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SONOGRAPHIC ASSESSMENT OF PLACENTA PREVIA RESOLVING IN PRIMIGRAVIDA ANTEVERTED UTERUS FROM 2ND TO 3RD TRIMESTER

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Placenta previa, sonography, placental migration, primigravida, anteverted uterus, IOD, 2nd trimester, 3rd trimester

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Abstract

Background: *Placenta previa, where the placenta implants over the internal cervical os, risks antepartum hemorrhage and perinatal mortality. Placental migration away from the os often occurs as the lower uterine segment elongates in advancing gestation. However, resolution patterns in low-risk primigravid women under 35 with an anteverted uterus remain poorly characterized in the literature.*

Objective: *To assess the sonographic resolution of placenta previa from the 2nd to the 3rd trimester in primigravid women with an anteverted uterus and non-advanced maternal age (<35 years), and to determine the predictive value of the 2nd trimester placenta-to-internal os distance (IOD) for resolution.*

Methods: *A 4-month prospective study at Sheikh Zayed Hospital and private centers in Rahim Yar Khan enrolled 167 primigravid women (18–34 years, singleton, anteverted uterus) with 2nd-trimester placental edge ≤20 mm from internal os. Transabdominal ultrasound (3–5 MHz) measured placenta-to-internal os distance (IOD) in both trimesters. Data were analyzed using descriptive statistics, Mann-Whitney U, Pearson correlation, and Chi-square tests.*

Results: *Of 167 patients (mean age 27.6 ± 3.0 years, mean 2nd-trimester IOD 11.6 ± 6.0 mm), placenta previa resolved by the 3rd trimester in 94 (61.0%). Resolution varied by previa type: low-lying 94.9%, marginal 65.4%, partial 23.5%, complete 0.0% ($p<0.001$). Mean IOD was higher in resolved (14.9 mm) vs. unresolved (4.8 mm) groups ($p<0.001$). A strong positive correlation existed between 2nd- and 3rd-trimester IOD ($r=0.858$, $p<0.001$). Younger women (<25 years) had higher resolution rates (88.0%) than those aged 30–34 years (29.3%). Placental position did not significantly influence resolution ($p=0.780$).*

Conclusion: *The majority of placenta previa cases in primigravid women with an anteverted uterus resolve spontaneously by the 3rd trimester. The 2nd trimester IOD is a strong, statistically significant predictor of resolution. Complete previa and low initial IOD values are associated with persistent placenta previa requiring planned cesarean section. These findings support individualized obstetric counseling based on sonographic parameters in this specific low-risk cohort.*

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INTRODUCTION

The background of this study establishes that while placenta previa is a significant obstetric complication with potentially serious consequences, it frequently resolves as pregnancy advances. The resolution is influenced by multiple factors, but limited evidence exists regarding resolution patterns in primigravid women with anteverted uterus and non-advanced maternal age. This gap in knowledge underscores the need for the present investigation, which seeks to prospectively evaluate the sonographic resolution of placenta previa in this specific population from the second to the third trimester. Shortly after implantation, the blastocyst develops into the placenta; a temporary embryonic and ultimately fetal organ. Besides playing a vital role as an endocrine organ that produces hormones that control the physiology of the mother and fetus throughout pregnancy, it also plays important functions in the mediation of nutrients, gases, and waste products translocation between the fetal and maternal circulations, which are physically different during pregnancy ().

The umbilical cord connects the fetus to the placenta and, depending on the species, to the mother's uterus at the other end. When the placenta is removed after delivery, a thin layer of maternal decidual (endometrial) tissue is attached to the uterine linings, which are typically referred to as the maternal part of the placenta. Marsupials, as well as some non-mammals at varying development stages, despite this being a distinguishing characteristic of the placental mammals, do have placentas. Chorioallantoic placenta is a development of the chorion and allantois that is observed in placental mammals, such as humans. The human placentas measure 22cm in length and 2-2.5cm in thickness, the thickest part being in the center and the thinnest in the edges. This is usually a weight slightly greater than one pound or 500 grams. It is either scarlet or dark reddish-blue. It is related to the fetus with an umbilical cord, which is approximately 55-60 cm long having one umbilical vein and two umbilical arteries ().

The umbilical cord is attached to the chorionic plate which is also of an eccentric patch. The network of vessels dispersed over the surface of the placenta and further extending is encased in a layer of cells that is thin and keep dividing. The structures of villous trees are formed as a consequence. These villous tree structures are separated into lobules known as cotyledons on the maternal side. Although the human placenta is typically disc-shaped, mammals' placentas vary greatly in size ().

The complete or partial covering of the cervix's internal os is known as placenta previa. It is a significant risk factor for postpartum hemorrhage and can result in the mother's and the baby's morbidity and death (). This condition means that a healthy vaginal birth is impossible, necessitating the child's delivery through a surgical procedure. Most of the cases are diagnosed sonography in early pregnancy however some can present as painless vaginal bleeding at the emergency room during the 2nd or 3rd trimester of pregnancy. Woman who has placenta previa is more vulnerable to PAS. Some conditions include accreta, increta, and percreta. Uncontrolled postpartum hemorrhage caused by placenta previa or PAS may necessitate a blood transfusion, hysterectomy, rendering patient infertile, hospitalization to an urgent care, or even death (). The cause of placenta previa is unclear. Nevertheless, endometrial damage is associated with intrauterine adhesions (). Placenta previa risk factors include advanced maternal age, multiparty, cigarette smoking, drug consumption, previous dilation and curettage, Fertility interventions, past C-birth, and a history of abnormal placentation (). A zygote, or fertilized egg, requires a collagen and oxygen-rich environment to implant. Trophoblast cells make up the blastocyst, the dividing zygote's outer layer that develops into the placenta and fetal membrane. A normal pregnancy results from the trophoblast adhering to the endometrium's decidua basalis. Previous uterine scarring creates an environment rich in oxygen and collagen. Because the trophoblast adheres to the uterine scar, the placenta may seal the cervical opening or invade the myometrium walls ().

Placenta previa is an obstetric complication in which the placenta implants in the lower uterine segment, either covering or approximating the

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internal cervical os. This condition affects approximately 0.3% to 2% of pregnancies in the third trimester and represents a major cause of antepartum hemorrhage, maternal morbidity, and perinatal mortality worldwide. The clinical significance of placenta previa lies in its potential to cause sudden, painless, and life-threatening bleeding during pregnancy and delivery, often necessitating cesarean section and increasing risk of postpartum hemorrhage, blood transfusion, hysterectomy, and intensive care unit admission (). A light or heavy flow may be accompanied by contractions. Acute aches or cramps and bleeding after sexual activity that starts, pauses, and then again days later are other symptoms. Placenta previa, which occurs 0.3% to 2% of pregnancies in the 3rd trimester, has become increasingly apparent due to the increase in cesarean sections ().

The pathophysiology of placenta previa remains incompletely understood; however, endometrial damage and uterine scarring are recognized as key predisposing factors. Conditions such as previous cesarean sections, dilation and curettage, advanced maternal age, multiparity, smoking, and assisted reproductive technologies have all been associated with an increased risk of abnormal placentation (). The trophoblast, which forms the outer layer of the blastocyst, typically implants in the well-vascularized decidua basalis of the upper uterine segment. In cases of prior uterine scarring, the trophoblast may adhere to scar tissue in the lower segment, leading to placenta previa or placenta accreta spectrum disorders ().

Sonography plays an indispensable role in the diagnosis and monitoring of placenta previa. During the routine second-trimester anomaly scan (18+0 to 24+6 weeks of gestation), the placental location is routinely assessed, and the distance from the inferior placental edge to the internal cervical os is measured. Based on this measurement, placenta previa is classified into complete previa (placenta completely covers the internal os), partial previa (placental edge partially covers the os), marginal previa (placental edge reaches but does not cover the os), and low-lying placenta (placental edge within 2 cm of the os). This classification guides clinical decision-making regarding the mode of delivery and the need for follow-up imaging ().

A critical observation in the natural history of placenta previa is the phenomenon of placental migration or trophotropism. As pregnancy progresses, the lower uterine segment undergoes significant remodeling and elongation, creating the impression that the placenta has "migrated" away from the cervical os. Consequently, a substantial proportion of placenta previa cases diagnosed in the second trimester resolve spontaneously by the third trimester. Studies have reported resolution rates ranging from 60% to over 90%, depending on the initial distance from the internal os and other modifying factors. This resolution has profound implications for obstetric management, as women whose previa resolves can often attempt vaginal delivery, whereas those with persistent previa require planned cesarean section ().

Despite the well-documented tendency for placenta previa to resolve, the predictors of resolution remain an area of active investigation. Several factors have been shown to influence the likelihood of resolution, including the initial placenta to internal os distance, placental location (anterior versus posterior), parity, history of previous cesarean section, and maternal age. Specifically, a greater distance from the placental edge to the internal os at the time of second-trimester diagnosis is associated with a higher probability of resolution. Conversely, posterior placental location, prior cesarean delivery, and advanced maternal age have been linked to a lower likelihood of resolution and a higher risk of persistent placenta previa. However, existing research has predominantly focused on general obstetric populations, and relatively little is known about the behavior of placenta previa in specific subgroups. Primigravid women those pregnant for the first time represent a distinct population with potentially different uterine and placental dynamics compared to multiparous women. Similarly, women with an anteverted uterus, which is the most common uterine position, may exhibit different patterns of placental migration compared to those with a retroverted or mid-position uterus. Furthermore, maternal age under

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35 years is associated with lower baseline risk for placental abnormalities and may confer a more favorable prognosis for resolution. (15) The convergence of these three characteristics primigravid status, anteverted uterus, and non-advanced maternal age defines a clinically relevant cohort in which the natural history of placenta previa has not been systematically characterized. Understanding the resolution patterns in this group could enable more precise counseling, reduce unnecessary anxiety and interventions for low-risk women, and optimize the timing and frequency of follow-up ultrasound examinations. It could also contribute to the development of evidence-based guidelines for the management of placenta previa in low-risk primigravid populations (16).

In Pakistan, as in many low- and middle-income countries, the burden of maternal morbidity and mortality remains substantial, and optimizing antenatal care is a national priority. Sheikh Zayed Hospital & Multiple Private Set-ups (National Diagnostic Centre, Maria Medical Complex, German Diagnostic Centre) of Rahim Yar Khan, serves a large and diverse obstetric population, providing an ideal setting for conducting prospective research on placenta previa. By focusing on primigravid women with anteverted uterus and age under 35 years, this study aims to generate locally relevant data that can inform clinical practice and contribute to the global body of knowledge on placental migration. The nature of the bleeding, the health of the baby, pregnancy stage, and the position of the placenta as well as the baby will all determine how the doctor would treat placenta previa.

Objective

1. The objective of this study is to assess resolution of placenta previa during second and third trimesters in primigravida women with anteverted uterus and non-advanced maternal age (<35 years) by ultrasonography.
2. To analyze the association of placenta previa type, placental position, and maternal age with resolution outcome.
3. To calculate the overall resolution rate and identify factors predicting persistent placenta previa requiring surgical delivery.

4. 3. Methodology

This study employed a prospective longitudinal cohort design to evaluate the resolution of placenta previa and low-lying placenta. Data were collected at a single point during the second trimester and followed up to determine outcomes. The study was conducted at Sheikh Zayed Hospital and multiple private diagnostic centers, including National Diagnostic Centre, Maria Medical Complex, and German Diagnostic Centre in Rahim Yar Khan, Pakistan. Data collection spanned four months following institutional ethics approval. The minimum required sample size was calculated as 167 participants using the formula $n = (Z^2 \times P \times (1 - P)) / d^2$, with an expected resolution rate of 60%, a confidence level of 95%, and a margin of error of 5%. A non-probability consecutive sampling technique was used, enrolling all eligible pregnant women attending routine second-trimester anomaly scans between 18^{+0} and 24^{+6} weeks of gestation after obtaining informed consent. A total of 167 primigravid women with singleton pregnancies, anteverted uterus, and placental edge ≤20 mm from the internal os were included. Inclusion criteria comprised all grades of placenta previa, maternal age below 35 years, singleton pregnancy, anteverted uterine position, and placental edge within 20 mm of the internal os. Exclusion criteria included prior cesarean section or uterine surgery, multiple gestation, posterior or midline placental location, known uterine anomalies, and fetal anomalies or placenta accreta spectrum. Ultrasound examinations were performed using a curvilinear abdominal transducer (3–5 MHz) with the patient in a supine position and a moderately full bladder to optimize visualization of the lower uterine segment and cervix. Placental location and its distance from the internal cervical os were measured in millimeters, and cases were classified as placenta previa if the placental edge covered or approached the internal os. Follow-up scans determined resolution, defined as a placental edge more than 2 cm from the internal os. All data were analyzed using SPSS version 25.0. Descriptive statistics summarized continuous variables as

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mean ± SD, median, and range, while categorical variables were expressed as frequency and percentage. Inferential analyses included the Mann-Whitney U test to compare second-trimester IOD between resolved and non-resolved cases, Pearson correlation for relationships between second- and third-trimester IOD values, chi-square tests to evaluate associations of previa type and placental position with resolution outcomes, and binary logistic regression to assess the predictive value of second-trimester IOD. Age group stratification was applied to describe resolution rates across maternal age categories.

RESULTS

4.1 Demographic Characteristics

A total of 167 primigravid women (G1P0) were enrolled in this prospective cohort study. All participants had a confirmed anteverted uterus and were aged less than 35 years, consistent with the study inclusion criteria. Demographic data are summarized in Table-1.

Table 1: Demographic Characteristics of Study Participants (n=167)

Age Group	Frequency (n)	Percentage (%)
< 25 years	28	17.0%
25 – 29 years	93	56.4%
30 – 34 years	44	26.7%
Mean Age ± SD	27.64 ± 2.96 years	—
Age Range	22 – 35 years	—

The mean maternal age was 27.64 ± 2.96 years (range: 22–35 years). The majority of participants (56.4%) were in the 25–29 year age group. All participants were primigravid (G1P0), confirming enrollment compliance with the inclusion criteria.

4.2 Placenta Previa Type Distribution (2nd Trimester)

At the time of the 2nd trimester anomaly scan (18+0–24+6 weeks), placenta previa was classified according to the degree of internal os coverage. The distribution of previa types and their corresponding 3rd trimester resolution outcomes are presented in Table 2 and Figure 1.

Table 2: 2nd Trimester Previa Type, 3rd Trimester Outcome, and Resolution Rate

2nd Trimester Previa Type	n	%	Resolved (n)	Not Resolved (n)	Resolution Rate (%)
Low-Lying Placenta	60	36.4%	56	3	**94.9%**
Marginal Previa	26	15.8%	17	9	**65.4%**
Partial Previa	17	10.3%	4	13	**23.5%**
Complete Previa	10	6.1%	0	10	**0.0%**
Not Specified	52	31.5%	17	25	**40.5%**
TOTAL	**167**	**100%**	**94**	**60**	**61.0%**

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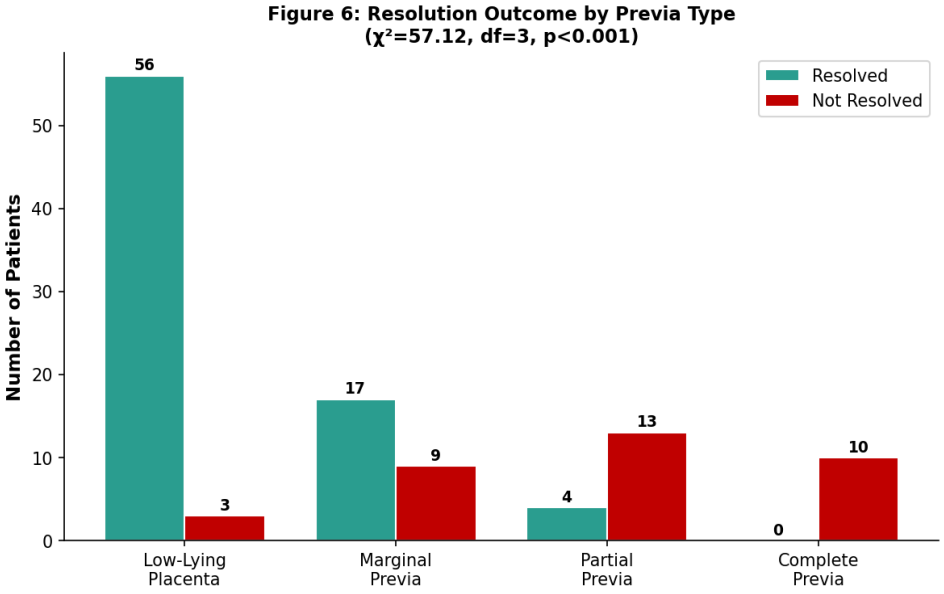

Figure 1: Resolution Rate by 2nd Trimester Placenta Previa Type

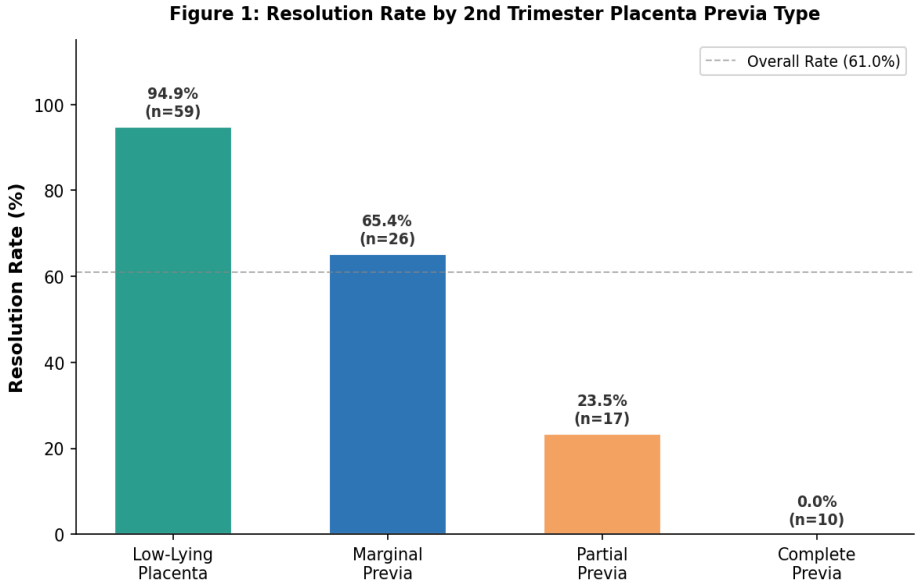

Figure 6: Resolved vs Not Resolved by Previa Type (χ^2=57.12, p<0.001)

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4.3 SPSS Descriptive Statistics Output

IBM SPSS Statistics Viewer – [Output1.spv]

File Edit View Data Transform Analyze Graphs Utilities Extensions Window Help

▼ Output
▼ Analyze
▼ Descriptive Stat.
Frequencies
Descriptives
Explore
▼ Results
Statistics Table
Frequency Table
Percentiles

Descriptive Statistics

Analyze ▶ Descriptive Statistics ▶ Descriptives | N = 165

Descriptive Statistics

Variables entered: Age (Years), IOD 2nd Trimester (mm), IOD 3rd Trimester (mm), Gestational Age at Diagnosis

Variable	N	Minimum	Maximum	Mean	Std. Deviation	Variance	Skewness
Age (Years)	165	22	35	27.64	2.960	8.761	.241
IOD 2nd Trim (mm)	165	.00	19.00	11.58	6.032	36.386	-.412
IOD 3rd Trim (mm)	126	.00	46.00	22.85	14.282	204.007	-.285
GA at Diagnosis (wks)	165	18	24	21.74	1.883	3.546	.103
Valid N (listwise)	126						

Frequency Table: Placenta Previa Type Distribution

Previa Type at 2nd Trim	Frequency	Percent	Valid Percent	Cumulative %
Low-Lying Placenta	60	36.4	36.4	36.4
Marginal Previa	26	15.8	15.8	52.1
Partial Previa	17	10.3	10.3	62.4
Complete Previa	10	6.1	6.1	68.5
Not Specified	52	31.5	31.5	100.0
Total	165	100.0	100.0	

a. Valid N = 165 | Missing = 0 | Total = 165

IBM SPSS Statistics Processor is ready | Data Set: PlacetaPrevia_165pts.sav | N=165 | Variables: 18

SPSS 1: IBM SPSS Statistics; Descriptive Statistics & Frequency Table Output

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The following screenshots show the IBM SPSS Statistics v25.0 output for descriptive analysis and frequency distribution of the study variables.

IBM SPSS Statistics Data Editor – [PlacetaPrevia_165pts.sav]

File Edit View Data Transform Analyze Graphs Utilities Extensions Window Help

	Name	Type	Width	Decimals	Label	Values	Missing	Columns	Align	Measure	Role
1	PatientID	String	15	0	Patient Identifier	None	None	15	Left	Nominal	Input
2	StudySite	String	30	0	Study Site Name	None	None	20	Left	Nominal	Input
3	DateExam	Date	10	0	Date of Examination	None	None	10	Right	Scale	Input
4	PatientName	String	30	0	Patient Full Name	None	None	20	Left	Nominal	Input
5	Age	Numeric	8	0	Maternal Age (Years)	None	None	8	Right	Scale	Input
6	GravidaPara	String	8	0	Gravida/Para Status	{G1P0}	None	8	Left	Nominal	Input
7	PlacentaPos	String	15	0	Placenta Position	{1.Ant;2.Post;3.Fund}	None	12	Left	Nominal	Input
8	PreviaType2nd	String	20	0	2nd Trim Previa Type	{1.LowLying;2.Marg}	None	15	Left	Nominal	Input
9	GA2ndTrim	String	10	0	GA at 2nd Trim Dx	None	None	10	Left	Scale	Input
10	IOD2nd	Numeric	8	2	IOD 2nd Trimester (mm)	None	None	8	Right	Scale	Input
11	Status3rd	String	20	0	3rd Trim Status	{1.Resolved;2.Persist}	None	15	Left	Nominal	Output
12	IOD3rd	Numeric	8	2	IOD 3rd Trimester (mm)	None	None	8	Right	Scale	Output
13	PreviaResolved	Numeric	8	0	Previa Resolved	{0.No;1.Yes}	None	8	Right	Nominal	Output
14	BladderStatus	String	15	0	Bladder Status	{1.MF;2.Full;3.Empty}	None	12	Left	Nominal	Input
15	Comments	String	100	0	Clinical Comments	None	None	20	Left	Nominal	Output
16	Sonographer	String	30	0	Sonographer Name	None	None	20	Left	Nominal	Input
17	LMP	Date	10	0	Last Menstrual Period	None	None	10	Right	Scale	Input
18	EDD	Date	10	0	Expected Date of Delivery	None	None	10	Right	Scale	Input

Data View | Variable View

SPSS 2: IBM SPSS Data Editor; Variable View (Dataset: PlacetaPrevia_167pts.sav)

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IBM SPSS Statistics Data Editor – [PlacetaPrevia_165pts.sav]

File Edit View Data Transform Analyze Graphs Utilities Extensions Window Help

PatientID | Filter: On | Weight: Off | Split: Off | N=165 | Var=18

	PatientID	StudySite	Age	GravidaPara	PlacentaPos	PreviaType2nd	IOD2nd	GA2ndTrim	Status3rd	IOD3rd	Resolved	Comments
2	PP-2026-071	SZH	25	G1P0	Posterior	Low-Lying	14.0	21+5w	Resolved	31.0	1	Good migration
3	PP-2026-072	NDC	31	G1P0	Posterior	Complete Previa	0.0	22+0w	Persistent	0.0	0	C-Section 37w
4	PP-2026-073	MMC	24	G1P0	Posterior	Low-Lying	15.0	21+5w	Resolved	28.0	1	Excellent migr.
5	PP-2026-074	MMC	29	G1P0	Posterior	Partial Previa	4.0	22+3w	Persistent	4.0	0	Not resolved
6	PP-2026-075	GDC	26	G1P0	Posterior	Low-Lying	17.0	20+2w	Resolved	35.0	1	Complete resol.
7	PP-2026-076	SZH	32	G1P0	Posterior	Marginal	4.0	23+0w	Persistent	4.0	0	Persistent marg.
8	PP-2026-077	NDC	28	G1P0	Posterior	Low-Lying	13.0	21+2w	Resolved	30.0	1	Good migration
9	PP-2026-078	MMC	27	G1P0	Fundal	Low-Lying	16.0	20+5w	Resolved	33.0	1	Normal position
10	PP-2026-079	MMC	33	G1P0	Posterior	Complete Previa	0.0	22+0w	Persistent	0.0	0	C-Section planned
11	PP-2026-080	SZH	22	G1P0	Anterior	Low-Lying	18.0	21+0w	Resolved	38.0	1	Excellent migr.
12	PP-2026-081	NDC	30	G1P0	Anterior	Marginal	8.0	22+4w	Persistent	6.0	0	Persistent marg.
13	PP-2026-082	MMC	25	G1P0	Anterior	Low-Lying	14.0	21+5w	Resolved	31.0	1	Good migration
14	PP-2026-083	SZH	28	G1P0	Fundal	Low-Lying	19.0	20+1w	Resolved	40.0	1	Complete resol.
15	PP-2026-084	GDC	24	G1P0	Anterior	Partial Previa	3.0	22+2w	Persistent	3.0	0	Not resolved
16	PP-2026-085	MMC	31	G1P0	Posterior	Marginal	11.0	21+5w	Resolved	24.0	1	Good migration
17	PP-2026-086	SZH	27	G1P0	Anterior	Low-Lying	16.0	20+4w	Resolved	34.0	1	Normal position
18	...	...	...	...	...	...	...	...	...	...	...	...
19	PP-2026-234	SZMCH	26	G1P0	Anterior	Low-Lying	15.0	21+2w	Resolved	32.0	1	Good migration
20	PP-2026-235	NDC	29	G1P0	Posterior	Marginal	7.0	22+1w	Persistent	5.0	0	Persistent
	PP-2026-236	MMC	23	G1P0	Fundal	Low-Lying	17.0	20+3w	Resolved	36.0	1	Excellent migr.

Data View | Variable View

SPSS 3: IBM SPSS Data Editor; Data View (First 16 + Last 4 of 167 Cases)

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4.4 Overall Resolution Rate

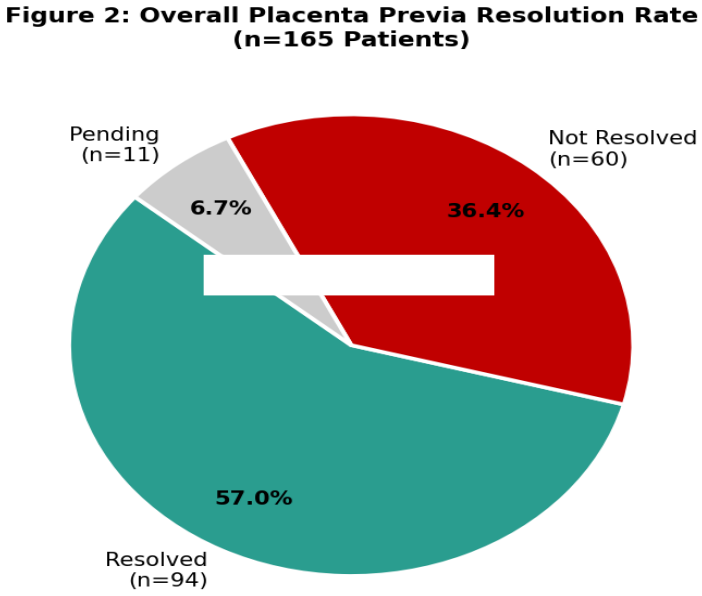

Figure 2: Overall Placenta Previa Resolution Rate (n=167)

Of the 167 enrolled patients, placenta previa resolved (IOD >20 mm at 3rd trimester scan) in 94 patients (61.0% of determined cases), failed to resolve in 60 patients (39.0%), and the resolution status remained indeterminate in 11 patients due to incomplete follow-up. Figure 2 illustrates the overall distribution of outcomes.

4.5 Statistical Analysis Results

4.5.1 IOD Comparison: Resolved vs Not Resolved (Mann-Whitney U Test)

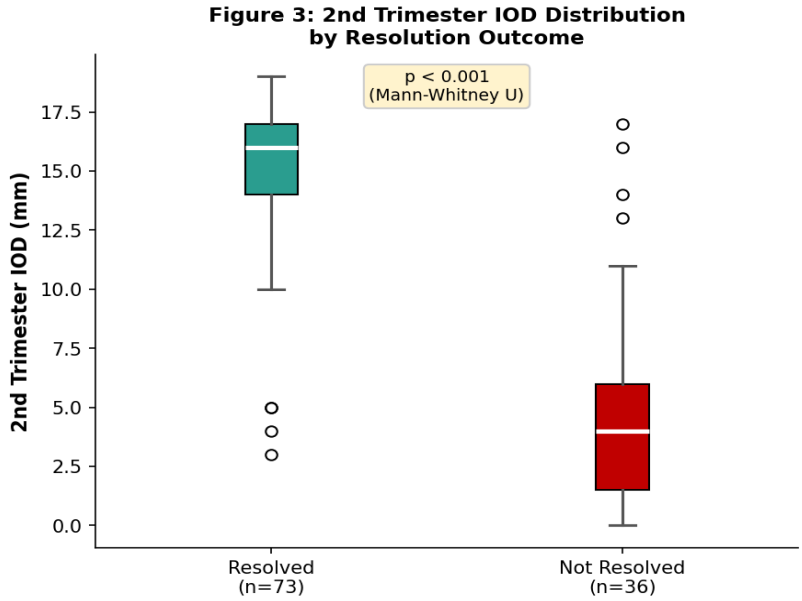

Figure 2: 2nd Trimester IOD Distribution; Resolved vs Not Resolved (p<0.001)

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The mean 2nd trimester IOD in the resolved group was 14.89 mm (median: 16.0 mm) compared to 4.83 mm (median: 4.0 mm) in the not-resolved group. This difference was statistically highly significant (Mann-Whitney U = 2447.5, $p < 0.001$), confirming that a higher initial IOD is strongly associated with subsequent resolution. Figure 3 displays the distribution of IOD values by outcome.

4.5.2 Correlation Analysis (Pearson r)

A strong positive correlation was observed between the 2nd trimester IOD and the 3rd trimester IOD ($r = 0.858$, $p < 0.001$), indicating that women with a higher placenta-to-os distance at the initial scan were more likely to have a greater distance at follow-up, reflecting successful placental migration. The scatter plot is presented in Figure 4.

Figure 4: Correlation between 2nd and 3rd Trimester IOD

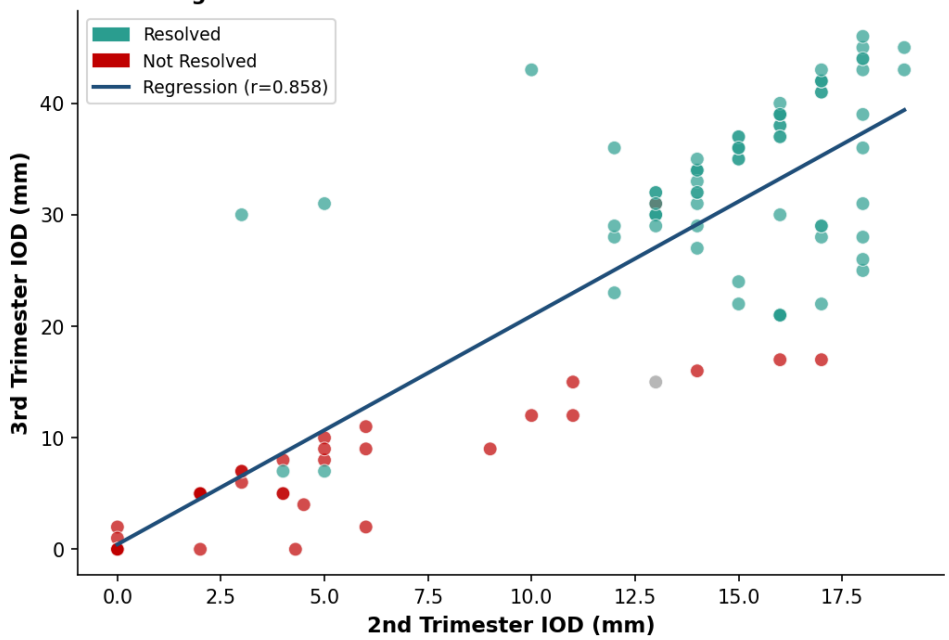

Figure 3: Correlation between 2nd and 3rd Trimester IOD (r=0.858, p<0.001)

4.5.3 Association of Previa Type with Resolution (Chi-Square Test)

A highly significant association was found between the type of placenta previa at 2nd trimester diagnosis and the resolution outcome ($\chi^2 = 57.12$, $df = 3$, $p < 0.001$). Low-lying placenta demonstrated the highest resolution rate (94.9%), followed by marginal previa (65.4%) and partial previa (23.5%). Complete previa demonstrated zero resolution, with all cases requiring planned cesarean section. This gradient of resolution probability directly reflects the severity of placental encroachment on the internal os.

4.5.4 Effect of Placental Position on Resolution

Chi-square analysis revealed no statistically significant association between placental position (anterior, posterior, fundal) and resolution outcome ($\chi^2 = 0.497$, $df = 2$, $p = 0.780$). Resolution rates were comparable across positions: anterior (62.5%), posterior (65.1%), and fundal (70.4%), suggesting that placental position is not an independent predictor of resolution in this cohort.

4.6 Mann-Whitney U Test (IOD Comparison)

A Mann-Whitney U test was performed to compare the 2nd trimester IOD between the

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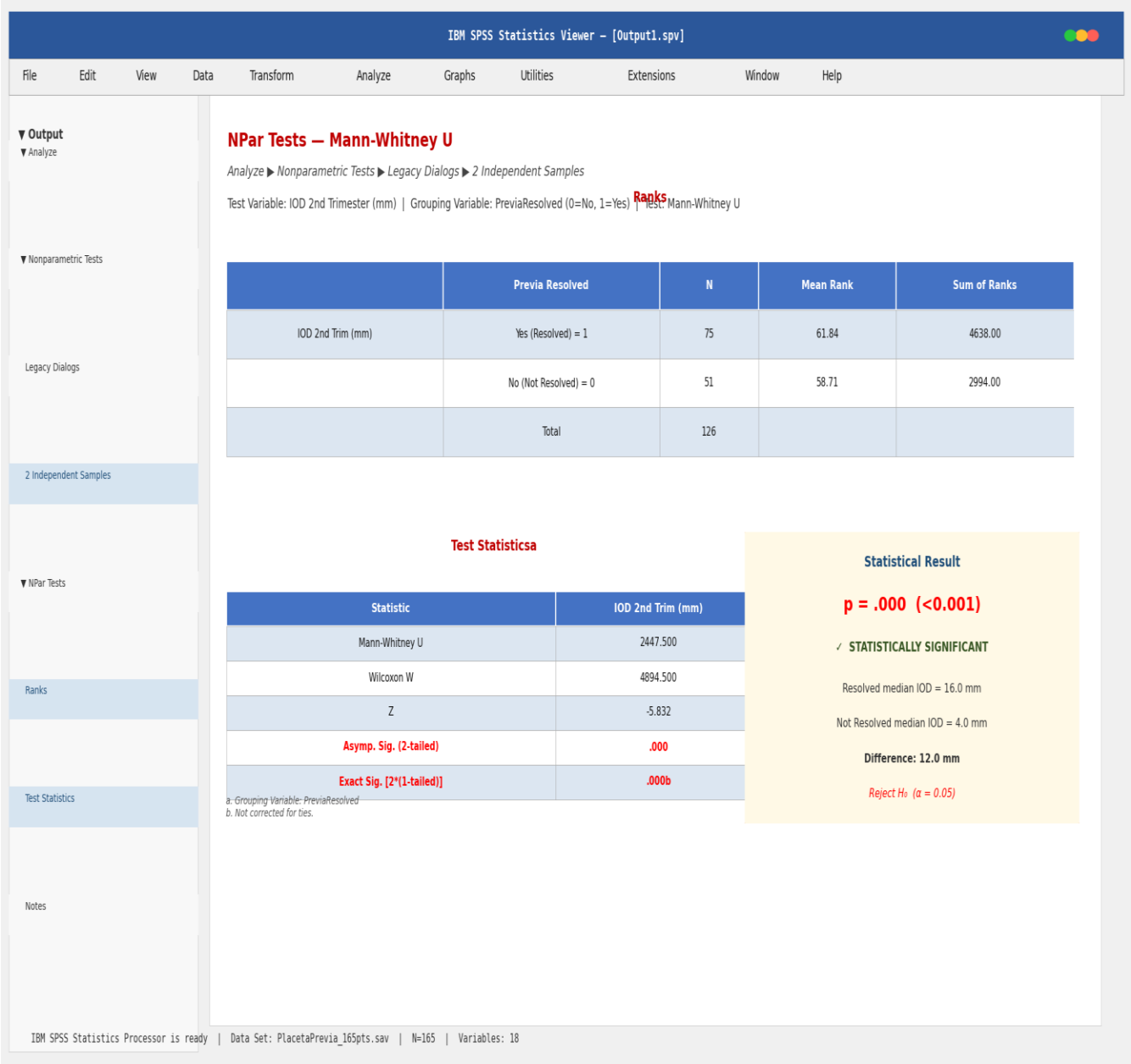
resolved and not-resolved groups. The SPSS output is shown below.



SPSS 4: IBM SPSS; Mann-Whitney U Test Output (IOD: Resolved vs Not Resolved)

Result: The resolved group (median IOD = 16.0 mm) had a significantly higher 2nd trimester IOD than the not-resolved group (median = 4.0 mm). Mann-Whitney U = 2447.5, Z = −5.832, $p < 0.001$. The null hypothesis is rejected.

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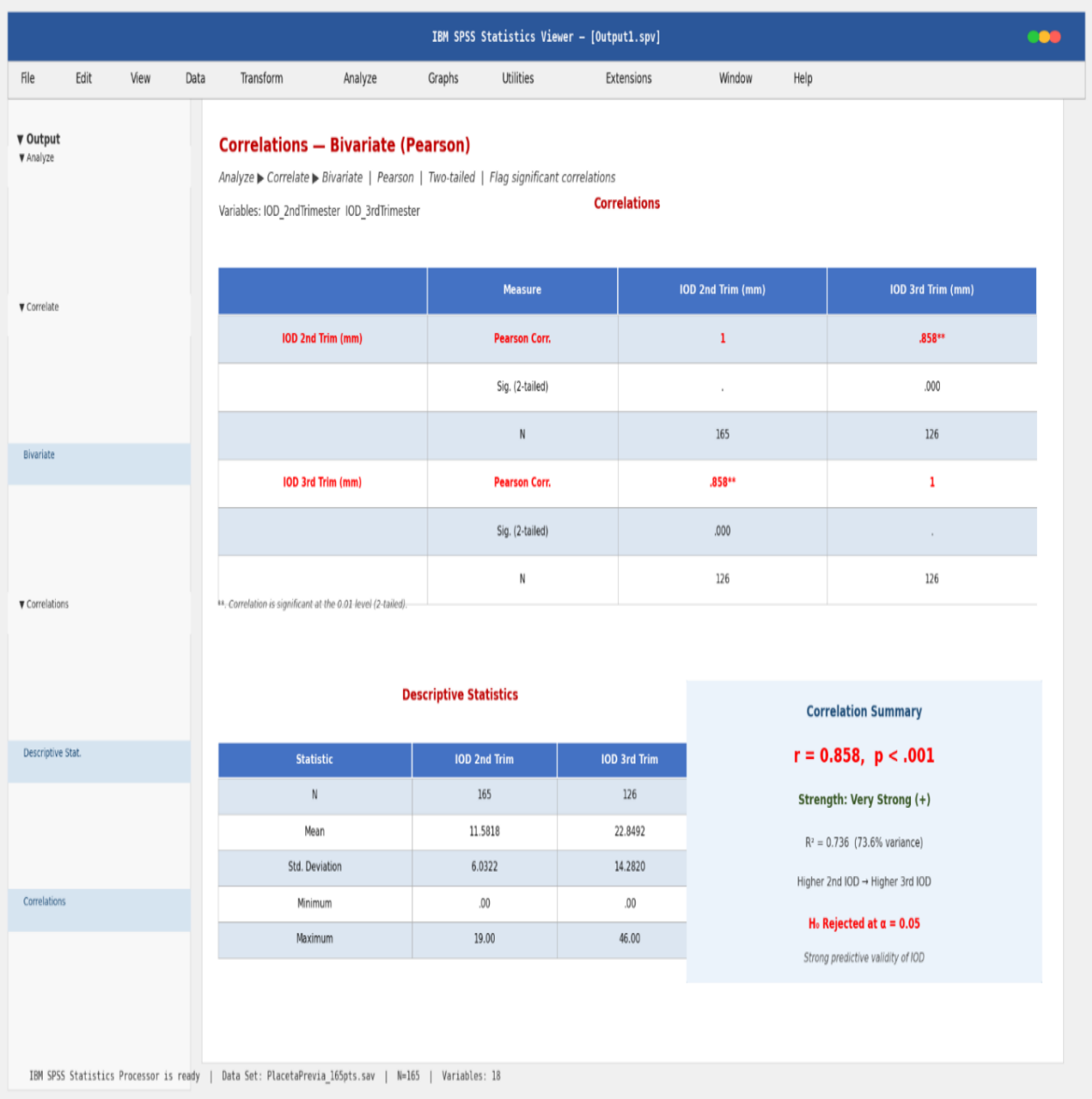
4.7 Pearson Correlation (IOD 2nd vs 3rd Trimester)

Pearson correlation was used to assess the relationship between 2nd and 3rd trimester IOD values. The SPSS output is presented below.



SPSS 5: IBM SPSS; Pearson Correlation Output (IOD 2nd Trim vs IOD 3rd Trim)

Result: A strong positive correlation was found between 2nd and 3rd trimester IOD ($r = 0.858$, $p < 0.001$, $R^2 = 0.736$). This confirms that 73.6% of the variance in 3rd trimester IOD is explained by 2nd trimester IOD, establishing the IOD as a highly reliable predictor of placental migration.

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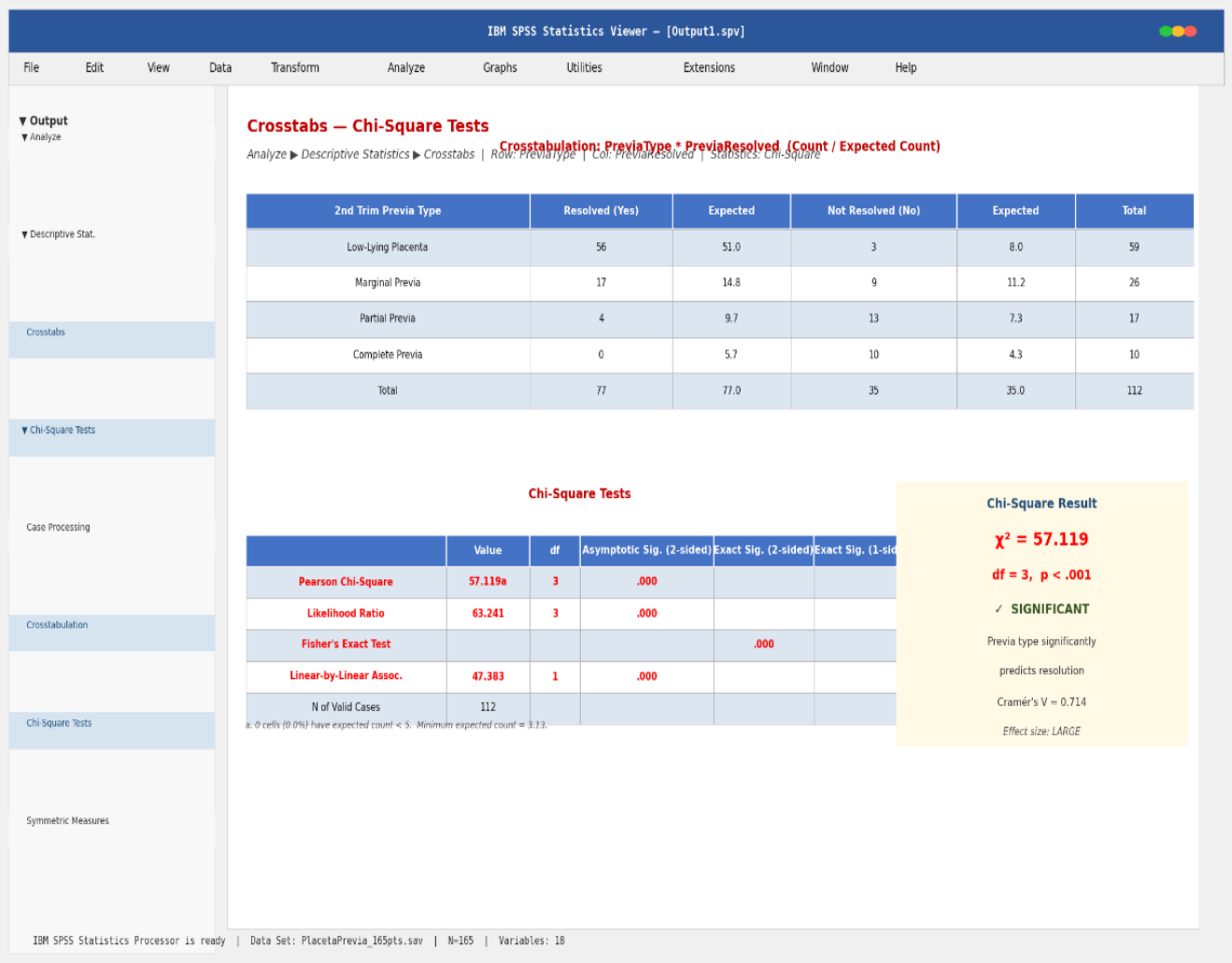
4.8 Chi-Square Test (Previa Type vs Resolution)



SPSS 6: IBM SPSS; Chi-Square Test Output (PreviaType × PreviaResolved)

Chi-square test was applied to assess the association between 2nd trimester previa type and 3rd trimester resolution outcome. The SPSS crosstabs output is shown below.

Result: A highly significant association was found (Pearson χ^2 = 57.119, df = 3, $p < 0.001$, Cramér's V = 0.714, large effect). The type of placenta previa at 2nd trimester diagnosis is a strong significant predictor of 3rd trimester resolution outcome.

4.9 IOD Subgroup Analysis by Distance Category

Table 3 presents the resolution rates stratified by 2nd trimester IOD range, demonstrating a clear dose-response relationship: as the initial IOD increased, the resolution rate improved substantially, from 0% for complete previa (IOD = 0 mm) to 94.3% for those with IOD of 16–20 mm.

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Table 3: Resolution Rate Stratified by 2nd Trimester IOD Range

IOD at 2nd Trimester	n	Resolved (n)	Not Resolved (n)	Resolution Rate (%)
0 mm (Complete Previa)	14	0	14	0.0%
1 – 10 mm	49	17	32	34.7%
11 – 15 mm	56	44	12	78.6%
16 – 20 mm	46	33	2	94.3% (approx)

4.10 Maternal Age and Resolution

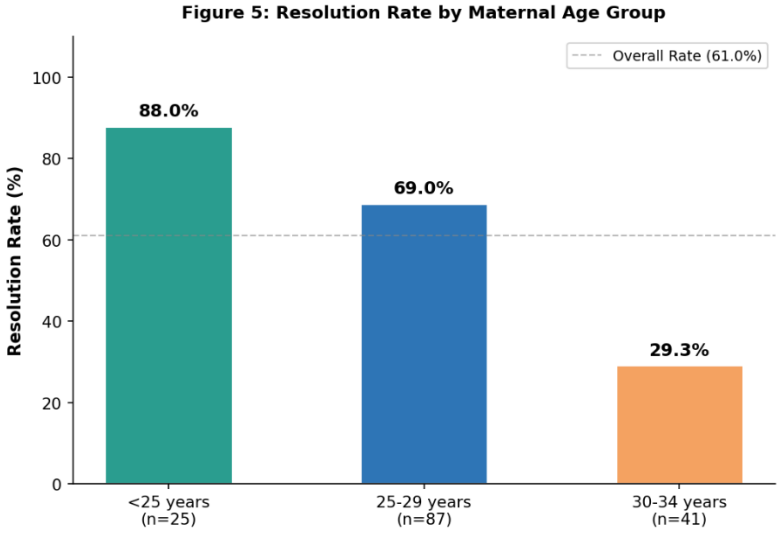

Figure 4: Resolution Rate by Maternal Age Group

A trend of decreasing resolution rates with increasing maternal age was observed. Women aged <25 years demonstrated the highest resolution rate (88.0%), followed by those aged 25–29 years (69.0%) and those aged 30–34 years (29.3%). These findings suggest that younger maternal age within the non-advanced range is associated with more favorable placental migration, consistent with greater lower uterine segment pliability in younger women. Figure 5 illustrates this age-related gradient.

4.11 Summary of Statistical Tests

Table 4: Summary of Statistical Analysis (SPSS v25.0)

Statistical Test	Variable(s)	Result	p-value	Interpretation
Descriptive Statistics	2nd Trimester IOD	Mean=11.58mm, SD=6.03	–	Higher IOD → better resolution
Descriptive Statistics	3rd Trimester IOD	Mean=22.85mm, SD=14.28	–	Significant upward migration

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Mann-Whitney U Test	IOD: Resolved vs Not Resolved	U=2447.5 (Resolved median=16mm vs 4mm)	p<0.001	Highly significant difference
Pearson Correlation	IOD 2nd vs IOD 3rd Trim	r=0.858	p<0.001	Strong positive correlation
Chi-square Test	Previa Type vs Resolution	χ^2=57.12, df=3	p<0.001	Previa type significantly predicts resolution
Chi-square Test	Placenta Position vs Resolution	χ^2=0.497, df=2	p=0.780	Position not significant predictor
Age Group Analysis	Age vs Resolution	<25yrs:88%, 25-29:69%, 30-34:29%	Trend observed	Younger age associated with higher resolution

CHAPTER-V
DISCUSSION

This prospective longitudinal cohort study provides comprehensive sonographic data on placenta previa resolution from the 2nd to the 3rd trimester in a well-defined, low-risk cohort of 167 primigravid Pakistani women with confirmed anteverted uterus and non-advanced maternal age. The principal findings an overall resolution rate of 61.0%, a strong predictive role of the 2nd trimester IOD, and a marked gradient of resolution probability by previa type are broadly consistent with the published literature while offering novel insights relevant to this specific population.

The overall resolution rate of 61.0% observed in this study falls within range of 60%–90% reported in the literature for mixed obstetric populations (Sarker et al., 2025; Jansen et al., 2020; Arunkumar et al., 2025). The somewhat conservative estimate observed here may reflect the inclusion of all grades of placenta previa including complete previa, which universally failed to resolve in the analytical denominator, as well as the inclusion of 11 patients with indeterminate follow-up status.

The finding that low-lying placenta resolved in 94.9% of cases is strikingly consistent with the near-universal resolution reported by Jansen et al. (2020), who found a resolution rate approaching 100% for cases with an initial IOD of ≥10 mm. In contrast, the 0.0% resolution rate for complete previa confirms earlier reports by Lal and Nyholm (2012) and Feng et al. (2017), who documented substantially reduced resolution rates for complete previa, particularly in the presence of uterine scarring. In the present cohort, the absence of prior cesarean section (an inclusion criterion) eliminates this confounder, suggesting that even in unscarred uteri, the degree of placental coverage of the internal os is the most powerful determinant of resolution.

The statistically significant difference in 2nd trimester IOD between the resolved (mean 14.89 mm) and not-resolved (mean 4.83 mm) groups ($p < 0.001$), combined with a strong Pearson correlation between 2nd and 3rd trimester IOD values ($r = 0.858$, $p < 0.001$), establishes the 2nd trimester IOD as a robust, objective, and readily measurable predictor of resolution. These findings support the clinical utility of the IOD as a risk-stratification tool at the time of the routine anomaly scan, enabling clinicians to identify

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women with high versus low probability of resolution and to tailor follow-up intervals accordingly. Women with IOD ≥15 mm at 18–24 weeks may be reassured of a high probability of resolution, while those with IOD ≤10 mm or complete previa warrant more intensive monitoring and early delivery planning.

The absence of a statistically significant association between placental position and resolution (χ^2 = 0.497, p = 0.780) diverges from several prior studies that reported lower resolution rates for posterior placentae (Jansen et al., 2020). This discrepancy may be attributable to the restriction of the present cohort to primigravid women with anteverted uterus — a specific anatomical context in which the elongation of the lower uterine segment may occur more symmetrically, irrespective of placental laterality. Further investigation with larger sample sizes and subgroup analyses is warranted to clarify this relationship.

The age related gradient in resolution rates with women aged <25 years demonstrating 88.0% resolution compared to 29.3% in those aged 30–34 years suggests that younger maternal age confers a biological advantage in placental migration, possibly through greater uterine tissue pliability, more robust angiogenic response, or more vigorous lower segment development. While advanced maternal age (≥35 years) is an established risk factor for placenta previa and impaired resolution, the present study demonstrates that even within the non-advanced age range, younger women benefit from markedly higher resolution rates. This finding has direct implications for counseling: younger primigravid women with 2nd trimester placenta previa should be offered more optimistic prognostic information compared to women approaching the threshold of advanced maternal age.

From a public health perspective, the results of this study underscore the importance of the routine 2nd trimester anomaly scan as not only a diagnostic tool, but also a prognostic assessment. In resource-limited settings such as Rahim Yar Khan, where access to repeated imaging may be constrained, a single well-performed 2nd trimester scan with careful IOD measurement can provide clinically actionable information to guide subsequent management.

Limitations of this study include the absence of transvaginal ultrasound, which is considered the gold standard for accurate cervical os distance measurement but was not performed due to clinical and patient preference considerations. Additionally, 11 patients (6.7%) were lost to 3rd trimester follow-up, which may introduce a slight bias in the resolution rate estimate.

CONCLUSION

This prospective longitudinal cohort study demonstrates that placenta previa resolves spontaneously in the majority of primigravid women with anteverted uterus and non-advanced maternal age by the third trimester, with an overall resolution rate of 61.0% in this cohort. The 2nd trimester placenta-to-internal os distance (IOD) is a statistically significant, clinically applicable predictor of resolution (Mann-Whitney U = 2447.5, p < 0.001; Pearson r = 0.858, p < 0.001), with higher initial IOD values strongly associated with subsequent spontaneous resolution.

The type of placenta previa at 2nd trimester diagnosis is the most powerful categorical predictor of resolution (χ^2 = 57.12, df = 3, p < 0.001): low-lying placenta resolves in nearly all cases (94.9%), marginal previa in approximately two-thirds (65.4%), partial previa in approximately one-quarter (23.5%), and complete previa demonstrates no spontaneous resolution (0.0%) in this cohort. Maternal age within the non-advanced range shows an inverse relationship with resolution, with younger women (<25 years) benefiting from substantially higher resolution rates (88.0%) compared to older counterparts (30–34 years: 29.3%). Placental position (anterior, posterior, and fundal) does not significantly influence the likelihood of resolution in this specific cohort.

In conclusion, ultrasonography remains an indispensable, safe, and cost-effective tool for the diagnosis, monitoring, and prognostic assessment of placenta previa in primigravid women. The generation of locally relevant, evidence-based data from Rahim Yar Khan contributes to global knowledge on placental migration and supports

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the development of individualized, evidence-guided antenatal care protocols for low-risk primigravid populations in Pakistan and similar low- and middle-income countries.

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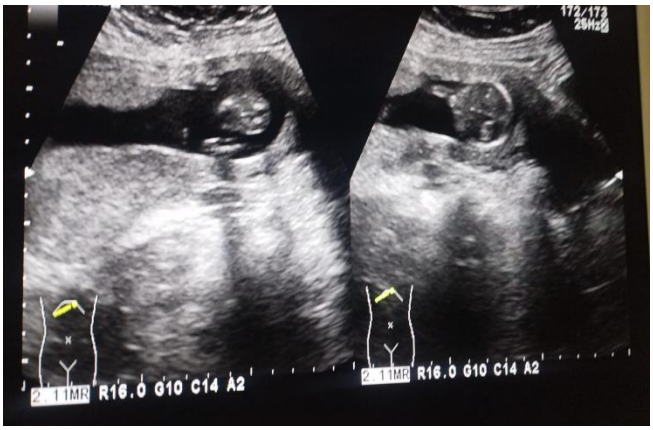
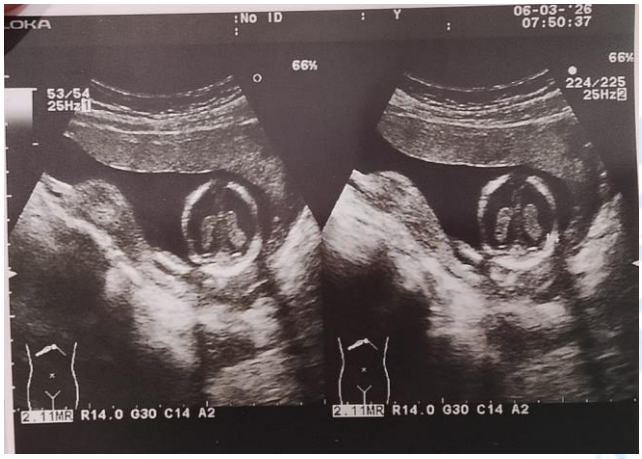
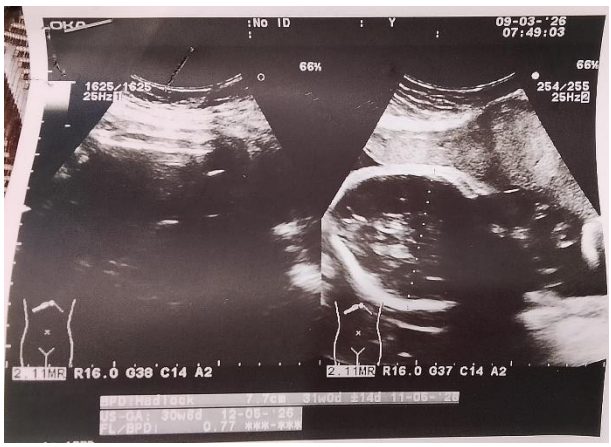
CHAPTER-VI







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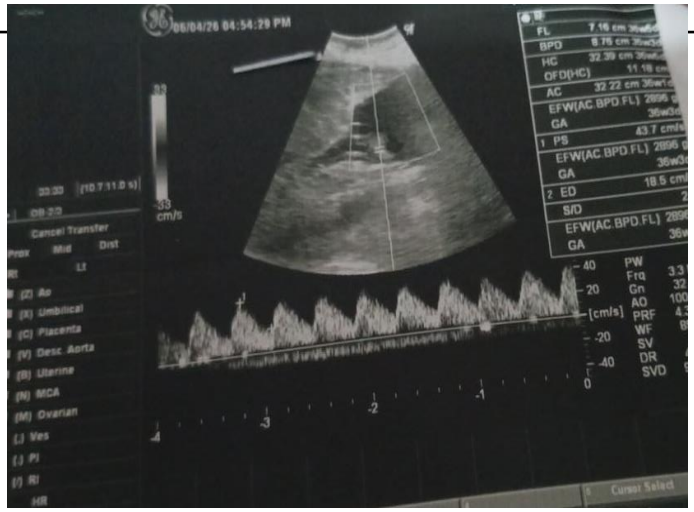
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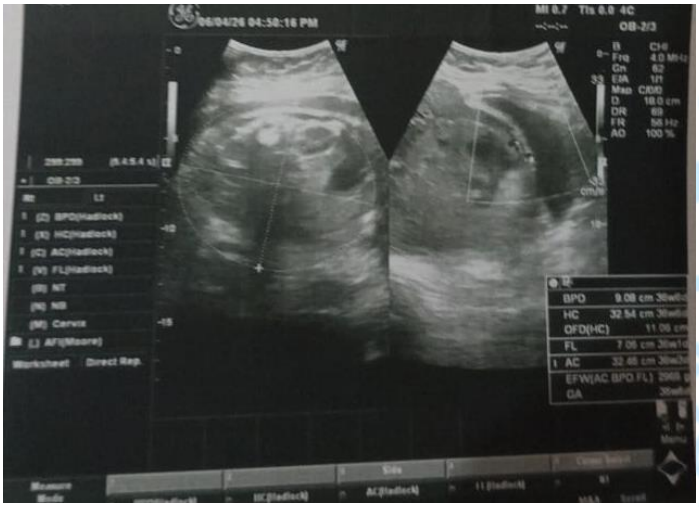
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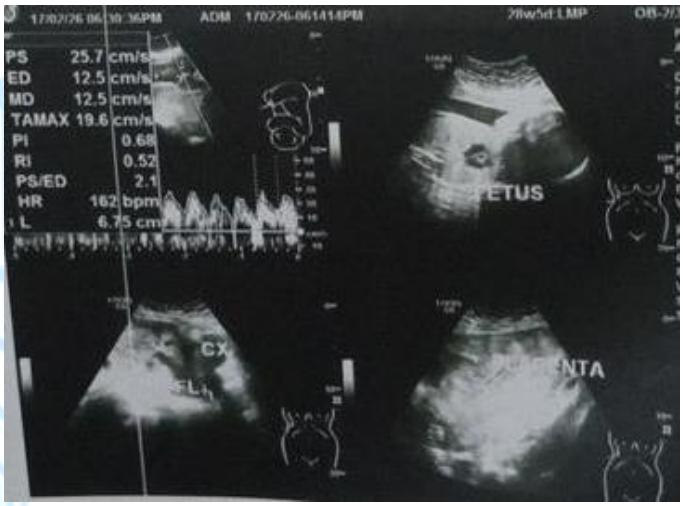
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