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Journal of KIST Medical College

Ultrasound Evaluation of Thyroid Volume Changes in Pregnancy

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ABSTRACT

Introduction: The female body undergoes many physiological changes during the period of pregnancy; the volume of thyroid gland may vary physiologically during pregnancy in healthy woman. The objective of the study is to assess the changes in thyroid volume in different trimester of pregnancy and establish local reference range of thyroid volume in non-gravid female.

Methods: A total of 125 women in different trimester of pregnancy underwent thyroid scan to calculate the volume which was obtained by measuring three dimensions (craniocaudal, anteroposterior and transverse diameter) of the both lobes of thyroid gland. After ethical approval, simple random sampling was done for subjects. Ultrasound for obstetric scan was followed by thyroid scan. Subjects with known thyroid disease or any sonological abnormality of thyroid were excluded from study. The volume obtained was recorded in data proforma. The data were analyzed using One way analysis of variance (ANOVA) in Statistical package for social science 26.

Results: The mean thyroid volumes \pm standard deviation in study were 5.3 ± 1.4 cc, 6.4 ± 1.3 cc, 7.3 ± 1.6 cc for first, second and third trimester respectively whereas the mean for control group was 3.9 ± 1.4 cc. The volumes were found to be increased as pregnancy advanced and the difference was statistically significant between the groups ($p=0.00$).

Conclusion: Increase in thyroid volume as pregnancy advanced was found in our study in different trimester of pregnancy. The physiological increase in volume will help in differentiating it from other pathologies and help in daily clinical practice.

Keywords: Pregnancy; Thyroid; Volume; Ultrasound

Citation: Koirala A, Pradhan A, Rijal K, Pun H. Ultrasound Evaluation of Thyroid Volume Changes in Pregnancy. JKISTMC 2021; 3(1)5:18-21

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Conflict of interest: None

Source of support: None

Article info:

Received: 7 Jan, 2021

Accepted: 17 Jan, 2021

Published: 31 Jan, 2021

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INTRODUCTION

The female body undergoes many physiological changes during the period of pregnancy; the volume of thyroid gland may vary physiologically during pregnancy in healthy woman. There is a historical belief that thyroid increases in size during pregnancy, as mentioned in ancient Egypt paintings.¹ The older literature provides some information on varying degree of enlargement during gestation notably in the area of low iodine.² It is important to establish the normal degree of enlargement and normal range for clinicians to diagnose abnormal enlargement as in goiter in pregnancy.

Thyroid gland is superficial organ in anterior neck with two lobes and a connecting isthmus. Being superficial in location it can be evaluated clinically by palpation using World health organization (WHO) criteria; however this criterion has limitations due to marked inter-observer variability and overestimation of goiter.³ Such limitations made us to look for alternative assessment method to evaluate thyroid volume such as ultrasound, CT and MRI, however ultrasound being cost effective and relatively safe in pregnancy it is more desirable to use to evaluate the size of thyroid. The thyroid volume calculated by the ultrasound is more reliable as compared to clinical palpation. The aim of this study is to determine the changes in thyroid volume in pregnancy and also establish the local reference of thyroid volume in pregnant females.

METHODS

This study was hospital based cross sectional observational prospective study done from November 2020 to January 2020 in radiology department of KIST Medical College Hospital. One hundred and fifty-five female patients who came for regular antenatal ultrasound scan and for control group females of reproductive age group with no history of conception for previous one year with no prior known history of thyroid disease were included. Females with known thyroid disorder or with sonological abnormality of thyroid gland were excluded.

After ethical approval, simple random sampling was done for subjects. Obstetric scan was done followed by thyroid scan. Verbal consent was obtained with all the subjects before scanning. For the ultrasound examinations, all patients lay in the supine position and neck extended. The gestational age (GA) of the embryo was obtained with the crown-rump length metric while biparietal diameter and femur length were used to obtain the GA for the second and third trimesters respectively. A trimester consisting of 13 weeks was adopted. The three dimensions of the thyroid were obtained to calculate volume. The longitudinal dimension in sagittal section from the midline, anteroposterior (AP) diameter, in sagittal section at 90° to the longitudinal plane at the widest dimension and greatest (widest) transverse diameter (width) in transverse section were measured and volume was obtained for both lobes of thyroid. The volume of both lobes was added to get the volume of the gland. Isthmus was not included in calculation. Ultrasonographic measurements was carried out with high-end ultrasound equipment (Siemens Acuson X600) using a Linear probe (7–12 MHz). Thyroid volumes were represented by mean value of each group \pm standard deviation. The thyroid volume of each group (control, first, second and third trimester) was compared using One way ANOVA with SPSS 26. The p-value of < 0.05 was considered statistically significant.

RESULTS

A total of 155 patients including 30 controls and 125 pregnant women aged 18 to 38 participated in this study. The mean age was 28.9 with standard deviation of 5.25. The mean thyroid volumes in study were 5.3 ± 1.4 cubic centimeter(cc), 6.4 ± 1.3 cc, 7.3 ± 1.6 cc for first, second and third trimester respectively whereas the mean for control group was 3.9 ± 1.4 cc. The volumes were found to be increased as pregnancy advanced and the difference was statistically significant between control group, first, second and third trimester group. The mean difference between the groups was statistically significant. The summary of the result is shown in table below.

Table 1. Mean value of thyroid gland and its range

Groups	Range (cc)	Mean(cc)	p
Control	2.8-8.7	3.9±1.4	0.00
First trimester	2.2-7.9	5.3± 1.4	
Second trimester	3.7-8.6	6.4±1.3	
Third trimester	3.5-11	7.3±1.6	

DISCUSSION

The prevalence of thyroid disease is 6.6- 11.3%.⁴ The disease-causing enlargement of the gland include goiter, thyroiditis and neoplasia. According to the older literature, the thyroid gland shows some degree of enlargement during pregnancy notable in areas of low environmental iodine.² There is overall change in physiological status of woman during pregnancy including all metabolic activity and cardiovascular status. The alteration in thyroid volume during pregnancy is likely due to increased loss of iodine in urine.⁵⁻⁶ There is evidence of increase in volume of the thyroid progressively from first to third trimester of pregnancy and regression of size occurs postpartum. The evaluation of thyroid volume during pregnancy helps determine the physiological increase in volume as well defines cut off for normal range. Determination of the abnormal enlargement of thyroid is relatively easier as many studies have been done and normal range has been established for subjects other than pregnancy. During the pregnancy the gland is physiologically enlarged and may present difficulties to define difference of normal versus abnormal enlargement which in turn poses difficulty in diagnosing abnormality of thyroid such as goiter in pregnancy. Many methods to evaluate the thyroid gland is available including clinical palpation, computed tomography (CT), Magnetic resonance imaging (MRI), ultrasound and radionuclide scan which can also evaluate the function of the gland. Before introduction of advanced imaging technique clinical palpation was only method to evaluate which later on proved to be poor predictor of the size evaluation. CT, MRI and radionuclide studies are expensive, not readily available and some involves radiation exposure making them less preferable for evaluating thyroid gland. Ultrasound, being the best modality and more accurate to measure the change in thyroid volume was used in our study. The change in thyroid volume in pregnancy was notable in the area

with iodine deficiency and minimal or no change in volume was seen in iodine sufficient areas as shown by other studies carried out in different country.⁴⁻⁶ The measurement of volume in control group and pregnant female in different trimester will also serve as normal reference range and help in diagnosis of goiter in pregnancy. Our work established the mean thyroid volume of non-pregnant controls and pregnant woman in different trimester of pregnancy. The thyroid volume increased progressively from 5.3± 1.4 cc in first trimester through 6.4±1.3 cc in second trimester to 7.3±1.6cc in third trimester. The increase in thyroid volume was subtle as compared to previous work done in area of moderate iodine intake where mean value of non-pregnant was 13.9±0.8ml and 16± 0.7ml in pregnant group⁵ which suggest that we have proper iodine intake as most of our household use iodized salt but it is not verified. The increase in thyroid volume can be attributed to putative simulators like thyroid stimulating hormone, Human Chorionic Gonadotropin and iodine which is more likely to be contributing factor than insufficient iodine intake.⁹

CONCLUSION

Our study also suggests the enlargement of thyroid gland volume during pregnancy increasing progressively from first to third trimester. The normal reference range in different trimester was also established to help identify the abnormally increased volume of gland during pregnancy. We reckon the mean values obtained in the study will help clinician to differentiate normal physiological changes against the pathological enlargement of the gland.

LIMITATION

The thyroid volume was of different woman at different trimester of pregnancy. A longitudinal study in same subject in different trimester of study would be profound.

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