DIETARY PATTERN IN THYROID DISORDERS

Deepa Narayanan[1], Sindhu Kattali Bhaskaran[2]

[1]Assistant Professor, Department of Transfusion Medicine, Government Medical College, Kozhikode, Kerala, India.
[2]Professor, Department of Pathology, Government Medical College, Kozhikode, Kerala, India.

ABSTRACT

BACKGROUND

It is known that excess iodine can cause thyroid dysfunction. Some studies show that iodine supplementation is related to increased incidence of papillary carcinoma. But this has not been clearly proved.

Aims and Objectives-

1. To compare the prevalence of iodized salt usage and consumption of iodine rich foods in patients with papillary carcinoma, follicular neoplasms and nodular colloid goitre.
2. To study the association of iodized salt usage and consumption of iodine rich foods with papillary carcinoma, follicular neoplasm and nodular colloid goitre.

MATERIALS AND METHODS

In this study, we included 100 cases of thyroid neoplasms which included 52 papillary carcinomas and 48 follicular neoplasms. 100 cases of nodular colloid goitre were also included in the study. Dietary survey is done by giving questionnaire to all subjects asking specifically regarding consumption of- a) Iodized salt, b) Fish and c) Shell fish.

RESULTS

When usage of iodized salt and food items with high iodine content like fish and shell fish in thyroid neoplasms were compared with nodular colloid goitre, no statistically significant result was observed. Usage of iodized salt showed statistically significant association with papillary carcinoma, when it was compared with follicular neoplasm.

CONCLUSION

Iodine deficiency and excess are associated with thyroid diseases. Most areas of Kerala are iodine sufficient. Present study has shown association of iodized salt with papillary carcinoma. Further study is needed to rule out the negative effects of iodine rich diet and thyroid diseases in Kerala.

KEY WORDS

Papillary Carcinoma, Follicular Carcinoma, Iodized Salt, Fish, Shell Fish.

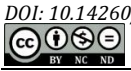
HOW TO CITE THIS ARTICLE: Narayanan D, Bhaskaran SK. Dietary pattern in thyroid disorders. J. Evolution Med. Dent. Sci. 2018;7(49):5264-5267, DOI: 10.14260/jemds/2018/1168

BACKGROUND

Iodine deficiency is known to cause hypothyroidism and resultant mental retardation in children. Iodine deficiency also causes goitre. Worldwide Iodization Programmes were introduced, which has led to decreased incidence of iodine deficiency disorders. Iodization of salt has been introduced in India to prevent iodine deficiency disorders. It is also known that excess iodine can cause thyroid dysfunction. Iodine is essential for the synthesis of thyroid hormones. Some studies show that iodine supplementation is related to increased incidence of thyroiditis and papillary carcinoma. But this has not been clearly proved. This study aims to study about dietary pattern and iodine intake in papillary carcinoma, follicular carcinoma and multinodular goitre.

India has been under effective salt iodization for about two decades, the residual goitre prevalence was reported after one decade of salt iodization to be 28.8%.[1] Goitre may occur in children due to high level of iodine.[2]

'Financial or Other Competing Interest': None.
Submission 03-11-2018, Peer Review 18-11-2018,
Acceptance 20-11-2018, Published 03-12-2018.
Corresponding Author:
Deepa Narayanan,
Assistant Professor, Department of Transfusion Medicine,
Government Medical College, Kozhikode, Kerala, India.
E-mail: drdeepa2@gmail.com
DOI: 10.14260/jemds/2018/1168



High iodine intake is associated with hypothyroidism and iodine induced thyroiditis.[2] When iodine is introduced in a previously iodine-deficient population, it leads to increased incidence of thyroiditis.[3,4,5] Diet in Malabar area is considered to be sufficient in iodine, as it is a coastal region and due to usage of iodized salt.[6]

Thyroid disease is common in iodine-replete areas. In a study of 2779 subjects living in Whickham, a mixed urban and rural area in Northeast England, showed the prevalence of thyroid disorders in that area.[7,8] The papillary carcinoma is the most prevalent type of carcinoma than follicular type. Papillary carcinoma presents with a higher incidence in females than in males.[9] The incidence of papillary thyroid cancer is increasing throughout the world[10] Increased iodine intake due to iodine prophylaxis is associated with increased incidence of papillary carcinoma. Animal experiments and epidemiological studies after introduction of iodine prophylaxis shows a relationship between iodine intake and the types of thyroid carcinoma, but has not demonstrated very clear evidence to establish relationship between cancer and iodine intake.[11] High iodine intake seems to be a significant risk factor for the BRAF mutation in thyroid gland and thus it can be a risk factor for thyroid malignancy.[12]

Study in a Goitre endemic area in Salta, Argentina, after iodization showed a lower frequency of follicular carcinomas, but a higher frequency of papillary carcinomas when compared to the period before introduction of iodine

prophylaxis. This supports the view that an increased iodine intake is associated[4] with an increased incidence of papillary carcinoma of the thyroid. Iodine supplementation has shifted the distribution towards papillary tumours in Germany.[13] Study in Sweden also showed increased incidence of papillary thyroid cancer in iodine-rich areas and follicular cancer in iodine-depleted areas.[14]

Sehested T et al compared the thyroid cancer incidence by morphological subtypes in two areas of Denmark, the eastern area (With mild iodine deficiency) and western area (With moderate iodine deficiency) during the period 1973-1997. Study showed no regional difference in the overall incidence of follicular or papillary thyroid cancer.[15] High dietary intake of iodine is associated with a high frequency of thyroiditis and thyroiditis is more commonly associated with papillary carcinoma than with other thyroid neoplasms.[16] Thyroid carcinoma shows geographic variation in its prevalence. Papillary carcinoma forms 85 - 90% of thyroid cancers in iodide-sufficient countries,[17] while the remaining epithelial thyroid cell tumours are mainly follicular carcinomas. The incidence of anaplastic carcinoma is decreasing. Anaplastic carcinoma often arises from pre-existing well-differentiated carcinoma, usually from follicular carcinoma.[18]

Iodization programmes were started in different parts of the world to prevent iodine deficiency disorders. Iodization of salt is considered the best method for iodine supplementation to a population.[19] Iodization programs have proved its value by reducing goitre size and by preventing goitre development and cretinism in children. Iodization programmes should be accompanied by monitoring of iodine level, because excessive iodine intake can also cause thyroid dysfunction and even small differences in iodine intake can lead to the prevalence of endemic goitre and other iodine-related thyroid diseases.[20,21,22] Knudsen et al found suppressed TSH level in iodine replete areas.[21] A study which was conducted after the initiation of a population-based iodine program in an area with iodine deficiency: Zimmermann et al[23] examined school children in an area with severe iodine deficiency and found that median thyroid volume significantly reduced in children, 2 years after iodized salt was introduced.[23] Toxic multinodular goitre is a common cause of hyperthyroidism in communities having adequate iodine intake, first being Graves' disease.[22,24]

When studies were done following iodization, they showed varying results from no change in occurrence of palpable goitre among children of 1 year after a shift from optional to mandatory iodization[25] to normalisation of goitre prevalence when measured by ultrasonography in children 18 months after iodization in different iodization regimes.[26]

Iodine has a role in thyroid carcinogenesis. High TSH level is associated with thyroid carcinogenesis. Iodine is essential for the synthesis of thyroid hormone. It is known that chronic iodine deficiency causes goitre. Similarly, iodine excess has also been associated with hypertrophy and hyperplasia of follicular cells, attributed to excessive secretion of TSH. This may be associated to at least a weak risk for thyroid cancer.[27,28] Experimental studies done in animals have shown that thyroid cancer can be induced by elevation of endogenous TSH, although in a small number of animals.

There is increased incidence of rodent thyroid tumours if TSH is elevated by goitrogen treatment. Low-iodine diet after mutagen administration, as DHPN or NMU also increases incidence of thyroid carcinogenesis. Thyroid carcinogenesis is abolished by giving thyroxine treatment or hypophysectomy immediately after giving a mutagen in rats preventing any TSH-induced growth.[29] Study was done in two regions in Italy, which showed that there was a two-fold increase in thyroid cancer incidence in an iodine-deficient area compared to an iodine-sufficient one.[30]

Objectives

1. To compare the prevalence of iodized salt usage and consumption of iodine rich foods in patients with papillary carcinoma, follicular neoplasm and nodular colloid goitre.
2. To study association of iodized salt usage and consumption of iodine rich foods with papillary carcinoma, follicular neoplasm and nodular colloid goitre.

MATERIALS AND METHODS

This is a cross-sectional observational study. Patients admitted in surgery wards of Medical College Hospital, Kozhikode, for thyroid surgery were taken as study population. Diagnosis was obtained from histopathological records of Department of Pathology. Study population mainly belonged to north Kerala.

Study period was from February 2008 to February 2009. Consecutive patients till sample size of 100 each was achieved for thyroid neoplasms and 100 for nodular colloid goitre was taken.

In this study, we included 100 cases of thyroid neoplasms which included 52 papillary carcinoma and 48 follicular neoplasm. 100 cases of nodular colloid goitre were also included in the study. Follicular neoplasms included follicular carcinoma and follicular adenoma, Hurthle cell carcinoma and Hurthle cell adenoma. Ethical clearance was obtained. Consent was taken from patients.

Dietary History

Dietary history is assessed by giving direct questionnaire to patients in the ward. Dietary intake of following were asked-

- Iodized salt - Used/ Not Used.
- Fish - Not consumed/ Consumed daily/ Not consumed.
- Shell fish - Not consumed/ Consumed.

Total of 52 papillary carcinoma, 48 follicular neoplasms and 100 multinodular goitre were studied.

Statistical Analysis

Statistical analysis was done using chi-square test.

RESULTS

	Thyroid Carcinoma	Nodular Colloid Goitre	Total
Using iodized salt	54 (54%)	57 (57%)	111
Not using iodized salt	36 (16%)	43	89
Total	**100**	**100**	**200**
P value 0. 388 > 0.05			

Table 1. Iodized Salt usage among Thyroid Carcinoma and Nodular Colloid Goitre

	Nodular Colloid Goitre (Number)	Thyroid Carcinoma (Number)	Total
Consuming fish daily	70 (72%)	76 (76%)	146
Consuming fish occasionally/ weekly	27(28%)	24 (24%)	51
Total	**97**	**100**	**197**
P value .626 > 0.05			

Table 2. Fish Consumption among Thyroid Carcinoma and Nodular Colloid Goitre

	Nodular Colloid Goitre Number (Percentage)	Thyroid Carcinoma Percentage (Number)	Total
Not consuming shell fish	16 (16%)	11 (11%)	27
Consuming shell fish	84 (84%)	89 (89%)	173
Total	**100**	**100**	**200**
P value .408 > 0.05			

Table 3. Shell Fish Consumption among Thyroid Carcinoma and Nodular Colloid Goitre

	Papillary Carcinoma	Follicular Carcinoma	Total
Not using iodized salt	18 (35.5%)	28 (58.3%)	**46**
Using iodized salt	34 (64.5%)	20 (41.5%)	**54**
P value 0.027 < 0.05			

Table 4. Iodized Salt usage among Follicular Carcinoma and Papillary Carcinoma

	Papillary Carcinoma (Percentage)	Follicular Carcinoma Percentage (Number)	Total
Consuming fish daily	38 (73%)	38 (79%)	76
Consuming fish weekly or occasionally	14 (27%)	10 (21%)	24
Total	**52**	**48**	**100**
P value 0.494 > .05			

Table 5. Fish Consumption among Follicular Carcinoma and Papillary Carcinoma

	Papillary Carcinoma	Follicular Carcinoma	Total
Not consuming shell fish	11 (21%)	0 (0%)	11
Consuming shell fish	41 (79%)	48 (100%)	89
Total	**52**	**48**	**100**
P value 0.001 < .05			

Table 6. Shell Fish Consumption among Follicular Carcinoma and Papillary Carcinoma

When usage of iodized salt and food items with high iodine content like fish and shell fish in thyroid neoplasms were compared with nodular colloid goitre. No statistically significant result was observed when usage of iodized salt in papillary carcinoma was compared with follicular neoplasm. Statistically significant result was observed with p value of 0.027 with usage of iodized salt high in papillary carcinoma. Usage of shellfish showed statistically significant association with follicular neoplasm when compared with papillary carcinoma. No statistically significant difference in the usage of fish was found in papillary carcinoma and follicular neoplasms.

DISCUSSION

Iodine is a trace element that is essential in the synthesis of thyroid hormones. Increase or decrease in iodine supply to a population may cause thyroid dysfunction and thyroid cancer incidence. But this has not been clearly proven. In general, chronic iodine deficiency is associated with an increased risk of follicular histological type of cancer, whereas chronically high iodine intake may increase the risk of papillary histological type of thyroid cancer.[31] Dietary iodine concentrations appear to influence the incidence, even the morphology of the papillary carcinomas in some cases. Introduction of iodized salt raised the incidence of papillary carcinoma in Salta, Argentina and Germany.[4,13] Papillary carcinoma forms 85% of well-differentiated carcinoma in iodine replete areas. WHO recommends that the median urinary iodine excretion levels in a community with optimal iodine nutriture should be in the range of 100 - 200 µg/L. Urinary iodine level survey conducted by Kapil U in 2001 showed median urine iodine level in Calicut 120.0 µg/L and in Malappuram 150.0 µg.[32]

Previous studies had found papillary carcinoma as the most common tumour in areas of iodine sufficiency. Our study population is mainly from Calicut and Malappuram districts are areas with optimal iodine uptake. Papillary carcinoma was more common than follicular carcinoma. In the present study 55 percent of persons used iodized salt, 74 percent consumed fish daily, 86 percent consumed shell fish. When usage of iodized salt and food items with high iodine content like fish and shell fish in thyroid neoplasms were compared with nodular colloid goitre, no statistically significant result was observed. When usage of iodized salt in papillary carcinoma was compared with follicular neoplasm, statistically significant result was observed with usage of iodized salt high in papillary carcinoma. Usage of shellfish with statistically significant association was seen with follicular neoplasm.

CONCLUSION

Iodine deficiency and excess are associated with thyroid diseases. Most areas of Kerala are iodine sufficient. Present study has shown association of iodised salt with papillary carcinoma when compared with follicular neoplasm. Further study is needed to rule out the negative effects of iodine rich diet on thyroid diseases in Kerala.

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