ISSN 2582 – 6050

Available Online at www.ijpba.info
International Journal of Pharmaceutical & Biological Archives 2025; 16(3):76-81

RESEARCH ARTICLE

Morphological Examination of the Placenta of Pregnant Women with Hypothyroidism Compared to Healthy Individuals

Azade Sarani[1], Hosnie Hoseini[2]

[1]*Department of Nursing and Midwifery, ZAH.C., Islamic Azad University, Zahedan, Iran,* [2]*Department of Laboratory Sciences, ZAH.C., Islamic Azad University, Zahedan, Iran*

Received: 31-05-2025 ; Revised: 21-06-2025; Accepted: 19-07-2025

ABSTRACT

Background: Some hormonal disorders, such as hypothyroidism, can affect the morphology of the placenta and subsequently the growth of the fetus. **Objectives:** This study aims to investigate the morphological changes of the placenta in pregnant women with hypothyroidism. **Methods:** For this case–control study, 120 fresh pairs from the labor and operation room were used. Of 120 pairs, 60 pairs belonged to the case group and 60 pairs belonged to the control group. **Results:** The results showed that the shape of the placenta in the case group was circular (51%), followed by oval (40%) and irregular (9%), whereas in the control group, the shape of the placenta was circular (45%), oval (32%), and irregular (23%). The average weight and thickness of the placenta in the case group were lower than those in the control group, and the surface and number of cotyledons in the case group were higher than those in the control group. **Conclusion:** The results of the study showed that the mother's hormonal changes can affect the placenta, and with timely diagnosis and treatment, the effects of hormonal changes on the fetus can be prevented.

Keywords: Morphometric, placenta hypothyroidism, pregnancy, subclinical hypothyroidism, targeted screening

INTRODUCTION

During pregnancy, women undergo many hormonal and metabolic changes that can affect the functioning of the thyroid gland.[1] By paying attention to the high prevalence of thyroid diseases in women, especially during pregnancy, the prevalence of diseases such as chronic thyroiditis and Graves' disease is high in pregnant women.[2] Therefore, awareness of metabolic and physiological changes during pregnancy is necessary. In early pregnancy, due to the increase in renal blood flow and glomerular filtration, the renal clearance of iodine increases, resulting in a reduction of plasma iodine concentration and an increase in iodine requirement is through food. Renal clearance of iodine has a small effect on thyroid function, because the storage of iodine inside the thyroid gland is sufficient and the need of the thyroid gland is sufficient. It ensures the length of pregnancy.[3,4] However, in areas with iodine deficiency, the situation is entirely different and significant changes occur during pregnancy. During normal pregnancy, the stimulating effects of human chorionic gonadotropin (HCG) on thyroid cells increase thyroxine and decrease thyroid-stimulating hormone (TSH) in the first trimester of pregnancy. In the second and third trimesters of pregnancy, with the decrease in hCG concentration, the amount of free thyroxine and TSH returns to normal.[5,6] The increase in serum concentration in normal pregnancy is the result of an increase in globulin binding to thyroxine.[7,8] Furthermore, estrogen during pregnancy stimulates production and changes its composition in plasma. Studies have also shown that thyroxine production

***Corresponding Author:**
Hosnie Hoseini,
E-mail: hosniehoseini@gmail.com

increases during pregnancy, and the concentration of TBG decreases immediately after delivery and within 4 days. In 6 weeks, it returns to its normal value, and at the same time, the concentration of T3 and T4 also reaches the time before pregnancy, and if the thyroid is normal. The iodine reserve is sufficient, the thyroid gland adapts to the conditions, and abnormal manifestations do not occur.[9] The prevalence of hypothyroidism in pregnant women is 0.3–0.5%. The cause of hypothyroidism in pregnant women is a lack of iodine, but in areas where there is enough iodine, it is the main cause of chronic autoimmune thyroid disease. Another cause of thyroid dysfunction during pregnancy is a history of radical treatment of hyperthyroidism or surgery of thyroid tumors.[10] Among other central causes (hypothalamus and pituitary gland), lymphocytic hypophysitis is a rare complication during pregnancy or in the stages after delivery becomes.[11] A rarer cause that is inefficient in differential diagnoses, TSH is raised, the presence of receptor inhibitory antibodies.[12] Although this complication is very rare, it passes these maternal antibodies from the placenta, causing hypothyroidism in the fetus. Transient hypothyroidism in infancy is considered important. Signs and symptoms such as weight gain, increased sensitivity to cold, and dry skin may be the possibility of a lack of work bring up the thyroid, but symptoms such as feeling weak and lethargic.[13,14] Despite the established link between hypothyroidism and reduced fertility, pregnancy in women with this condition, particularly in mild cases, is often viewed as problematic. However, if pregnancy does occur, these women face an increased risk of both early and late complications. Both, pregnancy complications and fetal complications, are more common in pregnant women with hypothyroidism.[15] The most important complications of pregnancy in mothers with hypothyroidism include anemia, postpartum hemorrhage, heart dysfunction, preeclampsia, placental abruption, and increased need for cesarean section, and in the fetus and newborn, including respiratory distress, prematurity, low weight, intrauterine growth retardation, congenital anomalies, and intrauterine death.[16] Therefore, many morphological changes in the placenta are associated with complications in the mother, such as blood pressure, diabetes mellitus, and hypothyroidism, which can affect the health of the fetus.

Objectives

In this research, the morphological examination of the placenta of pregnant women with hypothyroidism is compared to that of pregnant women without symptoms of hypothyroidism.

METHODS

This research was conducted on pregnant women referred to Ali Ibn Abi Talib Hospital in Zahedan during the years 1402–1403. The research method was a case–control study. To perform the test, written informed consent was obtained from the pregnant women, and then they entered the study. The study was approved as a research project in the Faculty of Medicine of the Azad University of Zahedan and has a code of ethics (IR.IAU.ZAH.REC.1400.042). In this study, 120 pregnant women were selected. The sampling method was easy and available. The studied group of women was examined in terms of clinical characteristics such as age, hypertension, blood pressure, psychiatric disease, gestational weeks at birth, cesarean section, preterm labor, preeclampsia, and placenta abruption. The case group was women who had thyroid disorders during pregnancy, and the control group was pregnant women without normal complications.

Inclusion Criteria

In this study, fresh pairs of women with thyroid disorders and women with thyroid complications with premature delivery were used as the case group, and pregnant women without complications were used as the control group.

Exclusion Criteria

Pregnant women who had non-thyroid complications or a damaged placenta.

Sample Size

The sample size is determined based on the Bezkurt study, taking into account the averages of both patient and healthy individual groups. Using a confidence level of 75% and a power of 70%, a total of 60 participants was calculated for each group.[17]

$n = [(z(1–\alpha/2) + z(1–\beta))\ 2\ (s12 + s22)]/(\mu1–\mu2)2$

The studied women were classified into upper, upper middle, lower middle, upper lower, and lower classes based on education, occupation, and income. The placentas of the women in the case group were collected from the delivery room or operating room after delivery, and then the placentas were washed under running water, and their extra membranes were cut, and the umbilical cord was cut about 2 cm from the place where it was connected to the placenta. In the gross examination of each pair, weight, average area, thickness in the center, adhesion of the umbilical cord, number of cotyledons, and shape of the pair were examined. Furthermore, the placentas were classified into 4 groups: oval, circular, irregular, and lobular, and placenta weight was measured using a digital scale. Placental thickness was measured in the center with a needle. The adhesion of the umbilical cord to the placenta was classified into three categories: centric, eccentric, and marginal. When the umbilical cord is attached to the edge of the placenta, its center, 2 cm from the edge of the placenta, off-center when the umbilical cord is attached to the edge of the placenta, 2 cm from the edge of the placenta, and when the umbilical cord is attached to The edge of the pair is connected, the edge is and each pair was placed on a flat surface with the mother surface facing up, and then on the mother surface, the heights were counted from left to right relative to right to left in a circle. The data were analyzed using Excel software to determine the statistically significant difference between the case and control groups, and a $P < 0.05$ was considered statistically significant.

RESULTS

In this study, 120 pregnant women were included, of which 60 women were in the control group and 60 women were in the case group. The two groups were similar in terms of age and social and economic status. The age of pregnant women was chosen between 25 and 37 years. There was no statistically significant difference in the mean age of the mother in the case and control groups [Table 1]. Most of the women were from middle to upper-class families. The placenta of women was examined in terms of shape, weight, area, thickness, number of cotyledons, and the adhesion of the umbilical cord to the placenta. The most common shape of the placenta in the case group was circular (51%), followed by oval (40%) and irregular (9%), while in the control group, the shape of the placenta was circular (45%), oval (32%), it was irregular (23%). The results of data analysis showed that the shape of the placenta in these two groups was not statistically significant. The average weight of the placenta in the case group was 245.4 ± 47.4 and in the control group it was 265.8.9 ± 38.4. The average thickness of the placenta center was 0.696 ± 0.174 in the case group and 1.536 ± 0.354 in the control group, as shown in Table 2. The mean weight and thickness of the placenta in the control group were higher than those in the case group, and a statistically significant difference was observed. The mean area of the placenta and the number of cotyledons between the case group and the control group showed a significant difference.

Table 1: Characteristics and pregnancy outcomes of pregnancies

Characteristics	Control (*n*=60) (%)	Hypothyroidism (*n*=60) (%)	*P*-value
Average age	24.66	24.72	0.78
Hypertension	28 (46.66)	0 (0.00)	0.42
Blood pressure	21 (35.00)	28 (46.66)	0.21
Psychiatric disease	32 (53.33)	5 (8.33)	0.51
Pregnancy outcomes			
Cesarean section	24 (40.00)	25 (41.66)	0.62
Preterm labor	5 (8.33)	7 (11.66)	0.25
Preeclampsia	5 (8.33)	6 (10.00)	0.11
Placenta abruption	2 (3.33)	0 (0.00)	0.06

Table 2: Comparative result of placental morphometry

Characteristics	Control group (*n*=60)	Thyroid group (*n*=60)	*P*-value
Placenta weight	265.8.9±38.4	245.4±47.4	<0.001
Thickness	1.536±0.35	0.696±0.174	<0.001
Area	171.5±35.47	184.02±28.704	<0.001
No. of cotyledon	12±3.66	13.74±4.77	<0.001

DISCUSSION

Growth and metabolism factors and the differentiation of fetal cells depend on the secretion of the mother's thyroid hormone.[1] In fact, the mother's thyroid hormone passes through the placenta and can directly affect the tissue of the fetus. Studies have shown that thyroid hormones are particularly important in maintaining fertility and pregnancy in humans.[18] Hypothyroidism changes the morphology of the placenta, which can lead to an increase in the rate of stillbirth, miscarriage, or delayed fetal growth.[19] The shape of the placenta in normal pregnancy is oval to circular.[20] Morphological changes of the placenta can lead to changes in the shape of the placenta to lobular, irregular, and discoidal. In the present study, 51% of pairs were circular, 40% were oval, and 9% were irregular. In the study conducted by Hardley *et al*., 66% of placentas were circular and 10% were irregular placentas, which was in line with our study, and no change in placenta shape was reported between the case and control groups.[21] In our study, the average weight of the placenta in the case group was 245.4 ± 47.4 and in the control group was 265.8.9 ± 38.4, which showed a significant difference between the two groups. The study conducted by De Leo and Pearce showed a decrease in placental weight in the thyroid group compared to the control group.[22] Furthermore, studies have shown that hypothyroidism increases apoptosis, which itself causes placental weight loss.[23] The thickness of the center of the placenta in our study was lower in the thyroid group than in the control group, which is in line with the study of Teng *et al*.[24] In this study, the number of cotyledons and placenta area in the case group increased significantly compared to the control group, and the results were consistent with the results of the study by Li *et al*.[25] Furthermore, in line with the current study, the results of the study by Korevaar *et al*. showed that hypothyroidism is associated with the risk factors of preeclampsia and placental abruption.[26] In addition, the results of the study by Hou *et al*., in line with our study, showed that the incidence of pregnancy hypertension disorders was higher in the case group than in the control group.[27] The results of our study showed that the complications of hypothyroidism in affected pregnant women are more than in pregnant women without symptoms, which leads to adverse effects on the mother and child. Furthermore, the results of de Barjaktarovic *et al*.'s study showed that the babies of mothers who had hypothyroidism during pregnancy had a lower IQ. They stated that there is a relationship between hypothyroidism and an increased risk of neurodevelopmental disorders in children.[28]

CONCLUSION

Changes in the mother's hormones during pregnancy affect the health of the placenta and the fetus. Hypothyroidism can have significant effects on the weight of the placenta and growing fetus, placenta thickness, and placenta diameter, so early diagnosis and treatment of hormonal disorders in pregnant women reduces the risk factor of developing fetal abnormalities and eventually mortality.

ACKNOWLEDGMENT

The evidence-based practice center thanks Dr. Shirin Shahraki for their assistance with searching and database management, and research organization and for her assistance with final preparations of the report.

AUTHORS' CONTRIBUTION

The authors contributed to the research conception and design. All authors studied this draft and contributed to and confirmed the final manuscript.

CONFLICT OF INTERESTS STATEMENT

The authors declare that there is no conflict of interest regarding the publication of this paper.

DATA AVAILABILITY

The dataset presented in the study is available on request from the corresponding author during submission or after publication.

ETHICAL APPROVAL

The study has a code of ethics (IR.IAU.ZAH.REC.1400.042).

FUNDING/SUPPORT

The study was approved as a research project in the Faculty of Medicine of the Azad University of Zahedan.

REFERENCES

1. Alemu A, Terefe B, Abebe M, Biadgo B. Thyroid hormone dysfunction during pregnancy: A review. Int J Reprod BioMed 2016;14:677-86.
2. Murmu AK, Kumari S, Sharan A, Baskey S. Correlation of hypothyroidism with pregnancy outcome in preeclampsia. IOSR J Dent Med Sci 2018;17:72-8.
3. Burton GJ, Jauniaux E. Development of the human placenta and fetal heart: Synergic or independent? Font Physiol 2018;9:373.
4. Wani RT. Socioeconomic status scales-modified kuppuswamy and udai pareekh's scale updated for 2019. J Family Med Prim Care 2019;8:1846-9.
5. Ismail KI, HanniganA, O'Donoghue K, Cotter A. Abnormal placental cord insertion and adverse pregnancy outcomes: A systematic review and meta-analysis. Syst Rev 2017;6:242.
6. Kumari S, Rani A, Diwan RK, Srivastava AK, Mehta V, Suri RK, *et al*. Morphological and morphometric evaluation of placenta in hypothyroid mothers. Astrocyte 2016;3:19-23.
7. Sheehan PM, Nankervis A, Araujo Junior E, Costa FD. Maternal thyroid disease and preterm birth: Systematic review and meta-analysis. J Clin Endocrinol Metab 2015;100:4325-31.
8. Leal JK, Glazier JD, Ntani G, Crozier SR. Practice bulletin no. 148: Thyroid disease in pregnancy. Obstet Gynecol 2015;125:996-1005.
9. Aggarawal N, Suri V, Singla R, Chopra S, Sikka P, Shah VN, *et al*. Pregnancy outcome in hyperthyroidism: A case control study. Gynecol Obstet Invest 2014;77:94-9.
10. You SH, Cheng PJ, Chung TT, Kuo CF, Wu HM, Chu PH. Population-based trends and risk factors of early-and late-onset preeclampsia in Taiwan 2001-2014. BMC Pregnancy Childbirth 2018;18:199.
11. Wang Y, Sun XL, Wang CL, Zhang HY. Influence of screening and intervention of hyperthyroidism on pregnancy outcome. Eur Rev Med Pharmacol Sci 2017;21:1932-7.
12. Nagata C, Yang L, Yamamoto-Hanada K, Mezawa H, Ayabe T, Ishizuka K, *et al*. Complications and adverse outcomes in pregnancy and childbirth among women who conceived by assisted reproductive technologies: A nationwide birth cohort study of Japan environment and children's study. BMC Pregnancy Childbirth 2019;19:77.
13. Zhong QY, Gelaye B, Fricchione GL, Avillach P, Karlson EW, Williams MA. Adverse obstetric and neonatal outcomes complicated by psychosis among pregnant women in the United States. BMC Pregnancy Childbirth 2018;18:120.
14. Anderson E, Raja EA, Shetty A, Gissler M, Gatt M, Bhattacharya S, *et al*. Changing risk factors for placental abruption: A case crossover study using routinely collected data from Finland, Malta and Aberdeen. PLoS One 2020;15:e0233641.
15. Kyozuka H, Murata T, Fukusda T, Yamaguchi A, Kanno A, Yasuda S, *et al*. Teenage pregnancy as a risk factor for placental abruption: Findings from the prospective Japan environment and children's study. PLoS One 2021;16:e0251428.
16. Luke B. Pregnancy and birth outcomes in couples with infertility with and without assisted reproductive technology: With an emphasis on US population-based studies. Am J Obstet Gynecol 2017;217:270-81.
17. Bozkurt NC, Karbek B, Ucan B, Sahin M, Cakal E, Ozbek M, *et al*. A study on the morphology and the morphometry of the human placenta and its clinical relevance in a population in Tamil Nadu. J Clin Diagn Res 2013;19:479-84.
18. Lopez-Munoz E, Mateos-Sanchez L, Mejia-Terrazas GE Bedwell-Cordero SE. Hypothyroidism and isolated hypothyroxinemia in pregnancy, from physiology to the clinic. Taiwan J Obstet Gynecol 2019;58:757-63.
19. Maraka S, Ospina NM, O'Keeffe DT, De Ycaza AE, Gionfriddo MR, Erwin PJ, *et al.* Subclinical hypothyroidism in pregnancy: A systematic review and meta-analysis. Thyroid 2016;26:580-90.
20. Pearce EN, Lazarus JH, Moreno-Reyes R, Zimmermann MB. Consequences of iodine deficiency and excess in pregnant women: An overview of current knowns and unknowns. Am J Clin Nutr 2016;104Suppl 3:918S-23.
21. Hardley MT, Chon AH, Mestman J, Nguyen CT, Geffner ME, Chmait RH, *et al*. Iodine-induced fetal hypothyroidism: Diagnosis and treatment with intra-amniotic levothyroxine. Horm Res Paediatr 2018;90:419-23.
22. De Leo S, Pearce EN. Autoimmune thyroid disease during pregnancy. Lancet Diabetes Endocrinol 2018;6:575-86.
23. Dhillon-Smith RK, Tobias A, Smith PP, Middleton LJ, Sunner KK, Baker K, *et al*. The prevalence of thyroid dysfunction and autoimmunity in women with history of miscarriage or subfertility. J Clin Endocrinol Metab 2020;105:dgaa302.
24. Teng D, Yang W, Shi X, Li Y, Ba J, Chen B, *et al*. An inverse relationship between iodine intake and thyroid antibodies: A national cross-sectional survey in mainland China. Thyroid 2020;30:1656-65.

25. Li Y, Shan Z, Teng W, Thyroid Disorders, Iodine Status and Diabetes Epidemiological Survey Group. The iodine status and prevalence of thyroid disorders among women of childbearing age in China: National cross-sectional study. Endocr Pract 2021;27:1028-33.
26. Korevaar TI, Pop VJ, Chaker L, Goddijn M, De Rijke YB, Bisschop PH, *et al*. Dose dependency and a functional cutoff for TPO-antibody positivity during pregnancy. J Clin Endocrinol Metab 2018;103:778-89.
27. Hou Y, Liu A, Li J, Wang H, Yang Y, Li Y, *et al*. Different thyroidal responses to human chorionic gonadotropin under different thyroid peroxidase antibody and/or thyroglobulin antibody positivity conditions during the first half of pregnancy. Thyroid 2019;29:577-85.
28. Barjaktarovic M, Korevaar TI, Chaker L, Jaddoe VW, De Rijke YB, Visser TJ, *et al*. The association of maternal thyroid function with placental hemodynamics. Hum Reprod 2017;32:653-61.