

The Prevalence of Blighted Ovum and Its Association with Maternal Age and Prior Miscarriages, Ascertained by Ultrasonography: A Cross-Sectional Analysis Conducted in Rawalpindi, Pakistan

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ABSTRACT

Background: Blighted ovum, or anembryonic pregnancy, is a cause of first-trimester miscarriage, characterized by a gestational sac without an embryo. Ultrasonography enables early diagnosis. Maternal age and previous miscarriage may increase risk, but local evidence remains limited. To determine the frequency of blighted ovum among women presenting in the first trimester and assess its association with maternal age and previous miscarriage by ultrasonography.

Methods: This cross-sectional study was conducted from April–September 2024 at Health Ways Diagnostic Centre and Life Care Lab, Rawalpindi, Pakistan. 150 women with gestational age ≤ 12 weeks underwent transabdominal and/or transvaginal ultrasonography. Data were analyzed using SPSS version 25. Associations were assessed using Chi-square test; $p < 0.05$ was significant.

Results: Among 150 participants, 22 had blighted ovum, giving a prevalence of 14.7%. Most cases occurred among women aged 36–41 years (45.4%); most cases were diagnosed at 7–9 weeks (72.7%). Low β -human chorionic gonadotropin levels were most frequent (40.9%), followed by abdominal discomfort (22.7%) and vaginal bleeding (18.1%). Previous miscarriage was present in 45.4% of cases. Sonography most commonly showed a gestational sac diameter > 25 mm without a fetal pole (45.4%). Maternal age ($p = 0.003$) and previous miscarriage ($p < 0.001$) were significantly associated with blighted ovum.

Conclusion: Blighted ovum occurred in one in seven pregnancies studied. Advanced maternal age and previous miscarriage were significantly associated with its occurrence. Early ultrasonographic assessment may support timely diagnosis and management in at-risk women.

Keywords: Blighted ovum, anembryonic pregnancy, ultrasonography, maternal age, miscarriage, gestational age, transvaginal ultrasound (TVS).

INTRODUCTION

The complication of early pregnancy loss is one of the most frequent complications in the first trimester, presenting substantial clinical and emotional hurdles for both women and healthcare providers. A notable cause of early pregnancy failure is the blighted ovum, also known as anembryonic pregnancy, characterized by the presence of a gestational sac devoid of embryonic development. Although implantation is successful, the embryo fails to develop, resulting in an empty gestational sac visible on ultrasonography. The American Pregnancy Association approximates that fifty percent of all first-trimester losses result from anembryonic pregnancy, contributing to a significant although indeterminate number of miscarriages. Merely 30% of clinically acknowledged pregnancies culminate in live births, whereas 15% of pregnancies conclude with a loss during the first trimester.¹ Early pregnancy loss refers to the unintentional termination of a pregnancy before 13 weeks of gestation. Early pregnancy loss (EP) is the preferred term for these gestations, encompassing anembryonic pregnancy.² The prevalence of early pregnancy loss (before 12 weeks) is approximated at 15% of clinically recognized conceptions, with considerable fluctuations in incidence relative to patient age. The prevalence varies from 10% among women aged 20 to 24 years to 51% in those aged 40 to 44 years.³

The exact cause of anembryonic pregnancies is challenging to determine. The causative variables for anembryonic pregnancies are typically examined within the wider framework of early pregnancy loss (EPL), encompassing both embryonic and anembryonic cases. The causes of anembryonic pregnancies encompass the following: Morphological abnormalities, chromosomal anomalies, obesity and advanced maternal age, infections, uterine abnormalities, immunological diseases, hormonal influences, and alcohol intake.⁽¹⁾ Miscarriage frequently occurs during pregnancy, with the majority of research indicating a loss rate of 12% to 15% in acknowledged pregnancies at the 20-week mark.^{6,7,8} Prior research has indicated that maternal age is a significant factor influencing early pregnancy loss. Elevated maternal age correlates with a greater incidence of chromosomal anomalies and diminished embryonic viability, leading to a heightened chance of anembryonic pregnancy. Likewise, women who have previously experienced miscarriages seem to possess an elevated risk of recurrent early pregnancy loss.⁹

Symptoms and signs of an anembryonic pregnancy may closely resemble those of an ectopic pregnancy. An anembryonic pregnancy is frequently discovered inadvertently during an initial obstetric ultrasound in the first trimester. When an anembryonic pregnancy culminates in an early pregnancy loss, the patient may



exhibit abdominal cramps and vaginal hemorrhage (10). Clinical manifestations and indicators, in conjunction with pregnancy tests and ultrasound assessment, validate the diagnosis of an anembryonic pregnancy. The three approaches for addressing early pregnancy loss consist of expectant management, medical management, and surgical intervention.¹

Transabdominal and transvaginal ultrasound methods are extensively employed to verify pregnancy viability, ascertain gestational age, and identify early pregnancy anomalies. Sonographic parameters, such as a mean gestational sac diameter surpassing the recognized diagnostic limit in the absence of an embryo or fetal pole, are pivotal in diagnosing blighted ovum.¹¹ Diagnostic validation occurs when ultrasound imaging reveals no recognizable embryo within a gestational sac with a mean sac diameter of 25 mm or greater.¹

Despite the expanding global literature, data from Pakistan are still scarce, especially concerning the incidence of blighted ovum identified through ultrasonography and its correlation with maternal age and prior miscarriages in standard clinical settings. The majority of existing research has been on first-trimester hemorrhaging or early pregnancy loss broadly, rather than particularly investigating blighted ovum. As a result, regional data are inadequate for informing evidence-based counseling and risk evaluation for Pakistani women in early pregnancy. This highlights a crucial gap in understanding that the current research aims to address. This research sought to ascertain the frequency of blighted ovum in women receiving first-trimester ultrasonography at two diagnostic facilities in Rawalpindi, Pakistan, and to analyze its correlation with maternal age and prior miscarriages.

METHODOLOGY

Ethical Considerations

Ethical approval was secured from the Institutional Review Board of Zohra Institute of Health Sciences, Rawalpindi (an affiliated college of GCUF), with study locations at Health Ways Diagnostic Center and Life Care Lab in Rawalpindi, Pakistan. Before the initiation of the research, informed consent was formally obtained from all individuals before their registration.

Study Design and Setting

A Descriptive cross-sectional investigation was carried out from April 2024 to September 2024 at Health Ways Diagnostic Center and Life Care Lab in Rawalpindi, Pakistan. The research aimed to assess the frequency of blighted ovum in women attending during the first trimester of pregnancy and to analyze its correlation with maternal age and prior miscarriages.

Study Population

The research encompassed expectant mothers aged 18 to 41 years with a verified gestational age of 12 weeks or less who had ultrasonographic assessment throughout the study duration. Women with recorded obstetric histories, encompassing prior miscarriages and relevant vaginal hemorrhage, were deemed eligible.

Pregnant women over 12 weeks of gestation, those with ectopic or molar pregnancies, ambiguous diagnoses, or insufficient medical documentation were omitted from the research.

Sample Size and Sampling Technique: The minimum determined sample size was 169 individuals according to the Raosoft sample size calculator. Nevertheless, owing to the limited pool of qualifying patients identified during the six-month study period who met the inclusion criteria, 150 subjects were sequentially recruited and included in the final evaluation. A convenient, non-probability sampling method was used, and the subjects were incorporated into the final analysis.

Data Collection

Clinical and demographic data were gathered utilizing a systematic proforma. The variables encompassed maternal age, gestational age determined by the last menstrual period, prior miscarriage history, presenting symptoms, and accessible serum β -human chorionic gonadotropin (β -hCG) concentrations. Ultrasound results, including the gestational sac, yolk sac, fetal pole, and other pertinent findings, were documented post-examination and validated by a consulting radiologist.

Ultrasonographic Examination

Ultrasonographic assessments were conducted with a Toshiba Xario ultrasound apparatus featuring a 3.5-MHz transabdominal curvilinear transducer and a 5-MHz high-frequency transvaginal probe.¹² Transabdominal ultrasonography was conducted with the patient lying supine and an adequately filled bladder to enhance the clarity of pelvic tissues. Images were acquired in both sagittal and transverse orientations.

When clinically necessary, transvaginal ultrasound was conducted with the patient in the lithotomy position utilizing a sterile endovaginally probe to acquire high-resolution pictures of the uterine cavity and adnexa. Transverse and longitudinal scans were performed to assess the anatomy of the gestational sac, yolk sac, fetal pole, and embryonic heart activity. A blighted ovum was identified when ultrasound revealed an intrauterine gestational sac lacking an embryo or fetal pole, despite meeting established diagnostic criteria. Special emphasis was placed on a mean gestational sac diameter (MGSD) exceeding 25 mm without a fetal pole and the absence of a yolk sac when relevant.¹³ All ultrasound assessments were evaluated and validated by a consultant radiologist utilizing the diagnostic standards set for the study.

Statistical Analysis

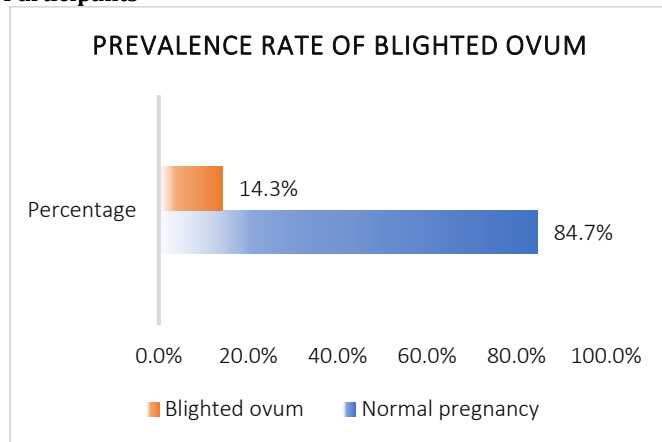
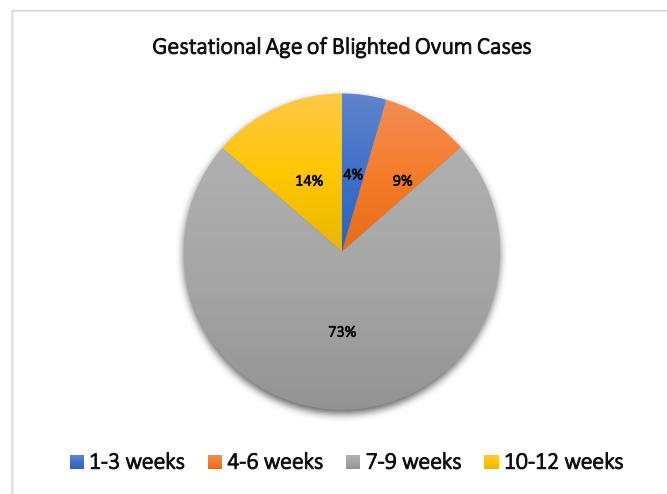
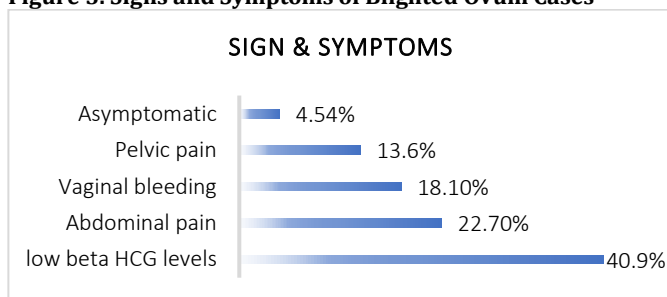
Data were input and examined utilizing Statistical Package for the Social Sciences (SPSS) version 25. Continuous data were summarized using descriptive statistics, whereas categorical variables were presented as frequencies and percentages. The correlation between blighted ovum and maternal age, as well as prior miscarriage, was evaluated using the Chi-square test. A p-value of less than 0.05 was deemed statistically significant.

RESULTS

A population of 150 pregnant women, each with a gestational age of 12 weeks or less, was incorporated into the study. Participants ranged in age from 18 to 41 years. The largest proportion was in the 24–29-year age group (28.0%), followed by the 18–23-year age group (27.3%) (**Table #1**). Among 150 pregnancies analyzed by ultrasonography, 22 had a blighted ovum, yielding a prevalence of 14.7%, whereas 128 (85.3%) were sonographically normal (**Figure #1**). Gestational age revealed a significant prevalence of blighted ovum diagnosis between 7 and 9 weeks, accounting for 16 out of 22 cases 72.7% (**Figure#2**). Analysis of the 22 blighted ovum cases revealed that reduced beta-HCG levels were the primary indicator, occurring in 40.9% of patients ($n = 9$). Abdominal pain was reported in 5 instances (22.7%), followed by vaginal bleeding (18.1%) and pelvic pain (13.6%). (**Figure#3**). Analysis of potential risk factors across the 22 blighted ovum cases revealed that a history of prior miscarriage was the most prominent variable, present in 50.1% of patients. Family history had the second-highest prevalence at 31.8% (**Table #2**). Transvaginal ultrasound (TVS) examination of the 22 blighted ovum cases revealed that a mean gestational sac diameter (MGSD) > 25mm without a fetal pole was the predominant sonographic feature, occurring in 45.4% of cases. The absence of yolk sac represented the second most prevalent observation at 36.3% (**Table#3**).

Table 1. Age Categorization of Research Participants (n = 150)

Patient age	Frequency	Percentage
18-23	41	27.33%
24-29	42	28.1%
30-35	32	21.33%
36-41	35	23.33%
Total	150	100%

Figure 1. Prevalence Rate of Blighted Ovum among Studied Participants**Figure 2. Prevalence of Blighted Ovum Cases With Respect To Gestational Age****Figure 3. Signs and Symptoms of Blighted Ovum Cases****Table 2. Risk Factors Identified Across the Blighted Ovum Cases**

Risk Factors	Frequency	Percentage
Pelvic Inflammatory Disease	3	13.6%
Family History	7	31.8%
Alcohol Consumption	1	4.5%
Previous Miscarriage	11	50.1%
Total	22	100.0%

Table 3. Sonographic Features Revealed Across the Blighted Ovum Cases

Sonographic Features	Frequency	Percentage
Thickening of Endometrium	1	4.5%
Echogenic Rim	1	4.5%
Decidual Reaction <2mm	2	9.09%
Absent Yolk Sac	8	36.3%
MGSD > 25 mm without Fetal Pole	10	45.4%
Total	22	100.0%

Chronological age significantly influences pregnancy results, and the evidence supports this assertion. A Chi-Square analysis revealed a distinct, statistically significant association between maternal age and the probability of a blighted ovum ($p < 0.05$). As a woman ages at the time of conception, her likelihood of experiencing an anembryonic pregnancy increase, primarily due to age-associated chromosomal alterations in the ovum (**Table#4**). A history of miscarriage is intricately linked to subsequent pregnancy outcomes, a correlation seen in the statistics. Statistical analysis indicated a significant correlation between previous miscarriages and the incidence of a blighted ovum ($p < 0.05$). Women with a history of miscarriage are at a markedly elevated chance of experiencing an anembryonic pregnancy, underscoring the importance of monitoring previous losses as a critical therapeutic consideration (**Table#5**).

Table 4. Association of Blighted Ovum with Maternal Age

Ultrasound findings					
		Blighted ovum	Normal	Total	P-value
Patient age	18-23	1	40	41	
	24-29	4	38	42	
	30-35	7	28	35	
	36-41	10	22	32	
	Total	22	128	150	<0.05

Table 5. Association of blighted ovum with previous miscarriages.

Ultrasound findings					
		Blighted ovum	Normal	Total	P-value
Previous miscarriages	Yes	10	3	13	
	No	12	125	137	
Total		22	128	150	<0.05

DISCUSSION

This research assessed the prevalence of blighted ovum in women attending during the first trimester of pregnancy and analyzed its correlation with maternal age and prior miscarriages by ultrasonography. Of the 150 women participating in the research, the prevalence of blighted ovum was 14.7%. This discovery suggests that anembryonic pregnancy constitutes a significant percentage of early pregnancy losses observed in standard obstetric ultrasonography procedures.

Maternal age was statistically significantly associated with the prevalence of blighted ovum. Almost 50 % of all identified cases were found in women between the ages of 36 and 41, and statistical evaluation established a notable association between advancing maternal age and blighted ovum ($p < 0.05$). Pandya et al. (1996) found that increased maternal age correlated with a greater prevalence of anembryonic pregnancies ($\chi^2 = 53.3$; $p < 0.0001$).^{14 & 15} Our results are highly concordant with Mitwally et al. (2019), who observed that advanced maternal age correlates with a heightened risk of early pregnancy loss due to the elevated incidence of chromosomal abnormalities and compromised

embryonic growth.⁽⁹⁾ The current results underscore the significance of meticulous first-trimester ultrasound evaluations in older expectant mothers.

Prior miscarriage has shown a substantial association with blighted ovum ($p < 0.05$). Nearly 50% of women diagnosed with blighted ovum had a history of at least one prior miscarriage, establishing it as the most commonly recognized risk factor in this research. This finding aligns with the American Pregnancy Association (2026). A blighted ovum accounts for around 50% of miscarriages during the first trimester and is typically due to genetic abnormalities. A woman's body identifies irregular chromosomes in a fetus and instinctively refrains from sustaining the pregnancy, as the fetus is unlikely to mature into a healthy infant. Fortunately, a minimum of 85% of women who have experienced a single loss will subsequently achieve a successful pregnancy, as will 75% of those who have endured two or three losses. 16 Unlike our findings, Pandya et al. (1996) observed no statistically significant association between the prevalence of early pregnancy loss and a history of prior miscarriages.^{14 & 17}

Most blighted ovum cases were identified between 7 and 9 weeks of gestation, highlighting the importance of early ultrasound assessment in the first trimester. Timely imaging during this phase helps differentiate viable from non-viable pregnancies, enabling appropriate counseling and clinical management while reducing unnecessary diagnostic delays. These findings are consistent with Ansari S et al. (2024). Most incidents take place between the fifth and eighth weeks of pregnancy and last fewer than three days. Among bleeding women, 4.87% reported the presence of a blighted ovum.^{18 & 19}

In terms of clinical manifestation, lower β -hCG levels were the most commonly noted observation, followed by abdominal discomfort and vaginal hemorrhage. These manifestations are frequently observed in early pregnancy problems and necessitate thorough sonographic assessment. Nonetheless, one individual with a blighted ovum had no symptoms, indicating that clinical manifestations alone may not consistently differentiate between viable and non-viable pregnancies. As a result, ultrasonography is essential for confirming the diagnosis. In 2017, Nie QW et al., concluded that the likelihood of a blighted ovum could be heightened by older maternal age and reduced β -HCG levels. These variables might be connected to inaccuracies in gene imprinting that happen in the early stages of embryo formation.²⁰

The most significant sonographic observation was a mean gestational sac diameter (MGSD) over 25 mm without the detection of a fetal pole, accompanied by the absence of a yolk sac. These observations are consistent with the diagnostic criteria and ultrasound features described in Aroke D, et al., (2018).¹³ Precise identification of these sonographic indicators allows radiologists and obstetricians to diagnose blighted ovum and prevent erroneous clinical choices confidently.

The current research holds significant relevance for clinical applications in Pakistan. Women of advanced maternal age and individuals with a prior history of miscarriage may gain advantages from prompt referral for first-trimester ultrasound and enhanced prenatal monitoring. Prompt recognition of non-viable pregnancies enables timely guidance on management options and may reduce undue concern from diagnostic uncertainty.

This research possesses numerous constraints. The study was carried out at two diagnostic facilities employing a convenience sample method, potentially restricting the applicability of the results. The sample size was somewhat limited, and only first-trimester pregnancies were assessed. Moreover, supplementary maternal elements, including genetic anomalies, body mass index, persistent health issues, and environmental influences, were not

evaluated. Future multicenter investigations with expanded participant cohorts and longitudinal follow-up are advised to corroborate these results and examine other factors influencing blighted ovum in the Pakistani demographic.

Strengths

- This research offers regional data concerning the incidence of blighted ovum among Pakistani women in the first trimester of pregnancy.
- Ultrasonographic assessments were validated by expert radiologists, hence improving diagnostic accuracy.
- Both transabdominal and transvaginal ultrasound techniques were employed based on clinical need.
- The research assessed sonographic results alongside significant clinical risk factors linked to blighted ovum.

Limitations

- The research utilized a convenience sample method, potentially leading to selection bias.
- Data were obtained from merely two diagnostic facilities, restricting the applicability to alternative healthcare environments.
- The limited sample size might have diminished the statistical efficacy of subgroup analyses.
- The long-term effects of pregnancy were not assessed.
- Potential confounding variables like chromosomal anomalies, body mass index, hormonal issues, smoking habits, and socioeconomic considerations were not evaluated.

CONCLUSION

This research established that the prevalence of blighted ovum in first-trimester pregnancies assessed via ultrasonography was 14.7%. Blighted ovum was more prevalent among women of advanced maternal age, especially those between 36 and 41 years old, and showed a notable association with a prior history of loss. The preponderance of cases was identified between 7 and 9 weeks of gestation, underscoring the significance of early ultrasonographic evaluation in the first trimester.

Among the assessed sonographic characteristics, a mean gestational sac diameter (MGSD) over 25 mm without a fetal pole was the predominant observation, followed by the lack of a yolk sac. These sonographic features serve as dependable diagnostic markers for the prompt detection of anembryonic pregnancy.

The research highlights the significance of first-trimester ultrasonography as a secure, non-invasive, and precise diagnostic tool for identifying a blighted ovum. Prompt identification may enhance timely clinical intervention, suitable patient guidance, and superior obstetric care, especially for patients at heightened risk due to advanced maternal age or prior miscarriage.

Ethical Approval

Ethical approval was obtained from the relevant institutional ethical review committee. Confidentiality and privacy of all participants were maintained throughout the study.

Data Availability

The data analyzed in this study are available from the corresponding author upon reasonable request.

Author Contributions

Kiran Arooj was responsible for conceptualization, methodology, data collection, formal analysis, and writing of the original draft, as well as review and editing of the manuscript.

The author take full responsibility for all aspects of the work, ensuring that questions related to the accuracy, integrity, and

completeness of the research are appropriately investigated and resolved.

Informed Consent

Written informed consent was obtained from all participants before their inclusion in the study. Participants were informed about the purpose of the study and their right to withdraw at any time.

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Conflict of Interest

The authors declare no conflict of interest.

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Declaration of AI-Assisted Language Editing

No AI used.

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