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Original Research Article

Role of single serum progesterone level in predicting continuation of pregnancy in early threatened miscarriage

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Abstract

Introduction: Nearly 20-25% of pregnant women have some degree of vaginal bleeding during the first 20 weeks of pregnancy and about 50% of these progress to an actual abortion. Progesterone is a hormone that aids in the preservation of pregnancy. It has been reported that spontaneous pregnancy failure decreases with increasing maternal serum progesterone levels. Predicting continuation of pregnancy is crucial in cases of threatened abortion in order to provide appropriate care and effective management.

Objectives: To study the role of single serum progesterone levels on day of threatened miscarriage to predicting continuation of pregnancy. To study the relationship between continuation of pregnancy in early threatened miscarriage and maternal age, gestational age, presenting complaint and associated risk factors.

Material & Methods: The place of study is Institute of obstetrics and gynecology, Egmore, Chennai, Tamil Nadu, India. The study involved 160 study participants, pregnant women with less than or equal to 12 weeks of gestation with complaint of spotting or bleeding PV. After obtaining informed consent basic sociodemographic and clinical history was recorded. 3 ml of venous blood was collected from the pregnant women. Serum progesterone and hemoglobin levels were assessed from the obtained blood samples. The data were analyzed.

Results: The results from our present study showed that the mean age for the study participants was 25.3± 4.08 years. Majority (76.6%) of the participants were in the age group between 20-30 years of age. Primi mothers constituted 47.5% of the study population. The most common presenting symptom in the study population was bleeding vaginum and Spotting per vaginum which constituted 46% of the total study population each. Anemia was observed in 22.6% of the study population. The mean hemoglobin value was 10.23±1.1. The mean serum progesterone value was 19.76±9.3. Increased values of serum progesterone levels had a significant association with the continuation of pregnancy while no significant association was noted between hemoglobin levels, body mass index and outcome of pregnancy.

Conclusion: Serum progesterone levels could be used as an effective diagnostic tool in aiding the diagnosis of viable pregnancies. The estimation of serum progesterone levels at a single point also alleviates the patients of inconvenient procedures and is also a cost effective alternative.

Keywords: Threatened miscarriage, serum progesterone, gestational age

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Introduction

Increased maternal blood progesterone levels have been demonstrated to lower the risk of spontaneous pregnancy failure. Overall, levels below 20 nmol/l (6 ng/ml) show a high positive predictive value for a failed pregnancy, whereas levels above 60 nmol/l (19 ng/ml) are strongly' related with a viable pregnancy [1]. Miscarriage risk rises with maternal age and the loss of a pregnancy at any time is a terrible experience for the mother. As a result, early identification and treatment should be initiated in order to give the mother a healthy baby. The current study attempts to assess a single blood progesterone level at the moment of a threatened miscarriage in order to determine whether the pregnancy would continue.

Aims & Objectives

The present study was undertaken with the following objectives,

- To study the role of single Serum progesterone levels on day of threatened miscarriage to predicting continuation of pregnancy.
- To study the relationship between continuations of pregnancy in early threatened miscarriage and risk factors like anemia (hemoglobin level), body mass index.
- Role of progesterone supplementation in threatened miscarriage may also be evaluated based on this study outcome

Materials and Methods

Study setting

The study was conducted in the institute of obstetrics and gynecology Egmore Chennai India, affiliated to Madras medical college Chennai ,India

Study duration: March 2020-February2021.

Inclusion criteria

Pregnant mother less than or equal to 12 weeks of gestation
Singleton intrauterine pregnancy with complaints of bleeding or spotting per vaginum.

Exclusion criteria

- Pregnant mother more than 12 week of gestation
- Inevitable miscarriage
- Ectopic pregnancy
- Multiple Pregnancy
- Molar Pregnancy
- Pregnancy by artificial reproductive technique
- Anomalous uterus
- Multiple Fibroid complicating pregnancy[except sub serosal type]

Methodology

- Pregnant women attending antenatal OPD or casualty with complaint of bleeding per vaginum, fulfilling the inclusion and exclusion criteria were recruited and informed consent obtained. Individuals were subjected to general, systemic, obstetric examination and ultrasonological assessment (for viability).
- 3 ml of venous blood were collected from pregnant women with threatened abortion
- Serum progesterone and hemoglobin levels were assessed from the obtained blood samples.
- Serum progesterone level was measured by using competitive binding immune enzymatic assay.
- Patient were admitted, evaluated and treated as per standard protocol.
- These patients were followed up to 20 weeks of gestation to confirm the viability of fetus and data will be collected. Patient with viable fetus and miscarried were compared and analyzed statistically with their serum progesterone level which was taken on the first day

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of admission.

Results and Analysis

Age Group

In the present study, majority (76.6%) of the participants were in the age group between 20-30 years of age. The mean age of the study participants was 25.3± 4.08.

Table 1: Age group of the participants (n=160)

Age group	Frequency	Percentage
Less than 20	17	10.6
20-30	122	76.3
More than 30	21	13.1
Total	160	100.0

Obstetric History

In the present study, Study participants with the history of previous LSCS were 20.6%.Primi mothers constituted 47.5% of the study population. History of previous normal delivery was noted in 18.8% of the study participants. History of previous abortion was recorded in 13.1% of the study population.

Table 2: Obstetric History of the participants (n=160)

Obstetric History	Frequency	Percent
Previous Normal	30	18.8%
Previous LSCS	33	20.6%
Previous Abortion	21	13.1%
Primi	76	47.5%
Total	160	100

Gestational age

In the present study, Study participants with Gestational age more than 8 weeks were 28% while the participants with gestational age less than or equal to 8 weeks constituted 71.3% of the study subjects.

Table 3: Gestational age of the participants (n=160)

Gestational age	Frequency	Percentage
> 8	46	28.7
≤ 8	114	71.3
Total	160	100

Chief Complaints

As seen in table 4/Fig 4, the most common presenting symptom in the study population with bleeding vaginum which constituted 46% of the total study population. Spotting per vaginum was observed also in 46% of the study population. While 7% of the population complained of bleeding per vaginum associated with lower abdominal pain, spotting per vaginum with lower abdominal pain was observed in 1% of the study population

Table 4: Chief Complaints of the participants (n=160)

Chief Complaints	Frequency	Percentage
Bleeding PV	73	46
Bleeding PV, LAP	11	7
Spotting PV+LAP	2	1
Spotting PV	74	46
Total	160	100

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Comorbidity Distribution

In the present study, Anemia was observed in 22.6% of the study population.

Table 5: Comorbidity Distribution among the participants (n=160)

Comorbidity	Frequency	Percentage
Anemia	36	22.6%
Type 2 DM and GDM	1	0.6%
Hypothyroid	9	5.6%
Consanguineous marriage	5	3.1%
Chronic HTN	2	1.25%
Heart Disease	4	2.5%
Seizure Disorder	3	1.9%
Myomectomy	1	0.62%

Body Mass Index Distribution

In the present study based on the body mass index, the study participants were grouped as Under Weight , Normal, Over weight and Obesity. Majority of the study participants fell under the category normal (55.6%) followed by overweight (20.6%) and (15.6%).

Table 6: Body Mass Index Distribution among the participants (n=160)

BMI Group	Frequency	Percent
Under Weight	25	15.6
Normal	89	55.6
Over weight	33	20.6
Obesity	13	8.1
Total	160	100

Hemoglobin level Distribution

In the present study, majority of the participants were having normal hemoglobin levels (77.5%).Mild anemia (48.8%) based on their hemoglobin values was observed among 18.75% of the study participants. Among the study population, 2.5% had moderate anemia and 1.25% had mild anemia. (Table 8/Fig 8)

Table 7: Hemoglobin level among the participants (n=160)

Hemoglobin level (gm/dl)	Frequency	Percentage
Normal	124	77.5%
Mild anemia	30	18.75%
Moderate anemia	4	2.5%
Severe anemia	2	1.25%
Total	160	100%

Serum Progesterone

In the present study, majority of the participants had serum progesterone levels more than 20 (58.8%), while 30% of the study participants had serum progesterone levels less than 10.In our study we observed that 11.3% of the participants had serum progesterone levels ranging between 10 to 20.

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Table 8: Serum Progesterone level among the participants (n=160)

Serum Progesterone	Frequency	Percentage
0 - 10	48	30
10 to 20	46	28.7
More than 20	66	41.3
Total	160	100%

Outcome Distribution

In the present study, 66.3% of the study participants had continued pregnancy. The outcome of abortion was observed in 33.8% of the study participants. (Table 10/Fig 10)

Table 9: Outcome Distribution among the participants (n=160)

Outcome	Frequency	Percentage
Abortion	54	33.8
Normal	106	66.3
Total	160	100

Correlation between serum progesterone, hemoglobin, Body mass index and Outcome of pregnancy

In the present study the correlation between serum progesterone, hemoglobin, body mass index and outcome of pregnancy. We observed that the increased values of serum progesterone levels had a significant association with the continuation of pregnancy. Our results also showed that there was no significant association between hemoglobin levels, body mass index and outcome of pregnancy.

Table 10: Correlation between serum progesterone, hemoglobin, Body mass index and Outcome of pregnancy among the participants (n=160)

	Abortion (n=54)	Continue (n=106)	Test of significance (χ^2; df; p)
Serum Progesterone			
0 - 10	46	2	118.21;2;0.0001
10 to 20	3	43	
More than 20	5	61	
Hemoglobin (Hb)			
Normal	50	74	2.017;3;0.5709
Mild anemia	11	27	
Moderate anemia	1	3	
Severe anemia	1	1	
Body Mass Index			
Under Weight	11	14	1.688;3;0.640
Normal	28	61	
Over weight	10	23	
Obesity	5	8	

*p value <0.05 was considered to be statistically significant

Diagnostic efficacy

In the present study, we assessed the role of serum progesterone levels as a tool to diagnose the outcome of pregnancy. We observed that the rate of abortion was significantly lower among participants with serum progesterone levels more than 15 U/L. The Sensitivity was 93.4% (95% CI: 86.99 - 96.76).The Specificitywas 87.04% (95% CI: 75.58 - 93.58).The Positive Predictive Value was 93.4 (95% CI:86.99 - 96.76) The Negative Predictive Value was 87.04 (95%CI: 75.58 - 93.58).The Diagnostic Accuracy 91.25% (95% CI:85.85 - 94.72).The Likelihood ratio of a Positive Test was 7.205 (95% CI: 5.438 - 9.546) The Likelihood ratio of a Negative Test was 0.07587 (95% CI: 0.05699 - 0.101)

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Table 11: Correlation between serum progesterone and Outcome of pregnancy among the participants (n=160)

	Continue	Abortion	Test of significance (χ^2; df; p)
Sr. p> 15	99	7	103.52;1;0.001
Sr. p ≤ 15	7	47	

*p value <0.05 was considered to be statistically significant

Table 14: Diagnostic parameters for serum progesterone

Parameters	Value	95% Confidence Interval
Sensitivity	93.4%	86.99 - 96.76
Specificity	87.04%	75.58 - 93.58
Positive Predictive Value	93.4	86.99 - 96.76
Negative Predictive Value	87.04	75.58 - 93.58
Diagnostic Accuracy	91.25%	85.85 - 94.72
Likelihood ratio of a Positive Test	7.205	5.438 - 9.546
Likelihood ratio of a Negative Test	0.07587	0.05699 - 0.101

Discussion

In the present study the mean age for the study participants was 25.3± 4.08 years. Majority (76.6%) of the participants were in the age group between 20-30 years of age. Dave *et al.* [2] in their study have reported that the participants aged between 21 and 25 years constituted 48.8% of the study participants while participants aged between 26 and 30 years were 41.1%. Kadam *et al.* [3] have reported similar finding s were the mean age of the antenatal mothers was 25.62 years, and majority of the study participants were aged less than 25 years. The similarity in the age group of the mothers from various part of India can be attributed to the socio-cultural role of marriage prevalent in the country.

Our study showed that primi-mothers constituted 47.5% of the study participants Dave *et al*. reported that 57.7% of the study participants in their study were primi mothers. Kadam *et al*. have also reported similar findings were most of the study participants were primigravida. Our results showed that 66.3% of the study participants had continued pregnancy. Kadam *et al*. have observed that 70% of the study participants had a viable pregnancy.

The most common presenting symptom observed in our study was bleeding vaginum and spotting per vaginum which constituted 46% of the total study population each. Similar findings have also been reported by Kadam *et al*. based on their study conducted at Delhi, were the observed the common presenting symptom to be bleeding pervaginum.

In the present study, majority of the participants had serum progesterone levels more than 20 (58.8%). Our results showed that 66.3% of the study participants had continued pregnancy. In our study we also observed that the incidence of miscarriages was significantly lower among the study participants with elevated serum progesterone levels as compared with participants with lower serum progesterone levels. A meta-analysis of various studies conducted by Verhaegen, *et al*. showed that when ultrasound findings are inconclusive the measurement of serum progesterone is of great significant in predicting the viability of the fetus. They observed that serum progesterone values less than3.2 to 6 ng/mL indicated the absence of a viable pregnancy. The cut off level of serum progesterone in the present study was 15ng/ml and the observed sensitivity was 93.4 and the specificity was 87.4%. These findings are in concurrence with the findings of Dave *et al.* who in their study reported sensitivity and specificity for the test was 93.1% and 90.5% respectively when the cut off value of serum progesterone was set at 10.05 ng/ml. Studies conducted by Al Jufairi, *et al.* [4], Phipps *et al.* [5] and Elson *et al.* [6] also reported that the estimation of serum progesterone levels during early pregnancy could be considered as an effective indicator for outcome of pregnancies.

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Conclusion

Our findings conclude that serum progesterone levels could be used as an effective diagnostic tool in aiding the diagnosis of viable pregnancies. The estimation of serum progesterone levels at a single point also alleviates the patients of inconvenient procedures and is also a cost effective alternative. The role of serum progesterone levels as a screening tool should also be further studied.

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Conflict of Interest: None.

Ethical approval: Approved by institutional ethical committee.

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