International Journal of Science and Research (IJSR)
ISSN: 2319-7064
Impact Factor 2024: 7.101

Liver Function Tests in Iraqi Pregnant Women

Hanan Jumaah Mohammed[1], Mohammed N. AL-Owaidi[2]

[1]AL - Karkh University of science, College of Science, Forensic science Department, Baghdad 10001, Iraq
Email: *hanan.jumaah95[at]kus.edu.iq*

[2]AL - Karkh University of science, College of Science, Forensic Science Department, Baghdad 10022, Iraq
Email: *alowaidim11[at]gmail.com*

Abstract: ***Liver dysfunction during pregnancy can impact both maternal and fetal health, making early detection through liver function tests (LFTs) critical for reducing complications. This case study evaluated LFTs in 36 healthy Iraqi pregnant women across all trimesters, compared with 13 age - matched non - pregnant controls. Blood samples were analyzed for hemoglobin (HGB) and serum levels of alkaline phosphatase (ALP), aspartate aminotransferase (AST), alanine aminotransferase (ALT), and gamma - glutamyl transferase (GGT). Results revealed a significant decrease in HGB across all trimesters (P<0.05), elevated ALP in the second (P<0.05) and third trimesters (P<0.001), increased ALT in the third trimester (P≤0.05), and reduced GGT in the third trimester (P≤0.05) compared to controls, while AST showed no significant change (P>0.05). These findings suggest that pregnancy induces notable liver function changes even in healthy women, highlighting the need to distinguish physiological shifts from pathological conditions for accurate diagnosis and management.***

Keywords: ALP, ALT, AST, GGT, Liver function tests (LFTS), pregnancy

1. Introduction

Adolescents and young adults are increasingly suffering from liver disease. The prevalence of chronic liver diseases among women aged 15 to 39 has significantly increased, according to data from the National Health and Nutrition Examination Survey collects between 1988 and 1994 and 1999 and 2012. Rate of chronic liver disease in this subpopulation were 10.4% in 1988–1994; 26.1% in 1999–2004; and 24.9% in 2007–2012 [1].

Changes of Physiological occur in pregnant woman to facilitates the development and growth of the fetus. through pregnancy, the serum progesterone and estrogen pregnant women were levels gradually increased and reached a maximum through third trimester [2].

Hepatic functions associated to metabolism, synthesis, and excretion are impacted by these sex steroids [3]. Because of the wide range of symptoms, an aberrant LFT may be minor and have no lasting effects, or it may be severe and result in the death of both the mother and the fetus. This often requires gastroenterologists and obstetricians to decide on urgent interventions in order to determine whether the abnormal LFT is associated to pregnancy [4].

Clinical practice would therefore benefit from knowing the distribution of the various likely causes of abnormal LFT in the pregnant population [4].

There are multiple serum liver parameters also known as liver blood tests or liver function tests, are frequently used to screen for liver diseases. These markers including (GGT) gamma - glutamyl transferase, (AST) aspartate aminotransferase, (ALT) alanine aminotransferase, and (ALP) alkaline phosphatase. Abdominal US is the first imaging modality that is often necessary to assess abnormalities in these tests [5].

Physiological changes of pregnancy associated with liver function are typically temporary and only last during the pregnancy; after that, they naturally heal. However, pregnancy - related conditions like cholestasis, hyperemesis gravidarum, Acute Fatty Liver of Pregnancy (AFLP), hemolysis, syndrome of increased liver enzymes and low platelets (HELLP), and isolated instances of high liver enzyme may have negative consequences [6]. understanding of liver function tests (LFTs) correctly can result in timely disease management and accurate diagnosis, potentially reducing complications for both the mother and the fetus. There are several traps to be aware of when interpreting basic serum LFTs. Pregnant women had 20% lower values of bilirubin, ALT, AST, and GGT in comparison to the normal reference range, according to a prospective analysis of 430 pregnant women's test results [7].

The levels of maternal hormones, particularly sex hormones, are essential for controlling the immunological and metabolic alterations necessary for a healthy pregnancy. The fetus produced steroids and peptides, which the placenta secreted into the mother's bloodstream to stimulate the production of hormones in the mother [8]. Throughout the course of pregnancy, the fetal and placental hormones undergo significant changes that gradually peak during the final trimester. The liver's excretory, synthetic, and metabolic processes are impacted by these hormones. The changes in hemodynamics brought on by an increase in the volume of plasma through the course of pregnancy, which results in hemodilution, are the other physiological change on liver [9], [10].

The goal of the current study was to examine the effects of pregnancy on the liver function tests in all three trimesters of pregnancy and compare it with a control (non - pregnant women).

2. Methods

2.1 Study design and sample selection

From August of 2023 to March 2024, 36 healthy pregnant women and 13 women without pregnant (serve as control) were include in this study. The samples in this study were collected from pregnant women who visited antenatal care at Abu - Ghraib Hospital General. The analysis was performed in the AL - Rahma Laboratory for Medical and Hormonal Analysis in Abu - Ghraib.

Based on the pregnancy semester, the pregnant women were divided into three groups. Among the 36 pregnant women, 12 members were first trimester (1, 2, 3 months of pregnancy), 12 members were second trimester (4, 5, 6 months of pregnancy), 12member third trimester (7, 8, 9 months of pregnancy), and the control included 12healthy members. The age for each group of pregnant women was matched with the non - pregnant woman. All individuals in this study not receiving oral contraception. The women's weights in this study varied. The mean of the pregnant was matched, the rang ages was (18 - 42 years), and the control age rang (18 - 40 years).

2.2 Blood Sample Collection

Three milliliters of venous blood were collected from pregnant and non - pregnant women to do HGB, and the remaining blood was centrifuged to obtain serum and storage at - 20C until assay ALP, ALT, AST GGT. The serum of ALP, ALT, AST, and GGT tests were assessed by the clinical chemistry analyzer IHeto AU240 (Fully Automatic).

2.3 Exclusion criteria

The current study excluded smoker women, hypertension (HTN), and hyperglycemia that occur during pregnancy.

2.4 Statistical Analysis

The data were statistically analyzed using SPSS and expressed as (Mean±SD). ANOVA was used to compare between pregnant women and non - pregnant in the first, second, and third trimesters. p<0.001 considered a highly significant difference at a confidence interval (CI) of 99 %. P value of p<0.05 was considered significant difference at a confidence interval (CI) of 95%.

3. Results

The mean ± SD of the age were non - significant difference (P>0.05) in the three groups of pregnant (27.81 ± 6.80), (27.65 ± 7.85), and (27.35 ± 5.02) and non - pregnant woman (27.45±5.95) (aged matched). Hemoglobin levels shown significantly decrease (P<0.05) in three groups (10.04± 4.52), (9.64±0.93), and (10.42± 1.47) as comparing with control (12.65±0.62), as shown in table (1).

Table 1: Mean of age, and HGB

Variables	*Controls (n=12) (man ± SD)*	*Pregnant (Mean± SD)*		
		1st trimester 1, 2, 3 months (n=12)	2nd trimester 4, 5, 6 months (n=12)	3nd trimester 7, 8, 9months (n=12)
Age (years)	27.45± 5.95	27.81 ± 6.80	27.65 ± 7.85	27.35 ± 5.02
p - value		(p>0.05) NS	(p>0.05) NS	(p>0.05) NS
HGB (g/dl)	12.65±0.62	10.04± 4.52	9.64±0.93	10.42± 1.47
p - value		P<0.05*	P<0.05*	P<0.05*

NS=non - significant * =there is significant difference (P<0.05)

There were no significant difference (p>0.05) in the levels of AST in all groups of pregnant women as compared with non - pregnant women as shown in Table (2).

Levels of ALT were significantly increased (P≤0.05) through the third trimester (23.933± 2.02) compared to the first trimester (13.52± 0.83) and controls (12.64±0.43). No significantly increased in levels of s. ALT and s. AST during the first and second trimesters compared to control. S. ALP levels were significantly rising (P<0.001) through the third trimester (119 ± 0.70) than in the second trimester (78.33±3.45) and the first trimester (55.14±1.23) and with the control group (50.43± 1.08). Through the second trimester serum ALP levels were significantly greater (P<0.05) compared with the first trimester and control group, as shown in table (2).

s. GGT levels were significantly drop **(**P< 0.001) in third trimester (6.15± 5.21) compared to control (12.14±3.54), first (13.27±2.79) and second trimester (10.12±4.32) of pregnant women, as shown in table (2).

Table 2: Levels of serum LFTs in non - pregnant and pregnant women

Parameters	*Control (n=12) (man ± SD)*	*Pregnant (Mean± SD)*		
		1st trimester 1, 2, 3 months (n=12)	2nd trimester 4, 5, 6 months (n=12)	3nd trimester 7, 8, 9months (n=12)
AST (GOT) (U/L)	12.81± 1.26	14.23±1.36	15.16±2.04	18 ± 0.32
p - value		(p>0.05) NS	(p>0.05) NS	(p>0.05) NS
ALT (GPT) (U/L)	12.64±0.43	13.52± 0.83	16.96± 0.917	23.933± 2.02
p - value		(p>0.05) NS	(p>0.05) NS	P<0.05*
ALP (U/L)	50.43± 1.08	55.14±1.23	78.33±3.45	119 ±0.70
p - value		p>0.05	P<0.05*	P< 0.001**

NS=non - significant, *= there is significant difference (P<0.05), **= there is significant difference (P<0.05)

4. Discussions

Levels of LFTs were assessed in 36 healthy pregnant women and 12 served as control age - matched do not receive mouthy contraception. None of the women in this study showed evidence of liver disease.

In this study, the HGB concentrations significantly decreased ($p>0.05$) in all pregnant woman's as compared with control that agreement with other studies [11], [12]. Many pregnant women raise blood volume, that causes hemodilution and, ultimately, a drop in women's hemoglobin concentration [13].

serum AST levels were non - significant differences ($p>0.05$) in the three groups of trimester as compared with control. All levels of AST and ALT were with in normal limit. Othman et al. (2022) found there were no significant changes in levels of AST between non - pregnant women and all three trimester in pregnant woman [14].

The level of ALT significantly rises in the third - trimester of pregnant women, while in the second and first trimesters still non - signficant as compared with control. Khatun et al. (2020) found significantly increased in the levels of serum ALT in the third trimester than in non - pregnant, first, and second - trimester of pregnancy. level of ALT showed a significant increase through the first and second trimester compared with nonpregnant women [15].

A high levels of AST and ALT were found through labor, which could occur due to the muscle contraction of the uterine [16]. AST and ALT levels remained normal throughout pregnancy until labor and raised levels of serum ALT and AST over the normal limits should be conducted further research.

In the current study the activity of ALP levels was significantly increased in the third and second trimester as compared with non - pregnant woman and first trimester. This result was consistent with previous research by Walker et al. (2013), who reported that the serum alkaline phosphatase typically rises through pregnancy due to the placental isoenzyme's synthesis and can, within a given term, reach triple upper than the normal range that is conceded for adults is normal [17]. The enzyme ALP alkaline phosphatase primarily increases through the pregnancy period due to the creation of the placental isoenzyme [14].

Gohel et al. examined the AST, ALT, ALP, and GGT and showed that third - trimester pregnant women had significantly increased s ALT and s AST levels than nonpregnant, and first and second trimester of pregnant women. There was no significant rise in the levels of ALT and AST in the first and second trimesters when compared to women who were not pregnant. ALP levels increased dramatically in the second and third trimesters [18].

Levels of LFTs were assessed in 36 healthy pregnant women and 12 served as control age - matched do not receive mouthy contraception. None of the women in this study showed evidence of liver disease.

In this study, the HGB concentrations significantly decreased ($p>0.05$) in all pregnant woman's as compared with control that agreement with other studies [11] [12]. Many pregnant women raise blood volume, that causes hemodilution and, ultimately, a drop in women's hemoglobin concentration [13].

Serum AST levels were non - significant differences ($p>0.05$) in the three groups of trimester as compared with control. All levels of AST and ALT were with in normal limit. Othman et al. (2022) found there were no significant changes in levels of AST between non - pregnant women and all three trimester in pregnant woman [14].

The level of ALT significantly rises in the third - trimester of pregnant women, while in the second and first trimesters still non - signficant as compared with control. Khatun et al. (2020) found significantly increased in the levels of serum ALT in the third trimester than in non - pregnant, first, and second - trimester of pregnancy. level of ALT showed a significant increase through the first and second trimester compared with nonpregnant women [15].

A high levels of AST and ALT were found through labor, which could occur due to the muscle contraction of the uterine [16]. levels of both AST and ALT were still normal through the pregnancy before the period of labor and raised levels of serum ALT and AST over the normal limits should be conducted further research.

In the current study the activity of ALP levels was significantly increased in the third and second trimester as compared with non - pregnant woman and first trimester. This result was consistent with previous research by Walker et al. (2013), who reported that the serum alkaline phosphatase typically rises through pregnancy due to the placental isoenzyme's synthesis and can, within a given term, reach triple upper than the normal range that is conceded for adults is normal [17]. The enzyme ALP alkaline phosphatase primarily increases through the pregnancy period due to the creation of the placental isoenzyme [14].

Gohel et al. examined the AST, ALT, ALP, and GGT and showed that third - trimester pregnant women had significantly increased s ALT and s AST levels than nonpregnant, and first and second trimester of pregnant women. There was no significant rise in the levels of ALT and AST in the first and second trimesters when compared to women who were not pregnant. ALP levels increased dramatically in the second and third trimesters [18].

In the current study, the third trimester of pregnancy showed significantly lower levels GGT compared to controls, first, and second trimesters of pregnant women. Reduced levels of GGT in the latter stages of pregnancy can be attributed to hormone secretion during pregnancy inhibiting the hepatic synthesis of GGT. Serum GGT activity is higher in women with early - stage viral hepatitis than in those with late - stage viral hepatitis. The same thing happens to women who take oral contraceptives [18]. Other studies showed Pregnant women's GGT levels in the first, second, and third trimesters each displayed a distinct trend [19], [20].

5. Conclusions

The pregnancy affects on liver and causes changes in the liver function tests of healthy pregnant women. These changes may be mistaken in the interpretation as liver disease or it can also detect pre - existing disease. Therefore, that important to understand these physological changes and diagnose liver diseases that may occur during the pregnancy period.

6. Other recommendations

The most difficult in this study was the small number of pregnant women in the study. Therefore, we recommended utilizing a lot of pregnant women to validate our findings.

References

[1] Doycheva, Iliana, et al. "Increasing burden of chronic liver disease among adolescents and young adults in the USA: a silent epidemic. " Digestive diseases and sciences 62 (2017): 1373 - 1380.
[2] Kazma, Jamil M., et al. "Anatomical and physiological alterations of pregnancy. " Journal of pharmacokinetics and pharmacodynamics 47.4 (2020): 271 - 285.
[3] A. Bonnaccorsi, “On the Relationship between Firm Size and Export Intensity, ” Journal of International Business Studies, XXIII (4), pp.605 - 635, 1992. (journal style)
[4] R. Caves, Multinational Enterprise and Economic Analysis, Cambridge University Press, Cambridge, 1982. (book style)
[5] M. Clerc, “The Swarm and the Queen: Towards a Deterministic and Adaptive Particle Swarm Optimization, ” In Proceedings of the IEEE Congress on Evolutionary Computation (CEC), pp.1951 - 1957, 1999. (conference style)
[6] H. H. Crokell, “Specialization and International Competitiveness, ” in Managing the Multinational Subsidiary, H. Etemad and L. S, Sulude (eds.), Croom - Helm, London, 1986. (book chapter style)
[7] K. Deb, S. Agrawal, A. Pratab, T. Meyarivan, “A Fast Elitist Non - dominated Sorting Genetic Algorithms for Multiobjective Optimization: NSGA II, ” KanGAL report 200001, Indian Institute of Technology, Kanpur, India, 2000. (technical report style)
[8] J. Geralds, "Sega Ends Production of Dreamcast, " vnunet. com, para.2, Jan.31, 2001. [Online]. Available: http: //nl1. vnunet. com/news/1116995. [Accessed: Sept.12, 2004]. (General Internet site)
[9] Murray, Irene, and Jenny Hendley. "Change and adaptation in pregnancy. " Myles' Textbook for Midwives E - Book: Myles' Textbook for Midwives E - Book 197 (2020).
[10] Vishnyakova, Polina, et al. "Expression of estrogen receptor α by decidual macrophages in preeclampsia. " Biomedicines 9.2 (2021): 191.
[11] Schoorl, Margreet, and Marianne Schoorl. "Effects of iron supplementation on microcytic and hypochromic red blood cells during the third trimester of pregnancy. " International Journal of Laboratory Hematology 44.6 (2022): 1060 - 1067.
[12] Peng, Zhicheng, et al. "The associations of maternal hemoglobin concentration in different time points and its changes during pregnancy with birth weight outcomes. " Nutrients 14.12 (2022): 2542.
[13] Feleke, Berhanu Elfu, and Teferi Elfu Feleke. "The effect of pregnancy in the hemoglobin concentration of pregnant women: a longitudinal study. " Journal of pregnancy 2020.1 (2020): 2789536.
[14] Othman, Amina, et al. "Comparative study between pregnant and non - pregnant women regarding variation of liver function tests: assessment of health literacy. " Evidence - Based Nursing Research 4.2 (2022): 18 - 28.
[15] Khatun, M. Rokeya, Amina Khatun, and Md Nowshad Ali. "Comparison of liver function tests in normal pregnancy with non - pregnant matched controls. " TAJ: Journal of Teachers Association 33.1 (2020): 17 - 24.
[16] Meade, B. W., and S. B. Rosalki. "Serum enzyme activity in normal pregnancy and the newborn. " BJOG: An International Journal of Obstetrics & Gynaecology 70.4 (1963): 693 - 700.
[17] Walker, Ian, Lucy C. Chappell, and Catherine Williamson. "Abnormal liver function tests in pregnancy. " Bmj 347 (2013).
[18] Gohel, Mukesh G., et al. "Evaluation of changes in liver function test in first, second and third trimester of normal pregnancy. " International Journal of Reproduction, Contraception, Obstetrics and Gynecology 2.4 (2013): 616 - 621.
[19] Shahramian, Iraj, et al. "Evaluation of Liver Enzymes in Normal Pregnancies in a University Hospital of Zabol Iran: A Cross - Sectional Study. " Journal of Family & Reproductive Health 17.3 (2023): 185.
[20] Zorić, Lara, et al. "Verification of bile acid determination method and establishing reference intervals for biochemical and haematological parameters in third - trimester pregnant women. " Clinical Chemistry and Laboratory Medicine (CCLM) 62.10 (2024): 2048 - 2061.

Author Profile

Hanan J. Mohammed received the B. S. degrees in chemical science from university of Baghdad in 2017, and M. S. degrees in biochemistry specialization from university of Baghdad 2021. I work in Sid lab in 2018, now I attended in AL - Karkh university of science as Asst. Lect.