



The impact of the month pregnant and fetus sex on progesterone and cortisol hormones and lipid profile in the women during the third-trimester pregnancy

Wahbi Abdulqader Salman Al-Hamdany , Sanaa Mohammed Morshed

Department of Biology , College of Education for Women , Tikrit University , Tikrit , Iraq

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Corresponding Author:

Name: Wahbi Abdulqader Salman

E-mail:

alhamdany_1954@yahoo.com

Tel:

ABSTRACT

This study was conducted at Salahaddin General Hospital to find out the impact of pregnancy month and the sex of the fetus on progesterone, cortisol hormones and some biochemical compounds (VLDL-C, LDL-C, HDL-C, TG Cholesterol, and Glucose), during the last trimester of the pregnant women. Ninety blood samples were collected from the pregnant women, 5ml blood from each woman, the number of pregnant women during the 7th, 8th and 9th months (34, 29, 27) woman respectively. During the ninth month of pregnancy, there was a significant increase ($P \leq 0.01$) in the concentration of cortisol hormone compared with the seventh and eighth month, but the concentration of progesterone hormone decreased significantly ($P \leq 0.01$) during the ninth month compared to the seventh and eighth months. The concentrations of (VLDL-C, LDL-C, TG, Cholesterol, and Glucose) increased in the ninth month of pregnancy compared to the seventh and eighth months, while the concentration of the HDL-C increased in the seventh and eighth months compared with the ninth month. There were no significant differences between the male and the female fetus in pregnant women cortisone and progesterone concentrations. The pregnant women with male pregnancy significantly increased compared with the female fetus pregnancy in the (VLDL-C, LDL-C, Glucose) while the female pregnancy significantly increased compared with the male fetus pregnancy ($P \leq 0.05$) in concentrations of HDL-C. There are no significant differences observed between the male fetus and female pregnancies in cholesterol concentrations. Conclusion: this study finds out that the ninth month of the pregnancy caused more detriment to the pregnant women and male fetus is more likely to cause stress on the pregnant women than the female fetus.

Introduction

The fetus sex affects many variations in pregnancy and in childbirth. Studies examined the relation of fetus sex and the metabolism of carbohydrates, which is one of the metabolism disorders during pregnancy and showed that the female sex fetus is associated with greater resistance to insulin in the mother compared with the male fetus [1]. While other studies have shown that the male predominance of the embryos in their correlation with insulin resistance, it also indicated that the carrying of male fetuses represents a risk factor for the first and second pregnancy because of the correlation to greater insulin resistance [2]. The sex of the fetus causes

complex interactions between the genetic, sexual factors, gonadal and hormonal factors as hypertension which can be predicted during pregnancy. Hypertension, and gestational sugar diabetes mellitus depend on the fetus sex [3].

The third pregnancy trimester includes the last three months from the seventh month to the ninth month, from the twenty-eighth weeks to the birth, Fetus movement and activity increase more in this period [4], with the progression of the pregnancy The mother becomes more stressed where the control of bladder weakens, back pain increases, blood sugar rises during this trimester and causes the gestational

diabetes [5]. At the beginning of the third trimester, the fetus length may reach 38 cm [6] in this stage brain and nervous system develops very quickly and the fetus can open and close his eyes. At the beginning of the week 31, rhythmic breathing can occur as lungs growth developed and bones growth is completed despite its elasticity and resilience [7]. When this phase ends between the last 36 to 40 weeks of gestation, the fetus length may reach (39-53cm) and the growth of all body organs are completed where they are ready to perform its functions, also the growth of the hair, nails, and the external appearance of the fetus [8]. In the third trimester, the fetus caused a big pressure on the abdomen of the mother and this pressure effects on the function of the bladder and rectum [9]. The concentrations of lipid profile increased dramatically during the last three months of pregnancy as they increase with the progression in pregnancy. The total cholesterol concentrations, triglycerides and high-density lipoprotein(HDL-C) and Low-density lipoprotein(LDL-C), which increase in the normal pregnancy of women during the last trimester of pregnancy compared to non-pregnant women, as triglycerides show the largest increase during pregnancy and the high-density lipoprotein HDL-C the smallest.

All lipid profiles are increased during the 40 weeks of gestation, while HDL-C remains stable during the second trimester of pregnancy. (10). Blood sugar increases with the fetus growth as the pregnancy progress and this condition is known as "gestational diabetes", which occurs at the last trimester, Although

the mother is not with diabetes and this is basically due to the low concentration of insulin hormone as well as the non-tolerance of sugar which causes to Hyperglycemia and hypertension. This is due to increased insulin resistance by its receptors on the body cells. This indicates the correlation between insulin resistance (IR) and hypertension resulting from pregnancy-induced hypertension (PIH) [11]. This study aims to determine the effect of pregnancy months and the sex of the fetus on the progesterone, cortisol hormones, blood sugar and fatty curve during the last trimester of pregnancy.

Materials and methods

The study was conducted at SalahadDin General Hospital for the period from October 2017 to March 2018. The study included (90) pregnant women during the last three months of pregnancy. A number of pregnant women in the seventh month was (27) women, the eighth month was (29) women and ninth month was (34) women, to explore the effect of the sex fetus and pregnancy month in the (progesterone and cortisol hormones) and some of the compounds (blood sugar, cholesterol, triglycerides, high-density lipoprotein, low-density lipoprotein, and very low-density lipoprotein) . The ages of women were (20-45) years. Blood samples were collected from all pregnant women 5ml blood from each woman. and the serum was separated by common laboratory methods. Finally, the study criteria were estimated by the measurement number shown in the table (1) .

Table (1) laboratory Kits used in the study

No.	The testing name	Testing technique	The manufacturer	The origin
1	Glucose	Spectrophotometer	Biolabo SAS	France
2	Cholesterol	Spectrophotometer	Biolabo SAS	France
3	Triglycerides	Spectrophotometer	Biolabo SAS	France
4	HDL-C(PTA)	Spectrophotometer	Biolabo SAS	France
5	Cortisol	ELIZA	Bad Homburg v.d.H.	Germany
6	Progesterone	ELIZA	Monobind	U.S.A.

The data of the study samples were collected and analyzed statistically using the program that symbolizes (SPSS) and the arithmetic averages mean and test T-Test and Duncan test to compare arithmetic averages to find the moral significance. Test results were returned at the level Probability ($P < 0.05$), ($p < 0.001$), [12].

Results and discussion

Pregnancy month effect

Table 2 shows the superiority of pregnant women during the ninth month in the cortisol hormone concentrations compared with pregnant women during the 7th and 8th months as the hormone concentrations have been considered significantly ($P < 0.01$) with the progression of the months of pregnancy included in the study. The reason for that the increase in pregnant pains with progress in the months of pregnancy particularly during the last months [13, 14]. Mother pains stimulate the cortex of

the adrenal gland in the increase the secretion of the cortisol and this secretion is directly proportional to the pregnant pains severity. We also believe that the Stress that the mother suffers from due to increasing of the fetus weight who needs to oxygen and food, this makes mother's condition to fully mobilize her energy to provide all these requirements, which cause an increase in concentrations of cortisol hormone.

From the same table (2), the results also showed the decrease of progesterone hormone concentrations with the progression of the months of pregnancy, the lowest decrease of this hormone is in the ninth month of pregnancy, confirmed by a study carried out [15, 16] , and they attributed the reason to the sooner of the birth date as progesterone concentrations are reduced in order to begin oxytocin hormone concentrations to rise because of the increase in progesterone during the last month of pregnancy causing the delayed birth.

Table (2) Effect of pregnancy month in cortisol hormone concentrations, Progesterone during the last trimester

Hormones	Mean $\pm$ Stander dev.		
	7 th month 27	8 th month 29	9 th month 34
Cortisol ng/ml	83.30 $\pm$ 38.92 b	110.0 $\pm$ 67.8 ab	126.2 $\pm$ 63.3 a
Progesterone ng/ml	304.7 $\pm$ 68.9 a	245.1 $\pm$ 88.8 b	246.8 $\pm$ 97.0 B

The different characters horizontally mean significant differences ($p < 0.05$) and ($P < 0.01$)

In table (3) the results in table (3) indicate significant increase ($P < 0.05$) for the ninth month of pregnancy in blood sugar concentrations compared with the seventh and eighth months due to the increase of the cortisol hormone concentrations which causes to increase blood glucose concentrations [17, 18] due to the high stress caused by the mother's mental state by sooner birth date, also because of fetus weight and requirements of fetus growth and development.

Also from the same table (3) The group of pregnant women in the ninth month increased significantly ($P \leq 0.01$) compared with pregnant women in the 7th and 8th months in the lipid profiles concentrations (Cholesterol, TG, LDL, VLDL) Also it is noticed that pregnant women in the eighth month of pregnancy are morally superior ($P < 0.05$) compared with the seventh month pregnant women in these lipids compounds.

Table (3) Effect of pregnancy month in glucose and lipid profile during the last trimester

Parameters	Mean $\pm$ Stander dev.		
	7 th month 27	8 th month 29	9 th month 34
Glucose mg/dl	112.11 $\pm$ 8.24 c	127.41 $\pm$ 10.76 b	152.82 $\pm$ 13.97 A
Cholesterol mg/dl	192.22 $\pm$ 24.48 c	219.83 $\pm$ 10.92 b	258.82 $\pm$ 12.08 A
Triglyceride mg/dl	107.78 $\pm$ 10.26 c	127.10 $\pm$ 11.81 b	153.18 $\pm$ 9.94 A
HDL-C mg/dl	45.22 $\pm$ 5.85 a	39.862 $\pm$ 5.174 b	35.676 $\pm$ 4.597 B
LDL-C mg/dl	125.44 $\pm$ 25.55 c	154.54 $\pm$ 12.76 b	192.51 $\pm$ 14.84 A
VLDL-C mg/dl	21.556 $\pm$ 2.052 c	25.421 $\pm$ 2.362 b	30.635 $\pm$ 1.988 A

The different characters horizontally mean significant differences ($p < 0.05$) and ($P < 0.01$)

The reason for the increased concentrations of these lipid compounds due to their increased processing by the liver cells as they are important sources of energy during the last month of pregnancy because of the increased demand for this energy for the need of the fetus and these reasons supported by both previous studies [19, 20]

The high-density lipid profile HDL-C has decreased during the ninth month of the pregnancy morally ($P < 0.05$) compared to the months of the seventh and eighth pregnancies, and may be due to hypertension for pregnant women during the ninth month, confirmed by the study carried out by [21] and that increased blood pressure occurred because of increasing the harmful fat concentrations, these fats have reduced the concentrations of high-density lipid profiles HDL-C.

Effect of the sex fetus

In Table (4) the results presented that there are no significant differences in cortisol hormone concentrations between the two groups of women with male and female pregnancy that means both groups of women suffer from the same stress despite the superiority of the male pregnancy in the blood

glucose concentrations compared to the female pregnancy.

Table 4 shows the effect of fetus sex on progesterone and cortisone concentrations during the last pregnancy trimester.

Hormones	Mean $\pm$ Stander dev.	
	Male fetus 48	Female fetus 42
Progesterone ng/ml	268.5 $\pm$ 90.6 a	258.0 $\pm$ 90.0 A
Cortisol ng/ml	106.4 $\pm$ 64.5 a	110.1 $\pm$ 56.8 A

The different characters horizontally mean significant differences ($p < 0.05$) and ($P < 0.01$)

The results in the table (4) indicated that there were no significant differences in progesterone hormone concentrations between the two categories (male pregnancy) and (female pregnancy) at a study in the effect of the sex of pregnancy in progesterone hormone concentrations.

The results of the study differed from the results that of several studies [22, 23, 24] which indicated that leptin hormone has a positive effect on steroid hormones, including estrogen and progesterone in

female pregnant and those who have a higher leptin hormone concentration than in the case of a male pregnancy. The study conducted by the [25] that the secretion of progesterone increased in pregnancy naturally as soon as the pregnancy occurs the placenta begins with the synthesis of progesterone, which rises dramatically during pregnancy.

The results also indicate that there are no significant differences between the male pregnancy and the female pregnancy during the last trimester of pregnancy in the steroid hormone concentrations, and the reason is that the stress that pregnant women are exposed to in pregnancy is the same as that of female

pregnancies and may also be attributed to the environmental, social and psychological factors [26] In table (5) of the study showed that the male pregnancy was significantly higher in the blood sugar concentrations ($P < 0.05$) in pregnant women with male embryos compared to pregnant women with the female embryos. A study carried out by the [27] indicated that the reason for this is that the pregnancy is causing the reduction in the efficiency of β - cells in the pancreas and decreases its production of insulin hormone in comparison with the female pregnancy which causes an increase in blood sugar in the male pregnancy.

Table (5) shows the effect of fetus sex on glucose and lipid profile concentrations during the last pregnancy trimester

Parameters	Mean $\pm$ Stander dev.	
	Male fetus 48	Female fetus 42
Glucose mg/dl	138.5 $\pm$ 20.7 a	127.1 $\pm$ 18.9 b
Cholesterol mg/dl	231.3 $\pm$ 36.5 a	221.9 $\pm$ 27.6 a
Triglyceride mg/dl	137.7 $\pm$ 20.5 a	125.4 $\pm$ 21.2 b
HDL-C mg/dl	38.57 $\pm$ 6.01 b	41.04 $\pm$ 6.67 a
LDL-C mg/dl	165.2 $\pm$ 37.1 a	155.8 $\pm$ 29.0 b
VLDL-C mg/dl	27.55 $\pm$ 4.09 a	25.08 $\pm$ 4.23 b

The different characters horizontally mean significant differences ($p < 0.05$) and ($P < 0.01$).

The same table (5) shows a moral superiority ($P < 0.05$) of the male pregnancy compared to the female pregnancy in lipid profiles concentrations (TG, LDL-C, VLDL-C) The reason may be due to increased systolic pressure. The study found that the male fetus affects the pregnant woman and urges her to increase these lipid profiles because of the need for more energy sources, thus increasing the systolic pressure In the mother with male pregnant compared with the female pregnancy this is due to the ability of

References

- [1] Xiao, L.; Zhao, J.P.; Nuyt, A.M.; Fraser, W.D. and Luo, Z, C. (2014) Female fetus is associated with greater maternal insulin resistance in pregnancy. *Diabet Med* 31(12):1696–701.
- [2] Retnakaran, R.; Kramer, C.K.; Ye, C.; Kew, S.; Hanley, A.J. ; Connelly, P.W. et al. (2015). Fetal sex and maternal risk of gestational diabetes mellitus: the impact of having a boy. *Diabetes Care* (2015) 38(5):844–851.
- [3] Al-Qaraghoul, M. and Fang, Y.V. (2017). Effect of Fetal Sex on Maternal and Obstetric Outcomes. *Front Pediatr*; 5: 144.
- [4] Olagbuiji, B. N.; Igbarmah, S.; Akintayo, A. A.; Olofinbiyi, B. A.; Aduloju, O. and Alao, O. O. (2014). Maternal understanding of fetal movement in third trimester: A means for fetal monitoring and reducing stillbirth. *Nigerian Journal of Clinical Practice*, 17(4): 489-494.
- [5] Kjos, S.L.; Buckanan, T.A. (1999). Gestational diabetes mellitus *England Jo. of Medicine*, 341. PP: 1749 – 1756.
- [6] Kurjak, A.; Stanojeviae, W.; Andonotopo, W.; Scazzocchio - Duenas, E.; Azumendi, G.; and Carrera, J. M. (2005). Fetal behavior assessed in all three trimesters of normal pregnancy by four dimensional ultrasonography. *Croat. Med. J.* 46(5):772-780.
- [7] Knuppel RA. (2007). Maternal-placental-fetal unit; Fetal & early neonatal physiology. in: De Cherney AH, et al. *Current Diagnosis & Treatment Obstetrics & Gynecology*. 10th ed. New York, N.Y.: The McGraw-Hill Companies:1.
- [8] Moore, K.L. and Persuad, TVN. (2003). The developing Human: Clinically Oriented Embryology. 8th ed. Philadelphia, Pa.: Saunders Elsevier: pp:1.

- [9] DeUgarte CM.; Bast, JD. (2007). Embryology of the urogenital system and congenital anomalies of the female genital tract. In: DeCherney AH. Current Diagnosis & Treatment Obstetrics & Gynecology. 10th ed. New York, N.Y.: The McGraw-Hill Companies:1.
- [10] Asif, M.; Ahmad, I.; Khattak, S.T. and Khattak, I. (2017). pattern of lipid parameters in healthy women during pregnancy. JSMC 2017;7(1): 37 – 39.
- [11] Chen, Z.; Liu, W.; Sun, X. and Zhu, L. (2017). Clinical study on the association between pregnancy-induced hypertension and insulin resistance. Exp Ther Med. 13(5): 2065–2070.
- [12] **Kirkwood, B.R. (1988)**. Medical statistics. Blackwell Scientific Publications, Oxford, 1st ed. PP.38, 89, 148.
- [13] Trainer, P. J. (2002). Corticosteroids and pregnancy. Semin. Reprod. Med.; 20(4):375-80.
- [14] Shah, S.; Banh, E. T.; Katharine Koury, K. and Bhatia, G. Nandi, R. and Gulur P. (2015). Pain management in pregnancy: Multimodal Approaches. Hindawi Publishing Corporation Pain Research and Treatment Article ID 987483, 15 pages.
- [15] Leon, J. B.; Smith, B. B.; Timm, K. I., and LeCren, G. (1990). Endocrine changes during pregnancy, parturition and the early post-partum period in the llama (Lama glama). J. Reproductive and Fertility. 88: 503 – 511.
- [16] Agoreyo, F.O. (2015) Quantitative evaluation of serum Progesterone levels in the three trimesters of pregnancy in Albino rat. *J. Appl. Sci. Environ. Manage.* 19(1): 77 – 79.
- [17] Parreti, E.; Mecacci, F.; Papini, M.; Cioni, R.; Carignani, L.; Mignosa, M.; Torre, P. and Mello, G. (2002). Third-Trimester Maternal Glucose Levels From Diurnal Profiles in Non-diabetic Pregnancies. *Diabetes Care* 24(8): 1319-1323.
- [18] Leon, J. B.; Smith, B. B.; Timm, K. I., and LeCren, G. (1990). Endocrine changes during pregnancy, parturition and the early post-partum period in the llama (Lama glama). J. Reproductive and Fertility . 88 : 503 – 511 .
- [19] Festus, O. O.; Idonije, O. B.; Eseigbe, M. A.; Okhiai, O.; Unuabonah, F. and Dike, M. (2011). Comparative study of lipid profile of normal pregnant women in the different trimesters. *Archives of Applied Science Research*, 3 (3):528-532
- [20] Asif, M. ; Ahmad. I. , Tanveer, S.; Imran-U-Din Khattak, I. (2017). Pattern of Lipid parameters in healthy women during pregnancy. JSMC;7(1): 37 – 39.
- [21] Rajyalakshmi, K. and Rao, B. S. (2015). A Study of Serum Lipoproteins and Serum Triglycerides in normal pregnancy and Pregnancy Induced Hypertension and Eclampsia. *International Journal of Contemporary Medical Research*. 3(10) : 2927-2930.
- [22] Wabitsch M.; Blum W. F.; Mucic R., et al. (1997). Contribution of androgens to the gender difference in leptin production in obese children and adolescents. *J. Clin. Invest.*;100:808-813
- [23] **Lazarus, J.H. (2002)**. Epidemiology and prevention of thyroid disease in pregnancy. *Thyroid*, Vol. 12, No 10, pp.861-865, ISSN 1050-7256.
- [24] Al Atawi, F.; Warsy, A.; Babay, Z.; Addar, M. (2005). Fetal sex and leptin concentrations in pregnant females. *Ann Saudi Med*. 25(2).
- [25] **Oyeyemi, A.O. and Asaolu. M. F. (2015)**. Reproductive Hormones and Pregnancy Induced Hypertension Cases in Nigerian Women IOSR Journal of Environmental Science, Toxicology and Food Technology (IOSR-JESTFT) e-ISSN: 2319-2402, p- ISSN: 2319-2399. Volume 9, Issue 3 Ver. I (Mar. 2015), PP 10-14.
- [26] DiPietro, J. A. ; Costigan, K. A.; Kivlighan, K. T. ; Chen, P. and Laudenslager, M. L. (2010). Maternal salivary cortisol differs by fetal sex during the second half of pregnancy. *Psychoneuroendocrinology*. 36(4): 588–591.
- [27] Geng, X. ; Geng, L. ; Zhang, Y.; Lu, H.; Shen, Y. ; Chen, R. ; Fang, P. ; Tao, M.; Wang, C. and Jia, W. (2017). *Acta Diabetol*. 54(12):1131-1138.
- [28] Retnakaran, R.; Wen, S. W.; Tan, H. ; Zhou, S.; Ye, C.; Shen, M.; Smith, G. N. and Walker, M. C. (2017). Maternal blood pressure before pregnancy and sex of the baby: A prospective preconception cohort study. *American Journal of Hypertension* 30(4) : 382-388.
- [29] Walsh, B. ; Spiegelman, D.; Morrissey, M. and Sacks, F. (1999). Relationship between serum estradiol levels and the increases in high-density lipoprotein levels in postmenopausal women treated with oral estradiol. *The Journal of Clinical Endocrinology & Metabolism* , 84(3) : 985-989.

تأثير شهر الحمل وجنس الجنين في تراكيز هرموني الكورتيزون والبروجستيرون والمنحني الدهني في النساء خلال الثلث الاخير من الحمل

وهبي عبد القادر سلمان الحمداني ، سناء محمد مرشد

قسم علوم الحياة ، كلية التربية للبنات ، جامعة تكريت ، تكريت ، العراق

الملخص

جرت هذه الدراسة في مستشفى صلاح الدين العام لمعرفة تأثير شهر الحمل و جنس الجنين في تراكيز هرموني البروجستيرون و الكورتيزول وبعض المركبات الكيموحيوية (VLDL-C , LDL-C , HDL-C , TG Cholesterol , Glucose) , خلال الثلث الاخير من الحمل . جمعت 90 عينة دم من النساء الحوامل و بلغ عدد النساء الحوامل خلال الاشهر السابع و الثامن والتاسع (34,29,27) أمراً على التوالي وكانت النتائج زيادة معنوية ($P \leq 0.01$) في تركيز هرمون الكورتيزول خلال الشهر التاسع من الحمل بالمقارنة مع الشهر السابع والثامن. بينما إنخفض تركيز هرمون البروجستيرون معنوياً ($P \leq 0.01$) خلال الشهر التاسع بالمقارنة مع الشهر السابع والثامن, وازدادت تراكيز المركبات (VLDL-C , LDL-C , TG, Cholesterol, Glucose) في الشهر التاسع من الحمل بالمقارنة مع الشهرين السابع والثامن بينما ازداد تركيز المركب الدهني HDL-C في الشهر السابع و الثامن بالمقارنة مع تركيزه في الشهر التاسع. ولم تلاحظ أية فروقات معنوية بين الحمل الانثوي و الحمل الذكري ($P \leq 0.01$) في تراكيز هرموني الكورتيزول والبروجستيرون. تفوق الحمل الذكري على الحمل الانثوي في تراكيز المركبات (VLDL-C , LDL-C , Glucose) , بينما تفوق الحمل الانثوي بالمقارنة مع الحمل الذكري معنوياً ($P \leq 0.05$) في تراكيز المركب الدهني HDL-C ولم تلاحظ اية فروقات معنوية بين الحمل الذكري والانثوي في تراكيز الكولسترول. و يستنتج من هذه الدراسة أن الشهر التاسع من الحمل أكثر تأثيراً ضاراً على الام الحامل و ان الحمل الذكري أكثر تسبباً في حدوث الاجهاد على الام الحامل من الحمل الانثوي.