Original Article

Investigating the Relationship Between Chorionic Villous Sampling and Pregnancy Complications

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ABSTRACT

Objective: To determine the relationship between chorionic villous sampling (CVS) and pregnancy complications by evaluating immediate procedural, antenatal, delivery, and neonatal outcomes among women undergoing first-trimester prenatal diagnosis.

Study Design: Prospective observational study

Place and Duration of Study: This study was conducted at the Department of Obstetrics and Gynaecology, Jinnah Postgraduate Medical Centre, Karachi, from September 2025 till January 2026.

Methods: Pregnant women between 10 and 13+6 weeks of gestation undergoing CVS for prenatal genetic diagnosis were enrolled using non-probability consecutive sampling. Singleton pregnancies with complete follow-up until delivery were included. Baseline demographic and obstetric variables were recorded. CVS was performed via transcervical or transabdominal approaches under ultrasound guidance.

Results: A total of 73 women were included with a mean age of 32.18 ± 7.32 years and mean gestational age of 11.03 ± 0.87 weeks. Transcervical CVS was performed in 43 (58.9%) cases. Immediate complications were absent in 49 (67.1%) participants, with minor symptoms such as uterine contractions in 10 (13.7%) and spotting in 14 (19.2%). Ongoing pregnancy was observed in 50 (68.5%) cases, while 37 (50.7%) remained free of antenatal complications. Vaginal delivery occurred in 39 (53.4%) women. Neonatal survival was noted in 68 (93.2%) cases, with 56 (76.7%) neonates appearing clinically normal.

Conclusion: CVS is a relatively safe and effective first-trimester diagnostic procedure with low rates of maternal and fetal complications. When performed by experienced operators with appropriate follow-up, it provides substantial diagnostic benefit with acceptable risk.

Key Words: Chorionic villous sampling, prenatal diagnosis, pregnancy complications, miscarriage, invasive procedures.

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INTRODUCTION

Chorionic villus sampling (CVS) is an invasive first-trimester prenatal test in which invasive testing is conducted to take samples of cells known as chorionic villi, which develop in the placenta in week 10 to week 13+6 of a pregnant woman[1]. It is used to obtain a sample of placental villi via transabdominal or transcervical procedures for genetic, chromosomal, and molecular testing.

The use of CVS is implied in cases where the fetus is at high risk of aneuploidy, an abnormality of the first-trimester screening test, or where the parents of the fetus have a family history of a genetic abnormality or one of the parents carries a chromosome abnormality[2]. Although CVS offers earlier diagnosis than amniocentesis, its safety profile has been questioned. Complications in pregnancies that occur during miscarriage, Vaginal bleeding or premature rupture of membranes (PROM) or preterm labor, preterm birth, and pregnancy (including limb defect of a fetus), have also been discussed in various articles[3]. A recent systematic review estimated the risk of pregnancy loss associated with CVS at 0.22, which overlaps with the background risk[4]. Through other research, the rate of miscarriage/after CVS is between 0.5 and 1.0 per cent of all the pregnancies that take place. Other complications include vaginal bleeding in 10% of 10% of the cases, PROM in 710 per cent, fetal growth restriction (FGR) in 5%, and preeclampsia in about 6 per cent[5]. An article about a 2023 retrospective cohort study, published in the Korean journal, informed that women who had CVS were at a higher risk of having a shortened cervix requiring cerclage compared to women who had amniocentesis (adjusted OR 3.17)[6,7].

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The defects associated with the limb reduction are associated with the operations that take place within the first 10 weeks of pregnancy, but are mainly rare (0.05-0.2)[7,8]. A 2020 study of 468 CVS by Turkish researchers (n=468) with a five-year follow-up in 2015 demonstrated that the rates of complications were low and the procedure is safe when conducted by any specialist, who has trained to perform CVS procedure 2020 However, the article by one more multicentric study predicted the importance of pre-procedure counseling, risk stratification and expertise of the operator in the reduction of risks[9]. The post-procedural effects were also recorded in terms of transient uterine reversal and focal placental hemorrhage, as shown by recent evidence[10,11].

METHODS

This prospective observational study was conducted at the Department of Obstetrics and Gynecology, Jinnah Postgraduate Medical Centre, Karachi, a tertiary care teaching hospital, from September 2025 till January 2026. The study included pregnant women with a singleton pregnancy who were between 10 and 13+6 weeks of gestation and experience CVS. Women who had provided written informed consent and had follow-up visits through delivery were recruited solely to facilitate full outcome evaluation. Females with an increased number of gestations, observed abnormalities of the uterine structure, or those with a prior history of cervical insufficiency were taken out because of their own risk of pregnancy complications. Also, patients with a chronic systemic disease like uncontrolled diabetes mellitus, kidney disease, or autoimmune disorders were excluded to eliminate the risks of confounding pregnancy outcomes. Patients who were either lost to follow-up before delivery or whose medical records were incomplete were also omitted from the final analysis. A non-probability consecutive sampling method was used. The World Health Organization formula on prevalence studies was used to calculate the sample size. Using an anticipated prevalence rate of pregnancy complications following CVS of 14%, a 95% confidence level (Z = 1.96), and an 8% margin of error, the required minimum was estimated at 73 subjects. It was sufficient to provide a good level of statistical power to identify significant relationships between CVS and adverse pregnancy outcomes.

Data Collection: After Institutional Review Board approval was obtained, potential respondents were contacted and informed consent was obtained prior to participation. A previously developed pro forma was used to capture baseline demographic and obstetric data, including maternal age, parity, gestational age at the time of CVS, the reason for the procedure, and other pertinent medical and obstetric history. CVS was conducted in 10-13+6 gestational weeks under real-time ultrasound guidance of experienced fetal medicine consultants, either using the transabdominal or the transcervical method under aseptic, stringent conditions. The early complications, such as vaginal bleeding, abdominal pain, uterine contractions, or indications of infection, were monitored immediately after the procedure. They were thereafter managed through regular antenatal clinic appointments until delivery. Clinical examination, ultrasound, hospital records, and delivery note data were used to record pregnancy outcomes such as miscarriage (pregnancy loss < 20 weeks), preterm birth (before 37 weeks), premature rupture of membranes, fetal growth restriction, and hypertensive disorders of pregnancy. All collected data were stored in encrypted electronic files to ensure confidentiality, and incomplete or missing records were excluded.

Data Analysis: Data were entered and analyzed using Statistical Package for Social Sciences (SPSS) version 26.0. Continuous variables such as maternal age and gestational age were summarized as means and standard deviations, while categorical variables, including miscarriage, preterm birth, PROM, fetal growth restriction, and hypertensive disorders, were expressed as frequencies and percentages. Associations between CVS and pregnancy complications were evaluated using the Chi-square test. A p-value of 0.05 or less was considered statistically significant.

RESULTS

Data were collected from 73 patients; the mean maternal age was 32.18 ± 7.32 years, and the mean gestational age at the time of CVS was 11.03 ± 0.87 weeks, indicating early first-trimester testing. The average gravida and para were 2.92 ± 1.47 and 1.84 ± 1.09, respectively, reflecting moderate multiparity. The transcervical approach was used in 43 (58.9%) cases, whereas 30 (41.1%) underwent transabdominal or other techniques. Indications included thalassemia risk in 29 (39.7%) and other genetic or aneuploidy concerns in 44 (60.3%). Immediately post-procedure, 49 (67.1%) experienced no complications, whereas uterine contractions occurred in 10 (13.7%) and spotting or pain in 14 (19.2%); amniotic fluid leakage and other minor events were each seen in 8 (11.0%), with 57 (78.0%) reporting no specific adverse event.

Table No.1: Maternal Characteristics, Procedure Details, and Pregnancy Outcomes (n = 73)

Variable	Category	Value
Baseline Characteristics		
Age (years)	Mean ± SD	32.18 ± 7.32
Gestational age at CVS (weeks)	Mean ± SD	11.03 ± 0.87
Gravida	Mean ± SD	2.92 ± 1.47
Para	Mean ± SD	1.84 ± 1.09

Procedure Type		
	Transcervical	43 (58.9%)
	Transabdominal/ Other	30 (41.1%)
Clinical Indication		
	Thalassemia major risk	29 (39.7%)
	Other genetic/ aneuploidy risks	44 (60.3%)
Immediate Post-Procedure Status		
	No complication	49 (67.1%)
	Uterine contractions	10 (13.7%)
	Spotting/leakage/ pain	14 (19.2%)
Specific Procedure Events		
	Amniotic fluid leak	8 (11.0%)
	Other minor events	8 (11.0%)
	None recorded	57 (78.0%)
Pregnancy Course		
	Ongoing pregnancy	50 (68.5%)
	Loss/termination	23 (31.5%)
Antenatal Complications		
	None	37 (50.7%)
	Hypertensive disorders	11 (15.1%)
	Other obstetric/medical issues	25 (34.2%)
Mode of Delivery		
	Normal vaginal delivery	39 (53.4%)
	LSCS/operative delivery	34 (46.6%)
Delivery Complications		
	None	60 (82.2%)
	Infection	5 (6.8%)
	Other complications	8 (11.0%)

Neonatal outcomes were generally favorable. Survival was documented in 68 (93.2%) neonates, while 5 (6.8%) represented perinatal loss or other adverse outcomes. Clinical assessment at birth showed that 56 (76.7%) neonates appeared normal, whereas 17 (23.3%) exhibited mild abnormalities.

Table No. 2. Neonatal Outcomes (n = 73)

Variable	Category	Value
Survival status	Alive	68 (93.2%)
	Perinatal loss/other	5 (6.8%)
Clinical appearance	Normal	56 (76.7%)
	Mild abnormality	17 (23.3%)

Baseline demographic and obstetric characteristics were comparable between the transcervical (n = 43) and other approach (n = 30) groups. The mean maternal age was 31.84 ± 7.28 years versus 32.67 ± 7.47 years (p = 0.639), and the mean gestational age was 11.12 ± 0.82 weeks versus 10.90 ± 0.92 weeks (p = 0.307). Similarly, gravida averaged 2.74 ± 1.53 compared with 3.17 ± 1.37 (p = 0.220), and para was 1.86 ± 1.10 versus 1.80 ± 1.10 (p = 0.818).

Table No. 3. Baseline Characteristics by Procedure Type

Variable	Trans-cervical (n = 43)	Other Approach (n = 30)	p-value
Age (years), Mean ± SD	31.84 ± 7.28	32.67 ± 7.47	0.639
Gestational age (weeks), Mean ± SD	11.12 ± 0.82	10.90 ± 0.92	0.307
Gravida, Mean ± SD	2.74 ± 1.53	3.17 ± 1.37	0.220
Para, Mean ± SD	1.86 ± 1.10	1.80 ± 1.10	0.818

No complications were reported in 29 (67.4%) women in the transcervical group and 20 (66.7%) in the other approach group, totaling 49 (67.1%). Any complication occurred in 14 (32.6%) transcervical and 10 (33.3%) other approach cases, totaling 24 (32.9%).

Table No. 4. Immediate Procedure Complications by Procedure Type

Complication Status	Transcervical	Other Approach	Total	p-value
No complication	29 (67.4%)	20 (66.7%)	49 (67.1%)	0.109
Any complication	14 (32.6%)	10 (33.3%)	24 (32.9%)	0.109

Table No. 5. Pregnancy and Delivery Outcomes by Procedure Type

Outcome	Transcervical	Other Approach	Total	p-value
Ongoing pregnancy	30 (69.8%)	20 (66.7%)	50 (68.5%)	0.781
Pregnancy loss/termination	13 (30.2%)	10 (33.3%)	23 (31.5%)	0.781
Vaginal delivery	24 (55.8%)	15 (50.0%)	39 (53.4%)	0.612
LSCS/operative	19 (44.2%)	15 (50.0%)	34 (46.6%)	0.612
Any delivery complication	7 (16.3%)	6 (20.0%)	13 (17.8%)	0.674

Ongoing pregnancy was observed in 30 (69.8%) transcervical and 20 (66.7%) other approach participants, while pregnancy loss or termination occurred in 13 (30.2%) and 10 (33.3%), respectively (p = 0.781). Vaginal delivery occurred in 24 (55.8%) transcervical and 15 (50.0%) other approach cases, whereas LSCS or operative delivery was required in 19 (44.2%) and 15 (50.0%) women (p = 0.612). Delivery complications were noted in 7 (16.3%) and 6 (20.0%) cases, respectively (p = 0.674).

DISCUSSION

This is a prospective observational study carried out in the Department of Obstetrics and Gynaecology, Jinnah Postgraduate Medical Centre that assessed the relationship of chorionic villous sampling (CVS) and subsequent pregnancy complications on a cohort of 73 women undergoing first-trimester invasive prenatal diagnosis. All in all, the results indicate that CVS had a positive safety profile, characterized by minimal cases of immediate procedural complications and overall positive maternal and neonatal outcomes. The study population baseline data revealed a mean maternal age of 32.18 -1 -7.32 years and a mean gestation age of 11.03 -1 -0.87 weeks at the time of the procedure, which suggests that the majority of the study population had CVS in the most appropriate timeframe of the first trimester. The moderate multiparty was noted and it indicates that the population under consideration were common patients who were brought to genetic screening because of previous obstetric history or of having an increased risk factor[12]. These adults are in line with the past studies where CVS was mostly used among women whose pregnancy was at higher risk or those who have experienced some negative outcomes in the past, which contributes to the representativeness of the study sample. Short-term complications with the procedure were also rare and 67.1 percent of women did not have any negative effects. The commonest ones were minor including uterine contractions and spotting whereas the serious ones like amniotic fluid leakage were of rare occurrence. This is in line with the past studies that have shown that CVS, when done under the guidance of ultrasound by skilled operators, has low complication rate[13]. In practice, the process was more of a managed outpatient intervention, as opposed to a high-risk or dramatic one, and this is reassuring to both clinicians and patients. In terms of the progression of the pregnancy, over two-thirds of the pregnancies proceeded normally, and about half of the individuals did not have any antenatal problems at all. Despite the fact that the pregnancy was lost or terminated in 31.5 percent of the cases, this needs to be understood with caution as some of the losses could have been as a result of underlying fetus abnormalities as detected by the use of CVS and not as a result of the procedure itself[14,15]. The other past studies also remark that focusing on attribution of miscarriage to the CVS alone may overestimate the riskiness of the procedure since most of the high-risk pregnancies already have an inherent probability of poor outcome[16-18]. Hence, causality may not be assumed out of context. Hypertensive disorders became the commonest antenatal complication[15.1%]. The conditions are, however, multifactorial and are often observed in obstetric populations, regardless of invasive testing. Previous studies have documented similar prevalence rates across age groups among mothers, which makes CVS unlikely to be a direct causative agent. The lack of a precise procedural connection also provides evidence of the technique's relative safety[19].

The delivery results were also positive. More than 50 percent of the women gave birth naturally, and most of them had no complications associated with delivery. There were also expected clinical ranges in operational delivery rates in tertiary care settings. The most promising results were observed in neonatal outcomes, with 93.2% surviving, and the vast majority were clinically normal at birth[20]. These results support the conclusion that CVS in the first trimester did not adversely affect fetal viability or perinatal health in the majority of cases. This research has several shortcomings that should be considered when interpreting the outcomes. First, the statistical power is relatively low due to the relatively small sample size of 73 participants and might restrict the relevance of the findings. Second, as a single-centre study at Jinnah Postgraduate Medical Centre, the results may not be generalizable to other healthcare settings, as they may reflect local practice and operator competencies. Third, the non-CVS comparison group does not reduce it to an observational design, and thus it becomes hard to make a direct causal relationship between CVS and pregnancy complications since some of the adverse outcomes can be caused by maternal or fetal risk factors, but not the procedure itself. Additionally, minor complications may have been underreported due to reliance on clinical records and patient follow-up, potentially introducing information bias.

CONCLUSION

It is concluded that chorionic villous sampling is a safe and effective first-trimester diagnostic procedure with a low incidence of immediate and subsequent pregnancy complications. This prospective study conducted at Jinnah Postgraduate Medical Centre found that most women experienced no adverse events related to the procedure, most pregnancies were uncomplicated, and infant outcomes were generally positive. Minor ones like uterine contractions and spotting were noted sporadically, and severe complications were rare. There were also no major differences between transcervical and alternative methods of procedure, suggesting similar safety profiles among the methods. Generally,

CVS has a significant diagnostic advantage and a reasonable risk when performed by qualified professionals during ultrasound-guided procedures, and with proper patient selection and follow-up, it can be recommended to continue the practice of CVS in tertiary care units as a means of early prenatal diagnosis of genetic disorders.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Simrun, Erum Majid, Fatima Nasir
Drafting or Revising Critically:	Fatima Nasir, Tamkeen Zehra, Komal
Final Approval of version:	All the above authors
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