell carcinoma was seen.

Conclusion

Significant correlation exists between ABO blood group thyroid disorders.

The prevalence of thyroid disorders being highest in blood group O **($p<0.05$)** in Mysore.

Among blood group O, HYPOTHYROIDISM being the most common presentation($p<0.05$). Among people with blood group A, HYPERTHYROIDISM being the dominant one ($p<0.05$ for blood group A). No significant co-relation could be established between people with B or AB and thyroid disorders.

Discussion

Current study revealed a significant correlation between thyroid disorders and ABO blood grouping. Overall "O" blood group was most prevalent amongst people with thyroid disorders, which is in accordance with the findings of a study done in Babylon by Manar et

al[9], however we found Blood group "O" to be associated with hypothyroidism and Blood group "A" and "B" to be associated with hyperthyroidism, which also supports his findings. Blood group antigens have been used as genetic markers in studies of their correlations with various diseases.

We found that people with BLOOD GROUP "O" are more prone for developing thyroid disorders followed by "A" and "B". Hypothyroidism being most common presentation amongst "O" blood group and Hyperthyroidism amongst "A" and "B" whereas "AB" showed no such preponderance. It can, in future help in identifying the population at risk for development of thyroid disorders – specifically hypothyroidism based on blood group and hence can help in early diagnosis and treatment of the same, reducing the morbid and economic burden.

Blood Group determination at birth
↓
Identification of Population at risk of developing thyroid disorders
↓
Active screening in that population
↓
Primordial preventive measures
↓
Minimize consequences
↓
Reduces morbid and economic burden of community

Further research needs to be done to determine the correlation between the two and also on the molecular basis responsible for the same, if at all the correlation exists.

Future molecular based research will help to find the cause of the correlation between the two and also on the molecular interventions that may be used for the prevention of the same in near future. We however hypothesize this correlation to be present because of aberrant expression of the blood group antigens on the thyroid tissue cells, which may be the cause of destruction of the same because of the antibodies present in people with blood group "O", ultimately leading to hypothyroid state in them.

Ethical Clearance: Obtained from institutional ethical committee

Conflicts of Interest: Nil.

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