The significance and Risk Prediction of ABO Blood Group and Rh Factor in Differentiated Thyroid Carcinoma-Initial Experience at INMAS, Dhaka

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ABSTRACT

Objectives: Thyroid carcinoma occurs when abnormal cells in the thyroid gland start to divide and grow in an uncontrolled way. There are limited studies world-wide regarding the risk prediction of thyroid carcinoma with blood groups. In our study, we aimed to evaluate the significance and risk prediction of thyroid carcinoma with blood groups (ABO and Rh factor).

Patients and Methods: The observational study included 100 thyroid carcinoma patients who came to INMAS, Dhaka for radioiodine ablation from January, 2022 to May, 2022.

Results: Out of total 100 patients, 79 patients were females and 21 males. The age range of the patients was 17-65 years. 84 patients had classical variant papillary carcinoma (PCT), 5 had follicular variant papillary carcinoma (FV PCT), 4 had follicular carcinoma (FCT) and 7 had papillary microcarcinoma. Lymph node metastases (LNM) were found only among the classical variant PCT, 35 (41.66%) patients. Out of total 100 patients, blood group of 32 patients were B positive, 31 patients were O positive, 20 patients were A positive, 12 patients were AB positive, 3 patients were B negative, 1 patient was O negative and 1 patient was A negative. LNM were found in 13 (40.62%) patients of B positive, 7 (22.58%) patients of O positive, 7 (35%) patients of A positive, 5 (41.66%) patients of AB positive, 2 (66.66%) patients of B negative and 1 patient of A negative blood group.

Conclusion: In our study, thyroid carcinoma is more common in B positive and O positive blood groups. In our country, B positive and O positive blood groups are common, so we could not conclude that these types of blood groups are more related with thyroid carcinoma than others.

Keywords: Differentiated Thyroid carcinoma, blood group, ABO and Rh factor, risk prediction

Bangladesh J. Nucl. Med. Vol. 27 No. 2 July 2024
DOI: https://doi.org/10.3329/bjnm.v27i2.79200

INTRODUCTION

Thyroid carcinoma is the most frequent endocrine malignancy and accounts for around 3% of global carcinoma incidence (1). It occurs in more than 500,000 cases per year worldwide (2). Thyroid carcinoma occurs when abnormal cells in the thyroid gland start to divide and grow in an uncontrolled way. There are limited studies world-wide regarding the risk prediction of thyroid carcinoma with blood groups (3). In the recent study, we aimed to evaluate the significance and risk prediction of thyroid carcinoma with blood groups (ABO and Rh factor).

The incidence of thyroid carcinoma continues to rise worldwide, mostly as a result of increased use of diagnostic imaging and surveillance. Although incidence is rising steadily, mortality from thyroid carcinoma has changed minimally over the past five decades (4).

Since the first link between blood type and carcinoma was described in 1953, numerous studies have sought to determine whether the histo-blood ABO group is associated with tumorigenesis. The first significant association between a SNP (single nucleotide polymorphism) located within the ABO glycosyltransferase gene and increased risk of pancreatic carcinoma was reported in 2009 (5).

PATIENTS AND METHODS

The observational study was done between January, 2022 to May, 2022 on 100 DTC patients referred to INMAS, Dhaka for radioiodine ablation (RIA) after total/completion thyroidectomy. All patients eligible for RIA were included in

that study. The demographics, ABO blood group, Rh factor, histopathological type of malignant thyroid tumors were recorded for each patient.

RESULT

out of 100 patients, 79 (79%) patients were females and 21 (21%) were males with male to female ratio was 1:3.7. The age range of patients was 17-65 years with majority of the patients were 31-50 years old (n=56, 56%). The mean age was 34.5 + 12.3 years.

Table 1 reveals the distribution of the study subjects according to age. Out of a total of 100 patients, majority of the patients were 31-50 years old (n=56, 56%).

Table 1: Distribution of the study subjects according to age (n=100)

Age (Years)	Number of patients (n=100)	Percentage (%)
≤20	7	7
21-30	24	24
31-40	30	30
41-50	26	26
51-60	7	7
>60	6	6

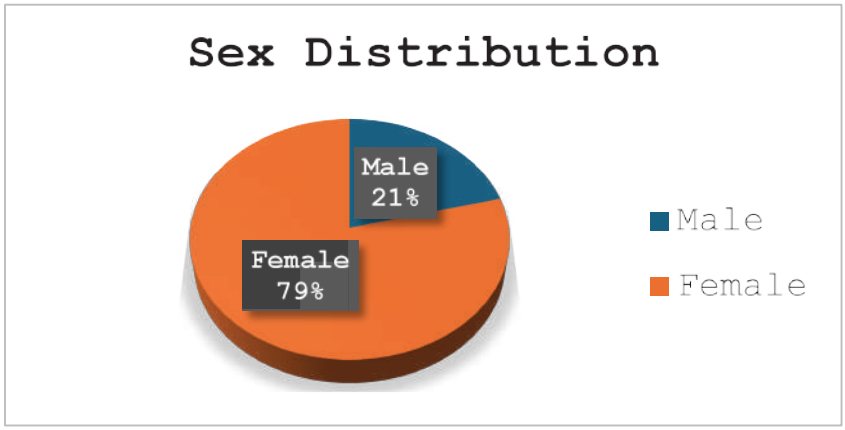

Figure 1: Gender distribution of the study subjects. There were 79% females and 21% males out of 100 subjects.

Table 2: Number of patients according to types of thyroid carcinoma

Types of blood group	Number of patients
Papillary carcinoma (classical variant)	84
Papillary carcinoma (follicular variant)	5
Follicular carcinoma	4
Papillary microcarcinoma	7

Table 3: Number of patients, types of differentiated thyroid carcinoma and corresponding blood groups

Types of Blood Group	Types of Thyroid carcinoma	Number of Patients	Percentages (%)
B positive	Classical PCT	30	93.7
	FCT	1	3.1
	Papillary microcarcinoma	1	3.1
O positive	Classical PCT	21	67.7
	Follicular variant PCT	3	9.6
	FCT	1	3.2
	Papillary microcarcinoma	6	19.3
A positive	Classical PCT	18	90
	Follicular variant PCT	1	5
	Papillary microcarcinoma	1	5
AB positive	Classical PCT	10	83.3
	Follicular variant PCT	1	8.3
	FCT		8.3
B negative	Classical PCT	2	66.6
	FCT	1	33.3
O negative	Classical PCT	1	
A negative	Classical PCT	1	

Table 3 shows number of patients, types of differentiated thyroid carcinoma and corresponding blood groups that revealed that out of a total of 100 patients, the blood group of 32 patients was B positive, 31 patients were O positive, 20 patients were A positive, 12 patients were AB positive, 3 patients were B negative, 1 patient was O negative, and 1 patient was A negative. Among 32 B positive patients, 30 (93.7%) patients had classical PCT, 1 patient had FCT (3.1 %), and 1 (3.1%) patient had papillary microcarcinoma. Among 31 O positive patients, 21 (67.7%) patients had classical PCT, 3 (9.6%) patients had PCT (FV), 1 (3.2%) patient had FCT, and 6 (19.3%) patients had papillary microcarcinoma. Among 20 patients of A positive blood group, 18 (90%) patients had classical PCT, 1 (5%) patient had PCT (FV), and 1 (5%) patient had papillary microcarcinoma. Among 12 patients of the AB blood group, 10 (83.3%) patients had classical PCT, 1 (8.3%) patient had PCT (FV), and 1 (8.3%) patient had FCT. Among 3 patients of the B negative blood group, 2 (66.6%) patients had classical PCT, and 1 (33.3%) patient had FCT. One O negative and A negative patient both had classical PCT. Lymph node metastases (LNM) were found only among the classical variant of PCT in 35 (41.66%) patients.

Table 4: Number of patients with LNM according to blood groups

Types of Blood Group	Number of patients with LNM	Percentage (%)
B positive	13	40.6
O positive	7	22.5
A positive	7	35
AB positive	5	41.6
B negative	2	66.6
A negative	1	

Table 4 illustrates the number of patients with LNM according to blood groups. LNM were found in 13 (40.6%) patients of B positive, 7 (22.5%) patients of O positive, 7 (35%) patients of A positive, 5 (41.6%) patients of AB positive, 2 (66.6%) patients of B negative, and 1 patient of A negative blood group.

DISCUSSION

The synthesis of blood group antigens in carcinoma cells is believed to be a consequence of the activation of specific glycosyltransferases, which are suppressed in normal cells. In papillary carcinomas that immunohistochemically frequently express blood group antigens DUPAN-2 and CA19–9 but less frequently express Lea (Lewisa) and Leb (Lewisb), it is speculated that the activity of the specific glycosyltransferases is increased; a2–3 sialyltransferase may be highly activated as compared with a1–4 fucosyltransferase. However, it seems that normal thyroids or the vast majority of follicular tumors are devoid of the activities of the specific glycosyltransferases. Among the four markers, DU-PAN-2 antibody could considerably aid in the diagnosis of papillary carcinomas in routine surgical pathology (6).

The abnormal glycosylation pattern of glycolipids and glycoproteins at the surface of cells is a common and well-described phenomenon in neoplastic development. Mucins are major carriers in their saccharide component of simple mucin and histo-blood antigens. The overexpression of such antigens in many neoplastic conditions may reflect an increase in the amount of carrier mucins (provided the appropriate glycosyltransferases are available). A study was conducted by Alves, P. et al. where they investigate the expression of mucin antigens (MUC 1, underglycosylated form of MUC 1-SM3, MUC2, MUCSAC, and MUC6), simple mucin antigens (Tn, sialyl Tn), Lewis type 1 histo-blood group antigens (Lewisa, sialyl Lewisa), and Lewis type 2 histo-blood group antigens (Lewisx, sialyl LewisX) were analyzed by immunohistochemistry using the monoclonal antibodies. They concluded that MUC1 plays a pivotal, though not exclusive, role in the glycosylation features of well differentiated thyroid carcinomas. PTC expressed more often, more intensively, and more extensively every antigen but MUC6, which was not observed in any case. The expression of MUC5AC was also extremely rare. No immunoreactivity for underglycosylated MUC1, MUC2, MUC5AC, and MUC6 was found in follicular carcinomas (7).

Using monoclonal antibodies (MoABs) against blood group determinants and related carbohydrate sequences, it is now possible to clarify their carcinoma-associated modulation at a molecular level. Vierbuchen, M. et al. conducted an immunohistochemical study to evaluate blood group antigen expression in medullary carcinoma of the thyroid (MTC). In that study, a panel of MoABs against different type 1 chain derived blood group antigens, comprising A,B, H type 1, Le a, sialyl-Le a (CA 19-9), sialyl type 1 structure (CA 50), and Le b was used to investigate their immunoreactivity in 38 patients of MTC and in normal thyroid tissue. The antigens were not expressed in normal follicular or C-cells but were expressed to a various extent in MTC. The investigations demonstrated the dominant re-expression of three type 1 chain-derived structures in MTC, namely H type 1, Le b, and CA 50. These findings support the general concept demonstrated in other carcinomas, that fucosyl-and sialytransferases are preferentially activated in MTC (8).

In the present study, out of 100 patients, 79 (79%) patients were females and 21 (21%) were males with male to female ratio was 1:3.7. The age range of patients was 17-65 years with majority of patients 31-50 years old (n=56, 56%). Abdullah, Y. A. et al. showed in their study that most of the thyroid malignant patients were females (n= 35, 70%), and males percentage was account 15 (30%); the male to female ratio was (1:2.3) out of total 50 patients. Majority of patients were in 31- 50 years old age group (n=31, 62%) which is similar with the recent study (9).

Thyroid carcinoma is more common in B positive (n=32, 32%) and O positive (n=31, 31%) blood groups in the current study. The most common thyroid carcinoma was papillary type. A similar study was done by Geneş, D. et al. that included 223 (F= 163, M = 60) PCT patients and found O blood type to be the most common blood group in the PCT group with an occurrence rate of 38.6%. A Rh-positive blood type was significantly less frequent among patients with PCT. A Rh-positive blood type could be considered a protective factor indicating a reduced risk of PCT (3).

Khoshsirat, S. et al. performed a study of 87 patients with thyroid carcinoma (68 of them had PCT) were compared with a control group. It was observed that, compared with the control group, blood type A was significantly less common in patients with thyroid carcinoma and reduced the risk of thyroid carcinoma by 43%. Increased risk of thyroid carcinoma was reported in patients with blood type B. It was considered that blood type A could significantly reduce the risk of thyroid carcinoma, whereas blood type B could increase this risk (10).

LNM were more common in the B positive group than the O positive group in this study. With the same number of patients with LNM, it was observed that the percentage of LNM was higher in A positive than O positive blood groups. Tam, A. A. et al. studied 2,043 patients with the B blood group and showed a higher risk of extrathyroidal extension and advancement of stages compared to patients with the non-B blood group (11).

Abdullah, Y. A. et al. enrolled 50 patients with thyroid carcinoma to evaluate the relationship between various histopathological types of primary malignant thyroid carcinoma and blood groups and found A positive blood group is the most frequently reported among cases of papillary thyroid carcinoma, which is the most common malignant thyroid tumor. The blood group A positive has more frequency rate (n= 17, 34%), blood group O positive was (n=15, 30%), B positive (n=10, 20%). Frequency rate for O positive blood group is almost similar with the current study (n=31, 31%) but dissimilar with B and A positive blood groups (9).

Other than thyroid cancers, ABO blood type also appears to be linked to several cancers. A study done by Wang, Z. et al. on gastric carcinoma and ABO blood group found that there was a slightly increased risk of gastric carcinoma in A blood group individuals, and people with blood type A are more prone to being infected by H. pylori. Moreover, slightly decreased risk of gastric carcinoma was identified in blood type O individuals (12).

The relationship between ABO blood type and the risk of incidental pancreatic carcinoma in two large, independent, prospective cohort studies found the association of A, AB, or B were more likely to develop pancreatic carcinoma compared with participants of blood group O (13).

The relationship between blood groups and lung carcinoma risk depending on histology showed small cell lung carcinoma (SCLC) patients had a significantly higher frequency of blood type B negative compared to non-small cell lung carcinoma (NSCLC) patients (14).

Gates, M. A., et al., used data from 49,153 women in the Nurses' Health Study and examined the association between ABO blood group and incidence of epithelial ovarian carcinoma. The study participants reported their blood type and Rh factor in 1996, and 234 women were diagnosed with incident ovarian carcinoma during 10 years of follow-up. In this large, prospective cohort of women, blood groups AB and B were associated with a borderline significant increased incidence of ovarian carcinoma. The magnitude of the association was similar for blood group AB and blood group B, suggesting that the B antigen may influence ovarian carcinogenesis. The study results were suggestive of a possible association between the B blood group antigen and increased risk of ovarian carcinoma (15).

Kashfi, S. M., et al. performed a study that revealed an association of blood groups with colon carcinoma. The results showed that the highest frequencies among 223 patients with colon carcinoma were related to blood group O positive (16).

Weisbrod, A. B., et al. conducted a retrospective study of 105 patients with Multiple Endocrine Neoplasia Type 1 (MEN-1) titled Association of Type-O Blood with Neuroendocrine Tumors in Multiple Endocrine Neoplasia Type 1 and found an association between O blood type and the manifestation of a primary neuroendocrine tumor of the gastrointestinal tract, lung, pancreas, and thymus in patients with MEN-1. Sixteen of 17 (94%) metastatic tumors had type O blood, compared to 32 of 43 (74%) with a benign tumor who had non-O blood type, and suggested an association between O blood type and the manifestation of a primary neuroendocrine tumor in patients with MEN-1 (17).

CONCLUSION

Thyroid carcinoma was found to be more common in B positive and O positive blood groups. In our country, B positive and O positive blood groups are common, so we could not conclude that these types of blood groups are more related to thyroid carcinoma than others.

LNM were more common in the B positive group than the O positive group. With the same number of patients with LNM, we also observed that the percentage of LNM was higher in A positive than O positive blood groups. Further large-scale study is needed to find out any specific relationship between thyroid carcinoma and blood groups.

REFERENCES

1. Gallardo, E., Medina, J., Sánchez, J.C., Viúdez, A., Grande, E., Porras, I., Ramón, Y., Cajal, T., Trigo,J., Iglesias, L., Capdevila, J., 2020. SEOM clinical guideline thyroid carcinoma. Clin Transl Oncol. 22(2), 223-35.
2. Sharifi-Rad, J., Rajabi, S., Martorell, M., Lopaz, M, D., Toro, M, T., Barollo, S., Armanini, D., Fokou, P, V., Zagotto, G., Ribaudo, G., Pezzani, R., 2020. Plant natural products with anti-thyroid carcinoma activity. Fitoterapia, 146, PP.104640.
3. GENEŞ, D., Pekkolay, Z., Şimşek, M., Saraçoğlu, H., Turgut, M., & Tuzcu, A. K., 2022. Importance and Risk Prediction of ABO Blood Group and Rh Factor in Papillary Thyroid Carcinoma. Journal of Endocrinology Research, 4 (1), pp.8-13.
4. Cabanillas, M.E., McFadden, D.G., Durante, C., 2016. Thyroid carcinoma. Lancet. 388 (10061), pp.2783-2795.
5. Rummel, S.K., Ellsworth, R.E., 2016. The role of the histoblood ABO group in carcinoma. Future Sci OA. 2(2), FSO107.
6. Kamoshida, S., Ogane, N., Yasuda, M., Muramatsu, T., Bessho, T., Kajiwara, H., Osamura, R. Y., 2000. Immunohistochemical Study of Type-1 Blood Antigen Expressions in Thyroid Tumors: The Significance for Papillary Carcinomas. Mod Pathol, 13 (7), pp.736–741.
7. Alves, P., Soares, P., Fonseca, E., Sobrinho-Simoes, M., 1999. Papillary Thyroid Carcinoma Overexpresses Fully and Underglycosylated Mucins Together with Native and Sialylated Simple Mucin Antigens and Histo-Blood Group Antigens. Endocrine Pathology, 10 (4), pp.315-324.
8. Vierbuchen, M., Larena, A., Schroder, S., Hanisch, Franz-G., Ortmann, M., Larena, A., Uhlenbruck, G., Fischer, R., 1992. Blood group antigen expression in medullary carcinoma of the thyroid-An immunohistochemical study on the occurrence of type 1 chain - derived antigens.Virchows Archiv B Cell Pathol, 62, pp.79-88.
9. Abdullah, Y. A., Hussein, A. H., 2023. Evaluation of the relationship between various histopathological types of primary malignant thyroid carcinoma and blood groups.

   Thi-Qar Medical Journal (TQMJ), 26 (2), pp.201-212.
10. Khoshsirat, S., Peyvandi, A. A., Oroei, M., Peyvandi, H., Rezaeifard, A., 2019. The Estimation of Thyroid Carcinoma Risk based on Type 2 Diabetes Mellitus and ABO Blood Group. Turkish Journal of Oncology, 35 (1), pp.64-69.
11. Tam, A. A., Ozdemir, D., Faki, Sevgul., Bilginer, M. C., Ersoy, Reyhan., Cakir, B., 2020. ABO Blood Groups, Rh Factor, and Thyroid Carcinoma Risk: To 'B' or Not to 'B'. Endocrine Research, 45 (2), pp.37-146.
12. Wang, Z., Liu, L., Ji, J., Zhang, J., Yan, M., Zhang, J., Liu, B., Zhu, Z., Yu, Y., 2012. ABO Blood Group System and Gastric Carcinoma: A Case-Control Study and Meta-Analysis. International Journal of Molecular Sciences, 13 (10), pp.13308-3321.
13. Wolpin, B. M., Chan, A. T., Hartge, P., Chanock, S. J., Kraft, P., Hunter, D. J., Giovannucci, E. L., Fuchs, C. S., 2009. ABO Blood Group and the Risk of Pancreatic Carcinoma.Journal of the National Carcinoma Institute, 101(6), pp.424-431.
14. EREN, C., AKBIYIK, A. G., OKTEN, I. N., 2021. Analysis of The Relationship between Blood Groups and Lung Carcinoma Risk Depending on Histology.Journal of Duzce University Health Sciences Institute,11(3), pp.386-390.
15. Gates, M. A., Wolpin, B. M., Cramer, D. W., Hankinson, S. E., Tworoger, S. S., 2010.ABO blood group and incidence of epithelial ovarian carcinoma.International Journal of Carcinoma,128(2), pp.482-486.
16. Kashfi, S. M., Bazrafshan, M. R., Kashfi, S. H., Jeihooni, A. K., 2018. The Relationship Between Blood Group and Colon Carcinoma in Shiraz Namazi Hospital During 2002 – 2011. Jundishapur Journal of Chronic Disease Care,7(1), pp:e59474.
17. Weisbrod, A. B., Nilubol, N., Weinstein, L. S., Simonds,W. F., Libutti, S. K., Jensen, R. T., Marx, S. J., Kebebew, E., 2012. Association of Type-O Blood with Neuroendocrine Tumors in Multiple Endocrine Neoplasia Type 1. The journal of clinical endocrinology & metabolism, 98(1), pp.109-114.