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Assessment of Acquaintance of Miscarriage with HCG Serum Level in Initial Stage of Pregnancy

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ABSTRACT
The purpose of this study was to evaluate the knowledge of miscarriage in relation to HCG serum levels throughout the early stages of pregnancy. HCG was examined in serum using a solid-phase two-site chemiluminescent immunometric test, calibrated against WHO 3rd IS 75/537, on an Immulite 2000 XPi system (Siemens Healthcare Diagnostics, Deerfield, IL, USA). The coefficient of variation between assays was 8.0%, 6.3% and 5.1% at concentrations of 9.7 IU L^{-1}, 53.1 IU L^{-1} and 821.5 IU L^{-1}, respectively. The average HCG level in women who experienced a miscarriage within 10 days was 40128.3 Miu mL^{-1}. The number of women who experienced a miscarriage between 10 and 20 days was 44987. The average HCG level in women who experienced a miscarriage that lasted more than 20 days was 65429.The average HCG level in women who did not experience a miscarriage was 92106. The discrepancy was notable ($p<0.05$). Women who experienced miscarriage had a lower amount of HCG compared to women who did not have a miscarriage. HCG level, Miscarriage, pregnancy.

INTRODUCTION

Miscarriage impacts 10-20% of all clinically acknowledged pregnancies that result in miscarriage[1]. Before 6 weeks of pregnancy the majority of losses occur due to cytogenetic abnormalities in the embryo, such as chromosomal trisomy. However, later in pregnancy, other factors that might lead to miscarriage, including as problems with the placenta, infection in the uterus and blood clotting, become more frequent. Unusual placental development is seen in around two-thirds of miscarriage instances[2]. HCG is a hormone made by the placenta after an embryo attaches to the uterus. The hormone's function is to ready the body for ongoing progesterone production, which inhibits menstruation. This safeguards the lining of the uterus called the endometrium and supports pregnancy. The way a woman's body responds to pregnancy is completely individual. During the initial stages of pregnancy, hCG levels typically increase by two-fold every two to three days. Curiously, while the measurements begin with a high value, they do not increase at a uniform rate. If they begin at a slower pace, the growth occurs more rapidly[3].

In traditional terms, hCG is recognised for its role in sustaining the corpus luteum and its synthesis of progesterone, which is crucial for the implantation of an embryo[4-6]. Different kinds of research have connected hCG to additional tasks related to the placenta, uterus and foetus, such as the development of the umbilical cord the reduction of contractions in the uterine muscles the support of growth and specialisation of foetal organs, as well as the formation of new blood vessels and the control of immunological tolerance[7]. While hCG levels are mostly used to assess early pregnancy, our findings emphasise the significance of hCG in the various stages of pregnancy and indicate that changes in hCG levels may be linked to negative clinical outcomes. In many instances, this is sufficient to establish the diagnosis of a pregnancy within the uterus (whether viable or nonviable) or an ectopic pregnancy. However, in situations where the hCG level is lower below the essential range of 1500-2000 mIU mL^{-1} (often referred to as the discrimination level) and ultrasound is not expected to provide a diagnosis the pregnancy is classified as unknown location (PUL). As mentioned in a recent agreement, PUL is simply a descriptive word and not a diagnostic. Women with a PUL should continue to be monitored until a diagnosis can be determined[8,9]. This follow-up involves measuring hCG values multiple times, usually with a 48 hrs gap between each measurement. The purpose is to determine whether the hCG levels indicate a non-viable pregnancy that may require intervention. Alternatively, after the hCG discrimination level is reached, an ultrasound can be used to make a diagnosis. It is important to recognise that the pattern of the increase in hCG alone is not conclusive evidence of a viable pregnancy and should always be accompanied by an ultrasound to confirm the accurate diagnosis.

Abnormal levels of hCG have been linked to negative pregnancy outcomes such as miscarriage, high blood pressure throughout pregnancy, early delivery and restricted foetal growth[10-15]. To examine such clinical associations, it is necessary to create accurate reference ranges (RRs) that depend on gestational age. This can be challenging because hCG has been suggested as a marker of gestational age[16]. HCG has been demonstrated to identify and assess factors that may affect the results, including as variations in measuring methods, pregnancy dating methods and variances in demographic characteristics[17-20]. The second point is particularly significant because prior research has shown that specific maternal or foetal traits, such as maternal smoking, number of previous pregnancies, ethnicity, body-mass index (BMI) placental weight, symptoms of severe morning sickness and foetal gender, which are linked to a higher likelihood of negative pregnancy outcomes are also linked to hCG levels[21-28].

MATERIALS AND METHODS

The current research was carried out in the Gynaecology Department of Icare Institute of Medical Sciences And Research and Dr. Bidhan Chandra Roy Hospital, Haldia. The study included 145 pregnant women who showed no symptoms and were in their 8-18th week of pregnancy and were reported to the department. An equal number of controls was also provided. Everyone was notified about the study. Approval was acquired from the institute before the study.

HCG was examined in serum using a solid-phase two-site chemiluminescent immunometric test, calibrated against WHO 3rd IS 75/537, on an Immulite 2000 XPi system (Siemens Healthcare Diagnostics, Deerfield, IL, USA). The Siemens test identifies many forms of hCG in the blood, including intact hCG, hyperglycosylated hCG, nicked hCG, nicked hyperglycosylated hCG, asialo hCG, free b-subunit of hCG, and nicked b-subunit of Hcg. Twenty nine the coefficient of variation between assays was 8.0-6.3%, and 5.1% at concentrations of 9.7 IU L^{-1}, 53.1 IU L^{-1} and 821.5 IU L^{-1} respectively. While the Im-mulite 2000 is regarded as one of the top tests for total hCG, it is important to mention that the reference ranges provided in this paper are particular to this assay and may not align with hCG values obtained from other assays. The 30 results that were obtained were analysed using statistical methods. A p-value below 0.05 was considered significant.

Table 1: Analysis of the HCG among patients

HCG (mIU mL)	Women with miscarriage Mean	Women without miscarriag Mean	p-value
	45129.8	92112.9	0.01

Table 2: Comparison of PAPP-A and B-HCG means between complications of pregnancy

Category	PAPP-A (mean (SD))	P-value	B-HCG (mean (SD))	p-value
IUGR				
Yes	1.09 (0.60)	0.186	1.54 (1.24)	0.983
No	1.28 (0.59)	1.53 (1.04)		
Preterm labor				
Yes	1.03 (0.49)	0.027	1.25 (0.71)	0.060
No	1.28 (0.59)	1.54 (1.05)		
HTN				
Yes	1.23 (0.70)	0.649	1.42 (1)	0.445
No	1.28 (0.59)	1.54 (1.05)		
Abortion				
Yes	0.77 (0.48)	0.195	0.88 (0.91)	0.336
No	1.28 (0.59)	1.53 (1.05)		

Table 3: Serum HCG level in different time of miscarriage

Groups	Mean
Women with miscarriage <10 days	40128.3
Women with miscarriage 10-20 days	44987.8
Women with miscarriage >20 days	65429.9
Women without miscarriage	92106.8

RESULTS

According to Table 1 the average hCG level in women who experienced miscarriage was 45129.8 mIU mL^{-1} while among women who did not have a miscarriage, it was 92112.9 mIU mL^{-1}. The discrepancy was substantial ($p<0.05$). Table 2 shows the findings of comparing the levels of PAPP-A and free β-hCG in the blood serum of patients with and without pregnancy problems. We discovered a decrease in the average serum level of PAPP-A in patients experiencing pregnancy difficulties. However the difference was only statistically significant in the group of patients with preterm labour ($p = 0.027$).

According to Table 3 the average hCG level in women who had a miscarriage within 10 days was 40128.3 mIU mL^{-1}. The number of women who experienced a miscarriage between 10 and 20 days was 44987. The average hCG level in women who had a miscarriage that lasted more than 20 days was 65429. The average hCG level in women who did not experience a miscarriage was 92106. The discrepancy was notable ($p<0.05$).

DISCUSSION

Women who experience loss not only face severe emotional consequences but also have a higher chance of having major complications during future pregnancies, such as hypertension and preterm delivery[31]. Thus, it is crucial to create uncomplicated and secure tests for detecting pregnancies that are at a heightened risk of miscarriage. This could enhance the precision of diagnosis and potentially enhance the outcomes of obstetric care. While it is evident that low levels of hCG between days 12-16 after conception (fourth week of gestation) are linked to preclinical early pregnancy loss the exact connection between early hCG levels and clinical (later) miscarriage is yet unknown[32]. In the past, research has typically combined clinical miscarriages, preclinical early pregnancy loss and ectopic pregnancies into one category and did not distinguish between twins in the analysis. Twins could create a notable bias since they are linked to greater early hCG levels and the rates of clinical miscarriage may differ from those of singletons[33].

This suggests that stopping smoking during a known pregnancy may help prevent the decrease in total hCG levels observed in women who continue to smoke. Additionally the impact of smoking on total hCG levels will only be noticeable after a certain duration of smoking (dependent on the amount smoked). Indeed, as reported by Ball *et al*.[34,35]. The correlation between total hCG and smoking became stronger as the pregnancy progressed. It is probable that this effect is a result of smoking over time, as we also discovered a significant relationship between the number of cigarettes smoked and the decrease in total hCG. For aneuploidy screening, often using b-hCG levels, neither the overall effects of smoking nor the effects dependent on gestational age had a significant impact on the outcome[36]. Smoking during pregnancy has repeatedly been linked to a higher chance of having babies who are small for their gestational age and have a low placental weight. The effects of smoking during pregnancy on the weight of the baby at birth are probably due, at least in part to a reduction in hCG levels. Research has demonstrated that smoking during pregnancy increases the occurrence of apoptosis in the synctiotrophoblast cell layer. Further research should examine the extent to which hCG influences the alterations in foetal growth and birth weight. In addition, considering the clear connection between smoking and negative outcomes during pregnancy the significant correlation between smoking and total hCG levels serves as a clear example of how

pregnancy characteristics can complicate studies examining the relationship between hCG levels and any clinical outcomes or measurements.

CONCLUSION

The findings indicate that the relationship between gestational age, hCG and foetal growth may result in less accurate ultrasound-based pregnancy dates, especially in women with high or low levels of hCG. The statistics highlight the intricate connections between hCG, maternal and foetal variables, which need to be considered while researching pregnancy problems. The results of our study can be used as a guide for other clinical research investigations and justify the need for more research on determining the reference range for hCG levels throughout pregnancy.

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