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Effect of Body Mass Index (BMI), Prolactin, Progesterone and Estrogen on Spontaneous Abortion in Women of Najaf Governorate

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تأثير مؤشر كتلة الجسم (BMI) والبرولاكتين والبروجستيرون والإستروجين على الإجهاض التلقائي لدى نساء محافظة النجف

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ABSTRACT

Background: One of the most complex problems facing pregnant women is Abortion, which affects approximately 15% of registered pregnancies in most of the world's population, there are many reasons that lead to miscarriages, some of which are known and studied, and they are many and varied, but 50% of these cases remain unexplained scientifically.

Materials and Methods: Samples were collected from both Al-Manathira Hospital and some private clinics during the period from 10/1/2022 to 3/1/2023, to conduct studies on (pregnant and healthy women) 50 women suffering from spontaneous abortion and control group, the number of which was (30) women. Women who were naturally pregnant during the pregnancy period between (2-6) months without having previously experienced Abortion were considered a control group, each woman's weight and height were measured to determine her (BMI).

Results: The findings of this study revealed a significant decline ($p<0.05$) in BMI for women who had Abortion. Biochemical tests also showed a significant decrease ($p<0.05$) in the levels of prolactin and progesterone in women who had Abortion compared to the control, However, the results indicated a notable rise in estrogen levels in women who had an abortion.

Conclusion: The findings indicate that disturbances in body mass index (BMI), whether through excess or deficiency, can negatively affect pregnancy stability. Moreover, abnormalities in prolactin and progesterone levels are associated with impaired endometrial support and an increased risk of miscarriage. In contrast, excessive elevation of estrogen may induce uterine contractions and further contribute to pregnancy loss.

Key words: Abortion, Prolactin, BMI, Endometrium

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INTRODUCTION

Abortion is a major event in pregnancy that results in the loss of the fetus [1]. Many factors influence this condition including genetic factors [2] Mycoplasma hominies and urealyticum infections [3] immune dysfunction [4] reproductive organ defects [5] endocrine disorders [6] environmental chemicals [7] and psychological factors [8].

as well as damage to the endometrium, placental dysfunction, chromosomal changes [9] And unhealthy maternal lifestyle choices, including alcohol intake, smoking, and the use of illicit substances, in addition to exposure to nonsteroidal anti-inflammatory drugs (NSAIDs) at the time of pregnancy [10], [11]. The emotional response to Abortion, including anxiety, depression, anger, feelings of loss, sleep disturbance, and marital disturbances, can also have profound effects on maternal health [12], [13]. Approximately 80% of Abortion occur in the first trimester, and their incidence decreases as pregnancy progresses [14], [15]. Anatomical factors account for approximately 10–15% of Abortion, including intrauterine adhesions, cervical laxity, and birth defects in the uterine septum [16].

The usual clinical symptoms of Abortion are vaginal bleeding and severe abdominal pain during early pregnancy, but these symptoms do not always predict the occurrence of Abortion.

The usual clinical symptoms of Abortion are vaginal bleeding and severe abdominal pain during early pregnancy, but these symptoms do not always predict the occurrence of Abortion [17], [18], [19].

Hormonal changes also play an important role in Abortion, including prolactin, LH, and progesterone, which play a crucial role in preparing the uterine lining to receive the early embryo [20]. Pregnancy maintenance and fetal growth and development depend primarily on the safety and effectiveness of the endocrine glands. In fact, most pregnant women experience recurrent endocrine disorders, which leads to Abortion. Studies have shown that 8 to 10% of miscarriages are caused by endocrine disorders or obesity [21]. In cases of Abortion in the first trimester of pregnancy, Major contributing factors include chromosomal abnormalities, found in approximately 60-70% of cases, as well as maternal health conditions such as uncontrolled diabetes, unmanaged thyroid disorders, severe systemic lupus erythematosus, and antiphospholipid syndrome [22], [23].

The purpose of this study was to

- Enhance the medical understanding of the causes of miscarriage by highlighting how hormonal imbalances and weight disorders affect the stability of pregnancy.
- Provide information to help doctors assess the risk of miscarriage in women based on hormone levels and BMI.
- Promote the importance of maintaining a healthy weight before and during pregnancy to reduce the chances of miscarriage.

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- Support reproductive health by raising awareness about the importance of hormonal balance and healthy weight in improving the chances of a successful pregnancy.
- Provide practical information to help women improve their reproductive health.
- Open up new horizons for studies on the impact of other biological and physical factors on pregnancy.
- Support medical research aimed at reducing miscarriage rates and improving maternal and fetal health.

MATERIALS AND METHODS

This study was conducted at Al-Munathira Hospital in Najaf Governorate from September 2022 to March 2023. The samples included 50 aborted women compared to 30 samples as a control group. The weights and heights of the women were measured to determine the body mass index for all studied samples. The weights and heights of the women were measured for the purpose of knowing the body mass index.

1. Serum prolactin detection

Prolactin levels were measured by following the steps included with the test kit using ELISA technique where a blood sample is collected from pregnant women, then the serum or plasma is separated from the rest of the blood components by centrifugation, the sample is diluted if necessary (according to the instructions of the kit used) then a plate containing wells is used coated with a binding material such as Streptavidin or Antigen that works to attract prolactin or LH or antibodies.

Then the sample and the known measurement standards (Standards) are added to the designated wells and incubated for a specific period (usually 30-60 minutes) at an appropriate temperature to allow the components to interact then a specific antibody for prolactin is added linked to an enzyme such as Peroxidase where the antibody works to bind to the prolactin hormone in the sample, forming a complex (Antibody-Hormone Complex) after which the wells are washed several times to remove unbound materials. Then a substrate material such as TMB is added with which the enzyme linked to the antibody interacts. The reaction produces a color, usually blue, which changes to yellow with the addition of Stop Solution. The plate is then placed in an ELISA Reader. The device measures the optical absorbance (Optical Density) at a specific wavelength (usually 450 nm). The optical absorbance of the samples is compared to known standards. Standard curves are used to determine the concentration of prolactin in the sample. The result is reported in ng/mL or µIU/mL depending on the kit system used. This method was used according to [24].

2. Serum estrogen and progesterone detection

The work was done according to [25] using the ELISA device. The levels of progesterone (P) and estradiol (E2) were tested, and the process was carried out according to the instructions of the device and the manual used accurately. The method of work for measuring estrogen, progesterone, LH, and prolactin using the ELISA device is similar, but there are differences represented in the antibodies targeting the hormones, the biological interaction between the

hormone and the antibody, the sensitivity of the test due to the concentrations of these hormones that may vary greatly, and the timing of the measurement, especially for hormones whose levels change periodically such as LH.

3. statistical analysis

Using the ready-made statistical program SPSS, 2008 [25], the data were statistically examined to determine the extent to which BMI, prolactin, estrogen and progesterone hormones affect spontaneous abortion in women. Duncan's (1955) multinomial test was used to analyze significant differences between means.

RESULTS AND DISCUSSION

1. Effect the BMI in normal and aborted women

The result in Tab1 showed significant decrease ($p<0.05$) BMI in abortion women (23.650± 0.272) compared with control group (30.550± 0.602).

Table 1. Effect the BMI in normal & aborted women (mean ± standard Deviation)

Women	BMI (kg/m²)
Abortion women	23.650±0.272*
Normal women (Control)	30.550± 0.602

2. Effect The prolactin level in normal and aborted women

The Tab2 showed significant decrease ($p<0.05$) in prolactin hormone in abortion women (60.52± 4.15) compared with control group (113 ± 10.522).

Table 2. Effect the prolactin level (ng/ml) in normal & aborted women (mean ± standard Deviation).

Women	Level of prolactin (ng/ml)
Abortion women	60.52±4.15*
Normal women (Control)	113±10.522

3. Effect the estrogen level in normal & aborted women

The results in Tab3 revealed significant increase ($p<0.05$) in estrogen level in abortion women (145.336±20.712) compared with control group (38.202± 2.110).

Table 3.Effect the estrogen level (pg/ml) in normal & aborted women (mean ± standard Deviation).

Women	Level of estrogen
Abortion women	*145.336± 20.712
Normal women (Control)	38.202± 2.110

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4. Effect the progesterone level (ng/ml) in normal & aborted women

The results demonstrated a substantial reduction. ($p<0.05$) in progesterone level in abortion women (13.544± 1.245) compared with control group (44.450 ±3.421).

Tab4. Effect the progesterone level (ng/ml) in normal & aborted women (mean ± standard Deviation).

Women	Level of progesterone
Abortion women	(13.544±1.245)*
Normal women (Control)	(44.450±3.421)

DISCUSSION

The findings indicated a notable reduction in BMI of women who had aborted When compared to the control group, this outcome aligns with [26], [27] where researchers have proven that women who are underweight or overweight have an increased risk of spontaneous abortion [28], [29], [30]. Moreover, obesity leads to an increased risk of miscarriage and birth defects of the fetus [28], [30]. Some researchers have explained that the weight and safety of the fetus are significantly affected by malnutrition, especially in the late stages of pregnancy [29].

The study's findings also revealed a marked reduction. in the level of prolactin in women who had aborted When compared to the control group, This finding is in agreement with the study. [31], which found a significant decrease in prolactin in women who had aborted When compared to the control, and the concentration of prolactin decreased in the case of spontaneous abortion. While its level gradually increases in pregnant women and with the progression of pregnancy to reach its peak immediately after birth to prepare the mammary glands in conjunction with the hormones progesterone and estrogen [32]. However, the results of this study do not agree with [33], as the study consisted of a group of 352 women suffering from recurrent spontaneous abortion, in which 64 patients were identified who suffered from a prolactin disorder not associated with any other causal abnormalities (such as ovarian or endocrine disorders, luteal phase dysfunction, polycystic ovary syndrome, hyperprolactinemia, or thyroid hormone disorders). Serum prolactin levels during early pregnancy (5-10 weeks of pregnancy) were significantly higher in patients who had a miscarriage (31.8-55.3 ng/ml) compared to patients who had a successful pregnancy (4.6-15.5 ng/ml). Prolactin levels decrease in the event of a miscarriage and increase in the event of pregnancy and continue to rise gradually until delivery. This increase prepares the mammary glands to produce and secrete milk and returns to normal levels four weeks after delivery [34]. Prolactin works in cooperation with progesterone and estrogen The development of mammary glands also has a major role in activating the corpus luteum in the ovaries in cooperation with the luteinizing hormone, which is called the corpus luteum nutrient hormone [35]. The results of the study also showed a significant increase

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($p<0.05$) in the level of estrogen compared to the control group, which is contrary to the study [36] that found a significant decrease in the level of estrogen in women who had aborted. The results were consistent with [37], which indicated an increase in the level of estrogen in women who had aborted. The results also showed a significant decrease ($p<0.05$) in the level of progesterone in women who had aborted When compared to the control. This result was consistent with [38], [39], which indicated a significant decrease in progesterone in women who had aborted. The reason for the decrease in progesterone in women who had aborted may be a defect in the corpus luteum and thus a defect in the process of progesterone synthesis. The results were consistent with [40], [41], [42], which indicated a decrease in the level of progesterone in women who had aborted When compared to the control. Progesterone secretion increases with the progression of pregnancy to reach a tenfold level, and performs basic functions, including the growth and development of uterine contractions during pregnancy, and the development of mammary glands [43], [44], [45]. Previous results and research also showed that a decrease in progesterone in pregnant women to less than 10 ng/ml causes spontaneous abortion [46]. This decrease is attributed to an abnormality or distortion of its receptors found in the uterine lining [47]. As for pregnant women, progesterone increases to reach 100-200 ng/ml during pregnancy and continues to increase until delivery. The placenta is the main source of progesterone production during the first and second trimesters of pregnancy, and any decrease in this hormone is caused by a defect in the placenta. As for the first months of pregnancy, progesterone is produced by the corpus luteum, and any decrease is caused by a defect in the corpus luteum [48].

CONCLUSIONS:

1. Effect of BMI: Overweight or obese women are at risk of abortion due to hormonal disorders and problems with the uterine lining. Underweight (very low BMI) may lead to poor fetal nutrition and instability of pregnancy.
2. Effect of prolactin: Normal levels of prolactin support pregnancy by promoting the development of the uterine lining. Abnormally high or low prolactin may cause hormonal disorders that lead to abortion due to poor ovulation or instability of pregnancy.
3. Effect of estrogen: Estrogen is essential for the growth of the uterine lining and the stability of the embryo. Its low level may cause failure of the embryo to implant, while its excessive increase may lead to uterine contractions and increase the risk of abortion.
4. Effect of progesterone: It is known as the "pregnancy" hormone because it maintains the uterine lining and prepares it to receive the embryo. Its deficiency is one of the common causes of early abortion, as it leads to instability of the uterine lining and embryo separation.

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RECOMMENDATIONS

1. Women planning to become pregnant are advised to maintain their BMI within the healthy range to reduce the risk of abortion.
2. Regular medical follow-up: Periodic check-ups to measure weight and levels of prolactin, estrogen, and progesterone during the different stages of pregnancy.
3. Hormonal therapy when needed:Use replacement therapy (such as progesterone supplements) for women at risk of miscarriage due to hormonal imbalance.
4. Health awareness: Educating women about the importance of hormonal balance and its role in stabilizing pregnancy and preventing abortion.

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Conflict of interest.

There are non-conflicts of interest.

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