Kerbala Journal of Nursing and Health Sciences. *(*2025) **Vol** 1, **No 3**

ISSN: 3007-9047 (online) 3007-9039 (Print)**.**

Valuation of the Role of Some Biochemical and Hematological Parameters in Pregnant Women, Smokers and Non-smokers

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Received: 2 / 7/2025
Accepted:18 / 8 /2025
Published:29 /10 /2025

Abstract

Introduction: This study examines the effect of smoking on pregnant women who smoker and compares the results with those of non-smoker pregnant women based on some hematological and biochemical parameters.

Methods: Samples from (80) pregnant women were examined, with a gestation period of (4-9) months and ages between (26-46) years. The samples were divided into two groups: the first was the experimental group, which included (60) pregnant women who smoked, and the second was the control group, which included (20) pregnant women who did not smoke. The two groups were divided according to age into two age groups: the first was (26-36) years, and the second was (36-46) years. .

Results: Upon conducting some blood tests, a significant increase ($P<0.05$) was observed in the blood sugar (BSC) level and the average levels of both biochemical and hematological parameters in the group of pregnant women who smoked compared to G2. A significant decrease ($P<0.05$) was observed in the percentage of hemoglobin (Hb), red blood cell (RBC) counts, and low-density lipoproteins (LDL). While a significant increase was observed at the level ($p<0.05$) in the number of WBC, high-density lipoproteins (HDL), average blood sugar levels, total cholesterol (TC) and triglycerides (TG).

Conclusion: In the present study, the association between pregnant womens smoker and non smoker with Biochemical and Hematological Parameters was evaluated. The results showed that smoking correlated with RBC indices (RBC count, , WBC count, TC , TG,HDL , LDL, and PLT count. The levels of these parameters were considerably higher in smokers compared with non-smokers; on the other hand, the and lowered RBC.

Keywords: diabetes , pregnant women , smokers , non-smokers, blood parameters, biochemical parameters.

1. Introduction

The age group 25–34 years has the highest tobacco consumption rate, overlapping with the reproductive years and fertility (Chabrol et al., 2005) . Studies indicate that 15–20% of all pregnant women who smoke continue to smoke during pregnancy (Lange et al., 2018; Vivilaki et al., 2016). Exposure to smoking during pregnancy is a major risk factor for adverse outcomes and remains a major public health concern (Coleman et al., 2015; Holbrook, 2016) Educating pregnant women to quit smoking and addressing smoking exposure are among the most important interventions used by healthcare professionals to reduce the risk of adverse birth outcomes (Diamanti et al., 2019) . Nicotine and carbon monoxide (CO) are two significant tobacco byproducts that adversely affect pregnancy outcomes. Nicotine is a recognized neurotoxic that disrupts normal neurotransmitter activity upon exposure. At elevated quantities, it can be detrimental to the developing fetus. During gestation, the growing baby is subjected to elevated concentrations of nicotine compared to those of a smoking mother, as nicotine accumulates within the fetal body. Carbon monoxide is a highly hazardous gas present in cigarette smoke (Carmines & Rajendran, 2008). Inhalation of carbon monoxide during smoking results in the production of carboxyhemoglobin (COHB), which adversely impacts the health of both the mother and the fetus by diminishing the blood's capacity to transport oxygen, potentially causing fetal hypoxia. Smoking cessation at any point during pregnancy correlates with enhanced pregnancy outcomes; however, evidence indicates that cessation during the first trimester yields the most significant advantages. Women who quit smoking prior to the 15th week of gestation face a heightened risk of preterm birth and delivering small-for-gestational-age infants compared to non-smokers ("Spontaneous Preterm Birth and Small for Gestational Age Infants in Women Who Stop Smoking Early in Pregnancy: Prospective Cohort Study," 2009) . As such, smoking cessation early in pregnancy should be a clinical priority. Health consequences associated with smoking include delayed pregnancy, ectopic pregnancy, spontaneous abortion, growth restriction, sudden infant death syndrome (SIDS), female infertility, type 2 diabetes, preterm premature rupture of membranes, respiratory problems ,low birth weight (lower respiratory tract infections, asthma, decreased lung function), birth defects (optic nerve hypoplasia ,microphthalmia, microphthalmia, cleft palate, anophthalmia, esotropia, exotropia), heart defects, cranial closure, gastroschisis, anal stenosis, hernia, and infertility, as well as neurological and neurodevelopmental effects (brain developmental abnormalities, impaired normal brain function). Risk factors for smoking were found in low educational levels (primary and secondary education), It can be inferred that women with lower levels of education possess diminished awareness of the detrimental effects of tobacco use. The lack of health education can impose greater difficulties on these women in accessing the health care system, which exposes them (mothers and children) to greater risk (Alves et al., 2013; de Wolff et al., 2019; Erlingsdottir et al., 2014; Roustaei et al., 2019; Širvinskienė et al., 2016).

2. Materials and Methods

The study was conducted on (80) pregnant women aged (26-46) years, including (60) pregnant women who were smokers (the experimental group) G1 and (20) pregnant women who were non-smokers (the control group) G2. Samples were collected from patients at various maternity clinics. The two groups were divided into two age groups: the first age group (25-35) years, and the second age group (36-46) years. Blood samples were collected at different stages of pregnancy from both experimental and control samples by withdrawing a quantity of venous blood using sterile medical syringes in the amount of (5 ml) of blood and storing it in clean

tubes containing an anticoagulant (EDTA) for the purpose of conducting some blood tests such as calculating the number of red blood cells (RBC) and the amount of hemoglobin (HB), measuring the average sugar levels according to the method (Tiez, 1995). measuring the total cholesterol level according to the method (Allain et al., 1974) measuring the percentage of triglycerides according to the method (Tiez, 1995), and high-density lipoproteins and low-density lipoproteins according to the method (BURSTEIN et al., 1970) .

2.1. Statistical Analysis

The results were tested statistically using the T-test at the significance level ($P<0.05$) (Moder, 2010) .

3. Results

Table (1) shows the relationship between some blood parameters for pregnant women, smokers and non-smokers, in the first age group (25-35) years.

Blood parameters	Experimental group 30	Control group 10
Hemoglobin concentration (Hb) mg/dl	9.80 ± 0.8	11.42 ± 1.4
Red blood cell (RBC) count	2.09 ± 0.7	3.69 ± 0.8
White blood cell (WBC) count	10.9 ± 0.9	8.51 ± 0.9

Table (2) shows the relationship between some blood parameters for pregnant women, smokers and non-smokers, in the Second age group (36-46) years.

Blood parameters	Experimental group 30	Control group 10
Hemoglobin concentration (Hb) mg/dl	9.2 ± 1.3	10. 5 ± 0.5
Red blood cell (RBC) count	2.1 ± 0.4	3.0 ± 0.61
White blood cell (WBC) count	10.9 ± 0.7	8.1 ± 1.40

Table (3) shows the relationship between some biochemical parameters of pregnant women, smokers and non-smokers, in the first age group (25-35) years.

Biochemical parameters studied	Experimental group 30	Control group 10
Average blood sugar levels	130.7 ± 1.2	111.6 ± 0.8

mg/dl	190 .6 ± 2.8	105 .2 ± 1.9
Average total cholesterol (TC) level (mg/dl)	110.0 ± 2.0	80.2 ± 2.4
Average triglyceride (TG) level (mg/dl)	90.8 ± 1.9	73.0 ± 1.6
Average high-density lipoprotein (HDL) level (mg/dl)	32.9 ± 0.8	46.7 ± 0.9

Table (4) shows the relationship between some biochemical parameters of pregnant women, smokers and non-smokers, in the Second age group (٤٦-٣٦) years**.**

Biochemical parameters studied	**Experimental group 30**	**Control group 10**
Average blood sugar levels	144.3 ± 1.5	115.9 ± 1.0
mg/dl	198.2 ± 2.6	110.1 ± 1.7
Average total cholesterol (TC) level (mg/dl)	119.9 ± 2.1	89.5 ± 2.0
Average triglyceride (TG) level (mg/dl)	95.0 ± 1.8	79.1 ± 1.3
Average high-density lipoprotein (HDL) level (mg/dl)	30.4 ± 0.7	44.8± 0.8

4. Discussion

The present investigation demonstrated a notable reduction in several blood parameters for pregnant women, both smokers and non-smokers. The decrease in red blood cell counts is due to the need for essential substances for the growth and development of the fetus. This is consistent with what was indicated by (Ross & Reith, 1985) . as a result of a decrease in the percentage of hemoglobin binding to oxygen to a level below the normal level of approximately (10-15%). Carbon monoxide replaces oxygen, forming the compound carboxyhemoglobin, the percentage of which increases with increased smoking, leading to anemia, which results in insufficiency in the blood circulation of the placenta due to the narrowing of the blood vessels. In addition to the decrease in RBC and the size of packed blood cells, which was consistent with what was indicated by (The American College of Obstetricians & Opinion, 2017). due to the change in the shapes and sizes of red blood cells, so that they are either small or large in size and low in hemoglobin, the increase in the number of WBC is also due to the natural increase in the number of white blood cells as a result of pregnancy (called natural abundance)

because the fetus is a foreign body in the mother's body and because of smoking, which leads to damage to the cells that make up the inner lining of the tissues resulting from the oxidation of low-density lipoproteins, which stimulates the blood system to generate white cells in the affected area, which is consistent with the study (Eastman et al., 1991). There was also a significant increase in blood sugar levels when compared to G2. This is consistent with what was indicated by (Lewis et al., 2018) , as the risk of diabetes increases during pregnancy, leading to negative complications for the mother and fetus. These risks can be reduced by improving blood sugar control before pregnancy. In addition to routine screening of women of childbearing age with diabetes, a comprehensive physical examination and tests to initiate treatment. It was also noted that the average level of HDL and the average level of LDL were higher during the last three months of pregnancy. This is consistent with what was found by (Wersch et al., 1994), which is a physiological necessity for Control group during normal pregnancy, and unfavorable for the normal development of the rapidly growing fetus in the final stage of pregnancy. Also, an increase in the average level of both cholesterol and triglycerides was found, as indicated by (Bizoń & Milnerowicz, 2017). .The reason behind this is due to the increase in oxidants and the decrease in antioxidants. Changes in lipid levels were also observed during physiological pregnancy in previous studies (Laggari et al., 2009; Vrijkotte et al., 2012) . During pregnancy, there is an increase in the concentrations of triglycerides and harmful cholesterol, with an increase in the concentration of good cholesterol at the same time, which reduces the effect of atherosclerosis in the blood of the experimental group (Abuhandan et al., 2012; Festus et al., 2023) . which is accompanied by an increase in the concentration of harmful cholesterol in the serum and a decrease in the concentration of good cholesterol, which leads to a disturbance in lipid levels.

5. Conclusion

Our findings clearly show that continuous cigarette smoking has severe adverse affects on hematological parameters (hemoglobin, WBC count, RBC count and platelet crit) in pregnant woman's smokers. In our result WBC counts are significantly higher in smokers, and decreased RBC , It is highly recommended to fully evaluate the impact of tobacco on exposed subjects Only the clinical assessment of smokers is not enough, but adding a biological evaluation will give the great picture of the problem , Additional research is clearly necessary to determine if reduction to be reduced for health .

6. Acknowledgments

The authors extend their sincere thanks to the volunteers who contributed their time and effort to the success of this research. We especially thank the life sciences professors for their advice and guidance in completing this work .

6.1. Conflict of interest statement

The authors declare no conflicts of interest relevant to the content of this study. No financia relationships, personal interests, or affiliations influenced the research design, analysis, interpretation, or reporting of the findings.

6.2. Funding statement

This study was not supported by any external funding agency.

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