DOI: https://doi.org/10.53350/pjmhs22165525

ORIGINAL ARTICLE

Correlation of Total Thyroid Volume with Thyroid Hormone among Pregnant and Non Pregnant Women in Local Population, karachi

HIRA AHMED[1], SOOFIA NIGAR[2], SHAZIA FAHMI[3], HINA JABEEN[4], RAFFAT RASOOL[5], MAHRUKH KAMRAN[6]
[1]*Assistant Professor Anatomy Department Karachi medical and dental college (kmdc)*
[2]*Associate professor Anatomy department Karachi Dow University of Health Sciences, DUHS*
[3]*Assistant Professor Anatomy department Kmdc*
[4]*Senior lecturer Dimc,DUHS*
[5]*Associate professor Forensic department Kmdc*
[6]*Associate professor Anatomy department DUHS, KARACHI*
Correspondence to: Hira Ahmed

ABSTRACT

Objective: The goal of the study was to find a link between the total size of the thyroid as measured by ultrasonography and the levels of thyroid hormones (TSH and FT4) in pregnant and non-pregnant women in Karachi.

Methodology: Between October 2016 and December 2018, the DUHS Ojha Campus in Karachi, Pakistan, hosted a clinical study in the Gynecology Outpatient Department (OPD) and the Radiology Department. Two groups of women between the ages of 14 and 45 who could bear children and were therefore candidates for recruitment (pregnant and non-pregnant women). Using an ultrasound, the total volume of the thyroid was accurately measured after ensuring that certain inclusion and exclusion criteria had been met. Thyroid hormone levels were measured using blood drawn from each of the women (TSH and FT4). At the Ojha campus of the Dow University of Health Sciences, the Ojha Diagnostic Research and Reference Laboratory, the blood test was performed (DDRRL).

Results: The study had 100 participants, 50 of whom were pregnant and the other 50 who were not. Total thyroid volume and the results of blood tests like serum TSH and FT4 were taken into account when comparing the two groups. Thyroid hormone levels were inversely correlated with thyroid volume in both groups of participants. Pregnant women had a total thyroid volume of 7.023.21, compared to 5.582.41 in non-pregnant women. When the p-value was less than 0.001, it was clear that the number of women who were pregnant had increased significantly. A pregnant woman's TSH level was 1.801.11 IU/mL, which was significantly higher than that of a non-pregnant woman's TSH level (p-value = 0.01). Non-pregnant women had an average FT4 level of 1.230.44 ng/dL, while pregnant women had an average FT4 level of 0.960.13 ng/dL.

Conclusion: So, our study shows that at least half of the pregnant women in our population do have some kind of thyroid hormone deficiency. During pregnancy, the size of the gland grows, which is a sign of an iodine deficiency.

Keywords: Pregnant women, non-pregnant women, TSH, FT4 and total thyroid volume.

INTRODUCTION

An important endocrine gland located in the middle of the neck is the thyroid, which is also known by the scientific name of the parathyroid gland. It has two lobes of the same size and shape located in front of the second and third tracheal rings, which are connected by an isthmus (1). They both play an important role in directing thyroid hormone production and activity. The thyroid gland produces, stores, and secretes T3 and T4 hormones, both of which depend on iodine as a primary building block (2). The body's biochemistry, metabolism, and nerve activity are all controlled by these (3). thyroid stimulating hormone (TSH), hCG, and iodine are the most common causes of an increase in hormone production by the thyroid gland during pregnancy. When you're expecting a child, your body goes through a lot of changes. For example, you'll need more energy, thyroid hormones, and iodine due to your metabolism speeding up (4, 5).

For pregnant women, breast-feeding mothers, and children in their first few years of life, iodine is a critical micronutrient. Seafood, dairy, and leafy green vegetables are the main sources of iodine in the diet. The amount of iodine in the soil is also linked to the quality of the water (6). Iodine is an essential component in the production of tri-iodo-thyronine (T3) as well as thyroxine, which is also known as tetra-iodothyronine (T4). Both while the baby is in the mother's womb and after birth, these hormones are critical to the brain development of the unborn child (2).

When pregnant women don't get enough iodine, the amount of thyroid hormone produced by both mother and fetus may be reduced. Pregnant women who are deficient in iodine are more likely to have a decreased production of thyroid hormone (6). Its deficiency can result in unplanned abortions, difficulties with the placenta during pregnancy, birth defects, low birth weight, mental problems, stunted growth in children, and an increased risk of mortality among newborns and infants (7). As a consequence of this, a fetus requires an adequate amount of iodine in order to grow and develop normally. According to the World Health Organization (WHO), the recommended daily intake of iodine for pregnant women is between 200 and 300 mg (8). It is possible to determine whether or not a woman is getting an adequate amount of iodine by observing the size of her thyroid gland as well as the amount of thyroid hormone she produces. This is also an effective way to prevent the thyroid gland from becoming abnormally large during pregnancy (9).

Hypothyroidism, which occurs when the body does not produce enough thyroid hormone because it does not have enough iodine, causes the thyroid gland to enlarge and become more obvious. This condition can be treated by taking iodine supplements (10). It is possible to determine this through ultrasonography of the thyroid gland, which measures and determines the size of the gland, as well as through the measurement of the amount of thyroid hormones that are present in the blood (11). In order to properly diagnose and treat thyroid problems that may arise during pregnancy, it is essential to determine the size of the thyroid (12). The accuracy of USG makes it the method of choice for measuring the size of the thyroid. Additionally, it does not involve any incisions, is not expensive, and does not call for any sedation or anesthesia (13). According to the World Health Organization (WHO), the USG is the most accurate method for determining the size of a pregnant woman's thyroid gland and the amount of thyroid tissue she possesses (12, 14).

With the goal of preventing any issues that might arise with the development of the fetus, this study was carried out to investigate how the size of the thyroid alters during pregnancy with the assistance of USG. Because low levels of iodine-based thyroid hormones are harmful to both the mother and the fetus, the purpose of this study was to increase awareness of the possibility of a thyroid hormone deficiency occurring in the early stages of an embryo's life. Sadly, many women don't become aware that they have hypothyroidism until their thyroid glands become enlarged and the condition becomes obvious. Because of this, a study had to be carried out to identify pregnant women who were deficient in either thyroid hormone or iodine so that the fetus would not experience any difficulties as a result of this.

METHODOLOGY

A cross-sectional approach was used in one study. One hundred women between the ages of 14 and 45 took part in this study and were able to have children. Only a hundred of them were pregnant, while the rest were not. The Ojha Campus of the Ojha Campus of the Dow University of Health Sciences (DUHS) in Karachi provided the information that was used in this study. Participants in the study signed a consent form agreeing to participate in the study and completing a questionnaire as part of that agreement.

A linear high frequency (7.5 MHz) USG probe was used on a GE Voluson S6 to obtain an accurate reading of the thyroid gland's total volume. The WHO-recommended correction factor of V(ml)=0.479* was applied to the results after they were obtained.

In order to calculate the total thyroid volume (TTV), both lobes were added together. Thyroid hormones (TSH and FT4) were analyzed in the lab using a blood sample taken from each woman. At the Ojha campus of the Dow University of Health Sciences, the Ojha Diagnostic Research and Reference Laboratory, the blood test was performed (DDRRL). The study was approved by both the ethics review committee and the BASR committee. Version 23 of SPSS was used to analyze all of the data. It was used to determine the size of the sample using the Open Epi method. Any and all P-values lower than 0.05 were assumed to be statistically significant. In addition, tables and graphs were used to illustrate the study's findings. The two groups were compared using a t-test based on independent samples

.

RESULTS

Total Thyroid Volume (TTV): In non pregnant women, mean TTV was 5.58±2.41 whereas in pregnant women, it was 7.02±3.21 which was significantly increased in pregnant women with p-value 0.01*. As shown in table and figure 1.

Table and Figure 1: Mean Comparison of TTV among two groups

	Non-Pregnant		Pregnant		
Parameters	(n=50)		(n=50)		p-value
	Mean	SD	Mean	SD	
Total Thyroid Volume	5.58	2.41	7.02	3.21	0.01*

*p<0.05 was considered significant using Independent Sample t-test

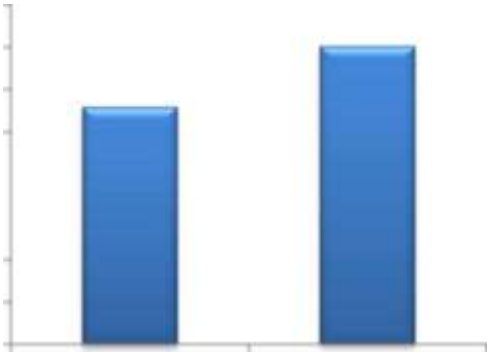

Figure 1: Mean Comparison of TTV among two groups

In non pregnant women, mean TSH was 1.29±0.83 µIU/mL whereas in pregnant, it was 1.80±1.11 µIU/mL which was significantly increased in pregnant with p-value 0.01. As shown in table and figure 2.

Table 2: Mean Comparison of TSH among two groups

	Non-Pregnant		Pregnant		
Parameters	(n=50)		(n=50)		p-value
	Mean	SD	Mean	SD	
TSH (µIU/mL)	1.29	0.83	1.80	1.11	0.01*

*p<0.05 was considered significant using Independent Sample t-test

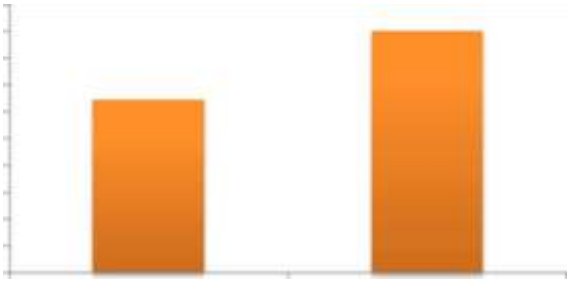

Figure 2: Mean Comparison of TSH among two groups

In non pregnant women, mean FT4 was 1.23±0.44 µIU/mL whereas in pregnant, it was 0.96±0.13 µIU/mL which was significantly increased in non pregnant with p-value 0.01. As shown in table and figure 3

Table 3: Mean Comparison of FT4 among two groups

	Non-Pregnant		Pregnant		
Parameters	(n=50)		(n=50)		p-value
	Mean	SD	Mean	SD	
FT4 (ng/dL)	1.23	0.44	0.96	0.13	<0.01*

*p<0.05 was considered significant using Independent Sample t-test

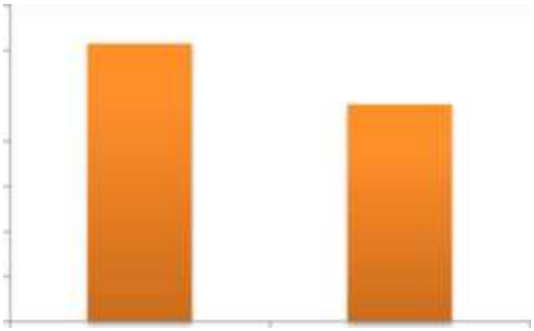

Figure 3: Mean Comparison of FT4 among two groups

DISCUSSION

People and groups differ greatly in the size of their hypothalamus, which is located in the thyroid gland (TGV). Low iodine intake during pregnancy is to blame for the thyroid gland's changes (15). Pregnant women with thyroid hormone deficiency had smaller thyroid glands than those who had normal thyroid glands. Additionally, we looked into the role that thyroid hormone played in causing those alterations. There was a significant difference in the total volume of the thyroid between the pregnant and control groups. Thyroid stimulating hormone (TSH) levels rose in response to low thyroid hormone levels, and this growth is a direct result of that rise. The thyroid follicles may swell and fill with more colloid if there is a dietary iodine deficiency, which may be the cause of this condition.

She's K Suzy. An investigation by A. Rhman Saad in 2018 found that the volume of a pregnant woman's thyroid gland decreased when measured with ultrasonography (USG). It was fascinating to see how closely her findings mirrored our own (16). Thyroid size increased significantly in pregnant women who did not consume enough iodine through their diets, according to a study conducted in 2015 by Henrietta OC and her associates (17). At each trimester of pregnancy, the size of the thyroid was measured using ultrasound (USG) by P. P. Symth et al, in 1997. The study's findings were released in a journal in 1997. During each and every one of the three trimesters, they found that the mean thyroid volume (MTV) was significantly (0.05) higher in pregnant women than in women who were not pregnant (18). 2015 saw a study in Turkey by S. Ertan and colleagues. Thyroid tissue in both lobes was found to be larger than previously thought (19).

Thyroid hormones such as TSH and FT4 are frequently used in prenatal diagnosis to determine if a woman is pregnant or not. Chemiluminescence and competitive immunoassay are methods used to determine whether or not the thyroid gland is functioning properly in the serum or blood. Consequently, it is critical that pregnant women be tested for thyroid issues (20). The fetus receives the iodine and thyroxine present in the mother's body during the early stages of pregnancy. Around the midway point of the pregnancy, the fetal thyroid begins to function (21).

When it comes to thyroid hormones (TSH and FT4), biochemical thyroid tests are the most useful during pregnancy. If you're pregnant, your TSH and FT4 levels should fall within the normal ranges of 0.6 and 3.4 U/mL, respectively. There are (22, 23). When the fetus has a greater need for thyroxin than the mother does in the first trimester of pregnancy, it is critical to have the thyroid hormone level checked (24). In 2016, M. Jidnysa carried out a study in India to examine the thyroids of both the mother and the baby during each of the three trimesters of pregnancy. The Indian National Science Academy provided the funding for this study. TSH levels were low in the first trimester, but increased significantly in the second and third, according to his findings (22). It was found that iodine supplementation had an effect on pregnancy-related changes in thyroid function that were both randomized and prospective. A significant increase in thyroid volume and serum TSH levels was found during pregnancy, as well as a significant decrease in FT4 levels. These changes were corrected by iodine supplementation (25).

In an area with a severe iodine deficiency, S. B. Serap et al. conducted research in 2014 on the changes in thyroid volume that occur during and after pregnancy. Their findings revealed

significant drops in FT4 levels during each of the three trimesters of pregnancy, but a return to normalcy three months after delivery (26).

During pregnancy, the thyroid's function changes, according to a study done by Pedersen, K. M. When pregnant, FT4 levels fall significantly, according to this study. Supplements of iodine were taken to compensate for these differences (25). The findings of these two other studies are consistent with the findings of our own study. It has been found that while TSH levels rise during pregnancy, those levels fall during all three trimesters of pregnancy (p-value = 0.001) by M. B. Carneiro and his colleagues in Brazil in 2018. (27).

We discovered a statistically significant difference in the mean of FT4 during the current investigation. Compared to the control group, pregnant women had lower FT4 and higher TSH levels, which was another surprise to us.

CONCLUSION

We can conclude that the average TTV of pregnant women differed in a statistically significant way based on our findings. We may see this because of our population's iodine deficiency, which causes the thyroid hormone to be produced less during pregnancy. A condition known as hypothyroidism is possible for these women and their children. Women who are pregnant or trying to get pregnant should ask their gynecologists for advice on which essential micronutrients they should include in their prenatal care. At every prenatal checkup, expectant mothers should have an ultrasound of their thyroid and a thyroid hormone test (TSH, FT4) performed on them. Preventing problems in the fetus's early stages of development would be beneficial.

REFERENCES

1. Lin Z, Yang Z, He B, Wang D, Gao X, Tam SY, Wu VW. Pattern of radiation-induced thyroid gland changes in nasopharyngeal carcinoma patients in 48 months after radiotherapy. PloS one. 2018 Jul 9;13(7).
2. Hall, J.E., Guyton and Hall textbook of medical physiology e-Book: Elsevier Health Sciences, 13th Edition; 2015.
3. Delshad.H. Iodine nutrition in pregnancy. Annals of Thyroid. 2018 Sept; 3(20).
4. Stagnaro.Green.A, Abalovich.M, Alexander. E, A. Fereidoun et al. Guidelines of the American Thyroid Association for the diagnosis and management of thyroid disease during pregnancy and postpartum. Thyroid. 2011 Oct; 21(10): 1081–1125.
5. Berghout, A. and W. Wiersinga. Thyroid size and thyroid function during pregnancy: an analysis. European Journal of Endocrinology. 1998.138(5):536-542.
6. Khattak RM, Khattak MN, Ittermann T, Völzke H. Factors affecting sustainable iodine deficiency elimination in Pakistan: A global perspective. Journal of epidemiology. 2017;27(6):249-57.
7. Fereja M, Gebremedhin S, Gebreegziabher T, Girma M, Stoecker BJ. Prevalence of iodine deficiency and associated factors among pregnant women in Ethiopia. BMC pregnancy and childbirth. 2018 Dec;18(1):257.
8. MH.Abel,TIM. Korevaar, Erlund I, GD.Villanger, IH.Caspersen et al. Iodine Intake is Associated with Thyroid Function in Mild to Moderately Iodine Deficient Pregnant Women. Thyroid. 2018 Oct;28(10):1359-1371.
9. Tayade, S.A. and S. Chhabra. Iodine status and its determinants in subpopulation of pregnant women in rural Central India. IJRCOG. 2018 Feb;7(2):665-670.
10. Wang.Z, X. Mingluan, Z. Wenming, M. Guangming, M. Zhe et al. Iodine Deficiency in Zhejiang Pregnant Women in the Context of Universal Salt Iodization Programme. 2018 June; 8(1):8835.
11. Ozdikici M. Ultrasonographic evaluation of changes in thyroid volume in women during pregnancy and lactation. Journal of health sciences and nursing. 2018 Aug 30;1(1):68-72.
12. Untoro.J, Nune Mangasaryan , Bruno de Benoist and Ian Darnton-Hill. Reaching optimal iodine nutrition in pregnant and lactating women and young children: programmatic recommendations. Public health nutrition, 2007. 10(12A):1527-1529.
13. Gyamfi. D. et al., Urinary iodine concentration and thyroid volume of pregnant women attending antenatal care in two selected hospitals in Ashanti Region, Ghana: a comparative cross-sectional study. BMC pregnancy and childbirth. 2018 Dec;18(1):166.
14. Parkkunam.J, Thiagarajan B. Role of ultrasound in thyroid disorders. Online Journal of Otolaryngology. 2015 Jul 15;5.
15. Muktyaz H, Birendra Y, Dhiraj S, Arun SK. Anatomical variations of thyroid gland and its clinical significance in North Indian population. Global J Biol Agric Health Sciences. 2013;2:12-6.
16. Saad SK. Variations in Thyroid Diameters during Normal Pregnancy. 2017-2018.
17. Henrietta OC, Anthony CU, Thomas A. Thyroid volume by ultrasound in asymptomatic gravid and non-gravid controls in a negroid population in Nigeria. Journal of Experimental and Clinical Anatomy. 2015 Jul 1;14(2):116.
18. Smyth, P.P.A., et al. Maternal iodine status and thyroid volume during pregnancy: correlation with neonatal iodine intake. The Journal of Clinical Endocrinology & Metabolism. 1997;82(9):2840-2843.
19. Azahin, E., U. Elbo Aya, and E. Kalender. Regional reference values of thyroid gland volume in Turkish Adults. 2015 March;143(3-4):141-145.
20. Pessah-Pollack R, Jovanovic L. Endocrine Disorders During Pregnancy. Elsevier Health Sciences; 2012 Feb 8.
21. 106. Bath, S.C., et al. Gestational changes in iodine status in a cohort study of pregnant Women. The American journal of clinical nutrition. 2015 March;101(6): p. 1180-1187.
22. Mankar J, Sahasrabuddhe A, Pitale S. Trimester specific ranges for thyroid hormones in normal pregnancy. Thyroid Research and Practice. 2016 Sep 1;13(3):106.
23. Abbassi-Ghanavati, M., L.G. Greer, and F.G. Cunningham, Pregnancy and laboratory studies: a reference table for clinicians. Obstetrics & Gynecology. 2009;114(6):1326- 1331.
24. Mansourian, A.R.. Thyroid function tests during first-trimester of pregnancy: Pakistan Journal of Biological Sciences. 2010 July 15;13(14):664.
25. Pedersen, K.M., et al. Amelioration of some pregnancy-associated variations in thyroid function by iodine supplementation. The Journal of Clinical Endocrin & Metabolism. 1993;77(4):1078-1083.
26. Sahin, S.B., et al., Alterations of thyroid volume and nodular size during and after pregnancy in a severe iodine deficient area. Clinical endocrinology. 2014 Nov;81(5):762-768.
27. Mioto VC, Gomes AC, de Camargo RY, Borel AR, Catarino RM, Kobayashi S, et al. High prevalence of iodine deficiency in pregnant women living in adequate iodine area. 2018 May 1;7(5):762-7.