

## A STUDY ON CASSAVA [TAPIOCA] CAUSING HYPOTHYROIDISM

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### ABSTRACT

#### BACKGROUND

The thyroid gland is an endocrine gland which secretes Thyroxine which is important for day-to-day metabolism, growth, etc. Certain foods interfere with production of thyroid hormones. Here, we are going to discuss one important food compound which interferes with thyroid hormone synthesis.

#### MATERIALS AND METHODS

Forty seven cases of hypothyroidism with or without goitre were studied in the Department of Surgery, Sree Mookambika Institute of Medical Sciences. Four males and forty three females were studied in detail and investigated. Detailed family history, dietary habits, personal history was taken in all forty seven cases. Among them, forty persons were consuming Tapioca.

#### RESULTS

Four males and forty three females were studied in detail and investigated. Two were suffering from Hashimoto's Thyroiditis. Minimal age was 20 years, and maximal age was 69 years. There were two cases of malignancy of Thyroid and another two cases of calcifications. All the forty seven cases were thoroughly investigated.

#### CONCLUSION

Plenty of Iodine rich foods like Dry Sea Weeds, Egg, Milk, Cod liver fish, Yoghurt, Turkey breast, Navy Beans, Tuna, etc., should be taken in people who are eating Tapioca.

#### KEYWORDS

Thyroxine, Peroxidase, Cassava, Tapioca, Iodine, Thyroiditis.

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**INTRODUCTION:** Tapioca is the main food consumed by most of the local people in and around Kulasekharam. It is proved that Tapioca contains Thiocyanate, sulphur containing compound that weakens the activity of enzyme peroxidase. This enzyme inserts iodine into thyroid gland. Thiocyanate competes for iodine entry into the gland. This leads to hypothyroidism. Usage of Iodised salt prevents hypothyroidism. Eating plenty of fruits and vegetables also prevents hypothyroidism. It is found that many people are suffering from hypothyroidism due to the abundant intake of Tapioca.

Seven food items are noted to be causing hypothyroidism. They are- i] Bamboo shotty, ii] Cassava [Pulp of Tapioca], iii] Corn, iv] Flax, v] Lima Beans, vi] Sweet Potato, vii] Cruciferous vegetables [Nineteen in number]. Out of these seven foods, Tapioca is the most important food item eaten here that causes

hypothyroidism. These foods form Thiocyanate. Thiocyanate is a sulphur containing compound.

**CASSAVA:** Fresh Cassava contains linamarin which can turn into Hydrocyanic Acid when plant is damaged. Cyanide is toxic, so the human body converts into Thiocyanate to eliminate. Thiocyanate prevents peroxidase enzyme to absorb iodine. So thyroid hormone metabolism is interfered.

**AIM OF THE STUDY:** The objective of present study is to know effect of Tapioca on Thyroid Gland.

**MATERIALS AND METHODS:** Forty seven cases of hypothyroidism with or without goitre was studied in the above department. Detailed family history, dietary habits, Personal history were taken in all forty seven cases. Forty persons were consuming Tapioca.

**Inclusion Criteria:** Hypothyroid patients consuming cassava.

**Exclusion Criteria:** Hypertension and Diabetes were investigated and ruled out.

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**Investigations:** Routine investigations like complete haemogram, urine analysis, along with US scan, CT Scan, were done. Two special investigations were carried out, namely Thyroid Profile [T3, T4, and TSH] and FNAC [To rule out Thyroiditis].

**RESULTS:** Four males and forty three females were studied in detail and investigated. Their minimal age was 20 years and maximal age was 69 years. Two cases of hypothyroidism associated with malignancy, Papillary carcinoma. Both had Hashimoto’s Thyroiditis. Calcification as comorbidity was seen in two cases. Most of the patients were on treatment. They were suffering subclinically. Thirty patients who came for review were lethargic, intolerance to cold, constipated, loss of appetite [anorexia], menorrhagia in females. All the patients were on Thyroxine. Some were taking inadequate dose of thyroxine which was corrected.

Sl. No.	Age Range	Number of cases	Percentage
1	21-30 years	14	29.78%
2	31-40 years	11	23.40%
3	41–50 years	06	12.70%
4	51-60 years	13	27.65%
5	61-70 years	03	06.38

**Table 1: Showing Percentages of Incidences of Number of Cases in Different Age Groups**

**From the above table 1, it is observed that:**

1. Maximum number of incidences have occurred between age group of 21-30 years that is 14 [29.16%].
2. Followed by incidences observed between age group of 51-60 years that is 13[27.65%].
3. Least number of cases were observed between age groups of 61—70 years that is 06.38%.

Sl. No.	Month and Year 2016	Number of Cases	Percentage
1	October-2015	06	12.76%
2	November-2015	02	04.25%
3	December-2015	13	27.65%
4	January-2016	02	04.25%
5	February-2016	11	23.40%
6	March-2016	05	10.63%
7	April-2016	08	17.02%

**Table 2: Showing Percentages of Incidences of Number of Cases in each Month**

Total number of cases – 47.

**From the above table 2, it is observed that:**

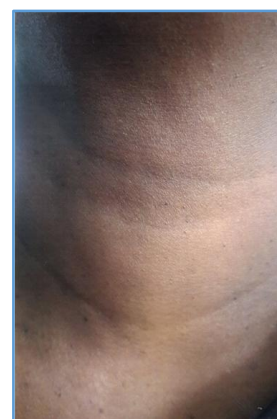
1. Maximum number of incidences have occurred during the month of December 2015 - 13 [27.65%].
2. Followed by incidences occurred during the month of February - 11[23.40%].
3. Least number of cases were observed during the month of January 2016 - 2 [04.25%].

Sl. No.	Age	Sex	Complaints	Diagnosis
1	55	Female	Swelling over the neck since one year	Multinodular Goitre
2	27	Female	Swelling over the neck since 6 months	Multinodular Goitre
3	32	Female	Hypothyroidism, on treatment since 2 years	No Goitre
4	37	Female	Swelling in front of the neck since 2 years	Multinodular Goitre
5	37	Female	Hypothyroidism, on treatment for 6 months	No Goitre
6	59	Female	Swelling in front of the neck since one and half years	Multinodular Goitre
7	24	Female	Swelling in front of the neck since 6 months	Multinodular Goitre
8	21	Female	Swelling in the thyroid region since 9 months	Solitary Nodular Goitre of Thyroid
9	63	Female	Swelling in front of the neck since 5 years	Multinodular Goitre
10	28	Female	Swelling in front of the neck since 4 years	Solitary nodular Goitre of Thyroid
11	57	Female	Swelling in front of the neck since 5 months	Multinodular Goitre
12	48	Female	Swelling in front of the neck since one year	Multinodular Goitre
13	21	Female	Swelling in front of the neck since 6 months.	Multinodular Goitre
14	52	Female	Swelling in front of the neck since 4 months	Multinodular Goitre
15	32	Female	Swelling in front of the neck since 3 years	Multinodular Goitre
16	28	Female	Swelling in front of the neck since one year	Multinodular Goitre
17	53	Female	Swelling in the neck since 2 years	Multinodular Goitre
18	30	Female	Swelling in the neck since one year	Multinodular Goitre
19	55	Female	Swelling in the neck since 5 months	Multinodular Goitre
20	24	Female	Pain and swelling in front of the neck since 3 months	Multinodular Goitre
21	42	Female	Swelling in front of the neck since 2 months	Multinodular goitre
22	46	Female	Swelling in front of the neck since one year	Multinodular Goitre
23	20	Female	Swelling in front of the neck newly diagnosed	Hashimoto’s Thyroiditis
24	44	Female	Minimal diffuse enlargement newly diagnosed	Hashimoto’s Thyroiditis

25	58	Female	Swelling in front of the neck since 9 years	Solitary nodular Goitre of Thyroid
26	36	Female	Swelling in front of the neck three and half years	Thyroiditis with papillary carcinoma
27	36	Female	Hypothyroidism, on treatment since 4 years	No Goitre
28	38	Female	Swelling in front of the neck since 15 years	Diffuse Goitre
29	53	Female	Hypothyroidism, on treatment	No Goitre
30		Female	Swelling in front of the neck since one month duration	Multinodular Goitre
31	57	Male	Hypothyroidism, on treatment since one year	No Goitre
32	63	Male	Swelling in front of neck since one month	Solitary nodular Goitre of Thyroid
33	53	Male	Hypothyroidism, on treatment since 10 days only	No Goitre
34	32	Female	Hypothyroidism, newly diagnosed	No Goitre
35	47	Female	Hypothyroidism since one and half years.	No Goitre
36	58	Female	Hypothyroidism since 2 years Swelling in front of the neck of 28 years duration	Multinodular Goitre
37	37	Male	Hypothyroidism since 28 years	No Goitre
38	29	Female	Swelling in front of the neck newly diagnosed	Solitary nodular Goitre of Thyroid
39	58	Female	Hypothyroidism one treatment since one year	No Goitre
40	31	Female	Hypothyroidism of 2 months duration	No Goitre
41	20	Female	Hypothyroidism of 6 years duration	Goitre present
42	52	Female	Hypothyroidism of seven years duration	No Goitre
43	37	Female	Hypothyroidism since 5 years	No Goitre
44	42	Female	Hypothyroidism of 12 years duration.	Goitre since two years
45	21	Female	Hypothyroidism since 2 months	Goitre Present
46	26	Female	Hypothyroidism since 3 years	Multinodular Goitre with papillary carcinoma
47	26	Female	Hypothyroidism since 6 months	Goitre Present

**Table 3: Showing the Incidences of Age, Sex, their Complaints & Diagnosis in Patients with Hypothyroidism**

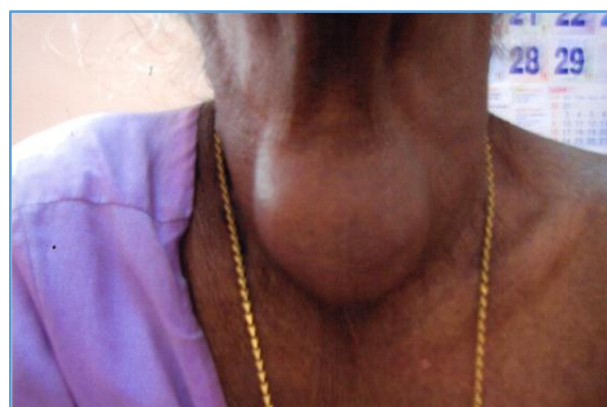
**From the above Table -3, it is observed that:** The minimum age of the patient was 21 years and maximum age was 63 years old. Mean age was 42 years. Twenty nine patients had swelling in front of the neck [61.70%] while 19 [40.42%] patients had hypothyroidism only ranging from newly diagnosed to 28 years. Regarding goitre, twenty two patients [46.80%] had Multinodular Goitre, Eleven patients [23.40%] had no goitre whereas three patients had Solitary Nodular Goitre of Thyroid. There were two cases of papillary carcinoma, one with thyroiditis in a female aged 36 years & other with multinodular goitre in a female patient aged 26 years. Hashimoto’s thyroiditis was seen in a female aged 20 years.



**Fig. 2: Showing Diffuse Swelling in the Neck**



**Fig. 1: Showing Diffuse Swelling in Cervical Region**



**Fig. 3: Showing Enlargement of Thyroid in a Female aged Sixty Years**



**Fig. 4: Showing Enlargement of Thyroid in a Female Patient**

**DISCUSSION:** Thyroid gland secretes two hormones namely thyroxine (T<sub>4</sub>) and triiodothyronine (T<sub>3</sub>).<sup>[1,2]</sup> Tyrosine and iodine on thyroglobulin molecule together form Thyroid hormones.<sup>[3]</sup> It is the thyroid follicles that produces 93% of T<sub>4</sub> and rest 7 % of T<sub>3</sub>.<sup>[2]</sup> It is through enzymatic conversion of T<sub>4</sub>, 80% of T<sub>3</sub> is produced in the peripheral cells.<sup>[3]</sup> Though only 7% T<sub>3</sub> is produced, its potency is 4 times more than that of T<sub>4</sub>.<sup>[1,2]</sup> Functions of Thyroid is very much affected by various conditions like pregnancy and iodine deficiency conditions.<sup>[4]</sup> Thyroid functions are affected by certain substances called Goitrogens and also they aggravate the effect of deficiency of iodine. These goitrogens mostly occur in food plants that are widely used.<sup>[5]</sup>

These food plants containing Cyanogenic glucosides, thioglucoside and thiocyanate (SCN) are goitrogenic.<sup>[6]</sup> It is the cassava which has high concentration of cyanogenic glucosides, in particular linamarin.<sup>[7]</sup> The goitrogenic activity of cassava is breaking down of cyanogenic glucosides and converting them to thiocyanate by the liver or residual cyanide (CN) from incompletely detoxified products. It is mediated by SCN which is formed by breaking down of cyanogenic glucosides in the intestine.<sup>[8]</sup>

In the study subjects, thyroid functions may be affected due to frequent consumption cassava and *M. stenopetala*. To reduce goitrogenic effect of cassava and *M. stenopetala*, food has to be processed properly before consumption.<sup>[9]</sup> A study was done in a rural population in Mozambique which was affected by the epidemic of spastic paraparesis due to dietary cyanide exposure from cassava. The lab investigation showed very high levels of serum and urinary thiocyanate, indicating a heavy exposure to cyanide. There was decrease in T<sub>4</sub> level and increase in TSH level.<sup>[10]</sup>

Cassava which is a vegetable that is grown in tropical countries. Six hundred million people in the world [especially in the developing countries] are consuming it as food. It is staple food in humid and sub humid areas of Africa. It is also an important food of famine. Cassava has high levels of cyanic glucosides which are toxic substances. These substances are removed to prevent them from being converted to hydrogen cyanide, which may give rise to

diseases and sometimes it may become fatal.<sup>[11]</sup> Cherinetet al study has shown that increase in rate of incidence of goitre with increased rate consumption of cassava as seen in three villages of the Demba Gofa district which is located about 530 Kilometres southwest of Addis Ababa.<sup>[12]</sup>

**Present Study:** This study was done on forty seven patients comprising four males and forty three females between age group of twenty one years to sixty three years who were suffering from either hypothyroidism or goitre or both in the surgical department of the above institution. These problems were due to consumption of cassava as their staple food for very long time ranging from five years to twenty eight years.

There were 51.06% suffering from multinodular goitre, five patients [10.64%] who were suffering from solitary nodular goitre. There were two female patients [04.26%] with papillary carcinoma who had associated thyroiditis in a female aged thirty six years & other with multinodular goitre aged twenty six years respectively. There were 2 [04.26%] patients with Hashimoto's Disease and one case of diffuse goitre [02.13]. The main cause of all these problems was due to cassava [Tapioca] as their main food or as associated food. So this study made us interesting, hence it has been reported.

**CONCLUSION:** We cannot avoid people from eating Tapioca. But we can advise them to take Iodine rich foods like Dry Sea Weeds, Egg, Milk, Cod liver fish, Yoghurt, Turkey breast, Navy Beans, Tuna etc. to avoid hypothyroidism and goitre.

**Take Home Message:** Create awareness in those who consume Tapioca as their main food and tell them the ill effects of consuming [hypothyroidism and goitre]. Also encourage them to consume Iodine rich foods along with Tapioca in order to avoid hypothyroidism.

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