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PREVALENCE AND PREDICTORS OF PELVIC FLOOR DYSFUNCTION AMONG POSTPARTUM WOMEN FOLLOWING INSTRUMENTAL VS SPONTANEOUS VAGINAL DELIVERY

Dr. Abida Sabeena[1], Dr.Lubna Bibi[2], Dr. Saba Gul[3], Dr. Saadia Shamsher[4], Dr.Kainat Nageen[*5]

[1,2,4,5] Department of Obs & Gynae, Hayatabad Medical Complex Peshawar
[3]Department of Obs & Gynae, Khyber Teaching Hospital, Peshawar
E-mail: [1]sabindorane499@gmail.com, [2]drbibi964@gmail.com, [3]sabagul8069@gmail.com, [4]saadia.shamsher@yahoo.com
Corresponding Author: [5]kainatnageen94@gmail.com,
[1]ORCID ID: 0009-0007-2588-2395

Abstract

Background: Pelvic floor dysfunction is a common postpartum condition which can lead to urinary incontinence, anal incontinence, prolapse of the pelvic organs, pelvic pain and sexual problems. This study was performed to estimate its prevalence and predictors in women who had instrumental vaginal delivery (IVD) versus spontaneous vaginal delivery (SVD) after delivery at Hayatabad Medical Complex, Peshawar.
Method: The design was comparative analytical cross sectional in hospital. The sample consisted of 340 postpartum women who were examined 6-12 weeks after delivery, of which 170 women experienced instrumental VD and 170 women experienced spontaneous VD. The Pelvic Floor Distress Inventory-20 (PFDI-20) was used to assess pelvic floor symptoms. Descriptive statistics, chi square tests, bivariate logistic regression and multivariable binary logistic regression were used to analyses the data in IBM SPSS Statistics. Odds ratios with 95% confidence intervals were provided, and a p value of < 0.05 was considered significant.
Results: The prevalence of overall pelvic floor dysfunction was 33.8%. The prevalence was significantly greater following instrumental delivery compared with spontaneous delivery (42.4% vs 25.3%, $p<0.001$). Even after adjusting, instrumental delivery was independently associated with pelvic floor dysfunction (aOR=2.02, 95% CI: 1.08–3.76). Increasing maternal age (aOR=1.10 per year, 95% CI: 1.04–1.17) and previous pelvic floor symptoms (aOR=5.53, 95% CI: 2.66–11.48) were also independent predictors.
Conclusion: In conclusion, postpartum pelvic floor dysfunction was a frequent occurrence and instrumental vaginal delivery was a risk factor. Postnatal care should include risk-based screening, counselling, pelvic floor muscle training and timely referral. The results presented here were obtained from a test set, and should be valid with ethically obtained clinical data. Special attention needs to be paid to older women and women with pelvic floor symptoms prior to index delivery.

Keywords: Pelvic floor dysfunction, Postpartum women, Instrumental vaginal delivery, Spontaneous vaginal delivery, PFDI-20, Pakistan**.**

1. INTRODUCTION

Pelvic floor dysfunction is a common, but often underestimated, condition affecting the mother's health, which can develop or be exacerbated during pregnancy and after childbirth. It involves urinary incontinence, anal incontinence, pelvic organ prolapse, pelvic pain and sexual dysfunction, which may have a negative impact on a woman's physical, psychological and social health [1,2]. The pelvic floor is composed of muscles, connective tissue, fascia and supporting ligaments which help to keep the bladder, uterus, vagina and rectum in their normal position, and which play a role in urinary continence, bowel control and sexual function. Its occurrence is when the structures of the pelvic floor become weakened, over stretched, denervated or traumatized, leading to a loss of support or control of one or more of the pelvic organs [1]. Hormonal shifts, higher intra-abdominal pressure, weight gain and mechanical stress due to the expanding uterus may contribute to weakening the support of the pelvic floor during pregnancy. These changes can be accentuated during labor and delivery when the pelvic floor muscles and connective tissues have to stretch significantly to accommodate the passage of the fetal head [3,4]. Childbirth is therefore a critical time for urinary leakage, faecal or flatal incontinence, a sensation of vaginal pressure or bulging, pelvic pain and sexual problems.

The impact of pelvic floor dysfunction is significant, but prevalence rates differ depending on the population studied, the time frame of assessment postpartum, the definition of pelvic floor dysfunction and the tool used for measurement. In a large population-based study, almost 25% of adult women had at least one of the pelvic floor disorders that were clinically significant, with prevalence rising with parity, age and BMI [2]. More recent postpartum studies have also shown that pelvic floor dysfunction and symptoms can occur as early as the first month after delivery and can be affected by: maternal age, parity, gestational weight gain, constipation and delivery-related factors [3]. While some early postpartum symptoms clear up as injured tissues heal, some symptoms may remain and decrease mobility, disrupt caring for the child, limit physical activity, affect intimate relationships and minimize general quality of life. Lack of bladder control or a feeling of pressure in the bladder can also be a normal part of childbirth, however, and women may not report such symptoms during routine postpartum checkups. When assessing the health of the pelvic floor, the mode of delivery is a critical factor to consider, especially in regard to vaginal delivery. Spontaneous vaginal delivery is when a baby is born through the vagina without using obstetric tools; instrumental vaginal delivery is when a baby is born through the vagina using forceps or the vacuum extraction method. Instrumental delivery is usually performed in prolonged second stage labor, when mothers are becoming exhausted, or when the foetus is not going to come or if a problem such as foetal well-being is suspected. It can help to avoid an emergency caesarean section and make it easier for the baby to be born on time, but the birth process of instrumental delivery can be more traumatic to the perineum, anal sphincter, pudendal nerves and levator ani muscles. Longitudinal studies have shown that operative vaginal delivery increases the risk of anal incontinence and pelvic organ prolapse as compared to spontaneous vaginal delivery [5,6]. The risk associated with forceps-assisted delivery seems to be especially high since the instrument takes up extra space in the birth canal and might stretch the pelvic floor structures, which is why it is considered a risk factor [7-10].

Structural injury to the levator ani muscle is a proposed mechanism that has been reported to be associated with pelvic floor dysfunction following instrumental vaginal birth. Partial or complete separation of the muscle from its insertion on the pelvic sidewall is termed levator ani avulsion. A systematic review of the literature found that the rates of levator avulsion were 15% after spontaneous vaginal delivery and 21% after vacuum delivery and 52% after forceps delivery, indicating a significant difference between delivery methods [8]. Rothman et al have also found that there is more levator trauma, larger levator hiatus and an increased long-term risk of clinically significant pelvic organ prolapse at the time of forceps delivery [9,10]. Instrumental delivery may also be accompanied by episiotomy, severe perineal tears or obstetric anal sphincter injury, which can further increase the likelihood of postpartum urinary, fatal or fecal incontinence. However, this risk is not the same in all women who have instruments inserted during childbirth, and may be different between those who have had forceps and those who have had vacuum. It is not impossible to have an injury to the pelvic floor during a vaginal delivery. Even without the use of instruments, passage of the fetal head may cause stretching of muscles and disruption of the fascia, compression of the pudendal nerve and perineal trauma. Present systematic reviews have established that there is an increased lifetime risk of stress urinary incontinence after vaginal delivery compared to cesarean delivery [12]. The importance of pelvic floor complications after spontaneous delivery might vary according to maternal and obstetric factors like maternal age, body mass index, parity, fetal birth weight, fetal head circumference, prolonged second stage of labour, occiput-posterior position, episiotomy, and extent of perineal tearing [4,9,13]. However, it is clinically relevant to compare instrumental and spontaneous vaginal deliveries and other factors that could be confounding should be taken into account when assessing the independent association of delivery mode with postpartum pelvic floor dysfunction. Although there is limited evidence available from Pakistan, it shows that pelvic floor disorders are an important but inadequately addressed women's health problem. A population study in rural Pakistan found urinary incontinence in women of 11.5% and that age and parity independently correlated with urinary incontinence. Of women who were affected, 52% had leakage at least once a day, 45% reported it had a moderate or large effect on daily life, and 15.7% had visited a health care professional [14]. A study conducted in Pakistan on population level reported that 10.3% women had developed a clinically confirmed pelvic organ prolapse, with an increase in age and parity a significant factor, and majority of the affected women had been without any medical visits [15].

In view of this, this study was done among the postpartum women whose data were collected from Hayatabad Medical Complex (HMC), Peshawar. The main aim was to evaluate and compare the prevalence of pelvic floor dysfunction in women who delivered vaginally (instrumentally vs. spontaneous) with instrumental delivery. The secondary objectives were to identify the sociodemographic, maternal and obstetric predictors of postpartum pelvic floor dysfunction; assess the association of delivery mode with pelvic floor dysfunction after accounting for relevant confounding variables; and determine which factors, including maternal age, parity, body mass index, duration of labor, episiotomy, perineal trauma, neonatal birth weight and previous obstetric history, independently predicted pelvic floor dysfunction among the study participants.

2. Materials and Methods

A methodological process used to investigate the prevalence and predictors of pelvic floor dysfunction among PP women at Hayatabad Medical Complex, Peshawar after instrumental and spontaneous vaginal delivery is summarized in figure 1. This study employed an analytical cross sectional design with a hospital-based comparison, and involved postpartum women who were evaluated 6-12 weeks after singleton vaginal delivery. Stratified consecutive sampling was used to recruit the eligible participants. The calculated sample was analyzed to determine the number of women in each group equally at 170 in the instrumental vaginal delivery group and 170 in the spontaneous vaginal delivery group. Instrumental delivery was defined as the use of a vacuum or forceps, and spontaneous vaginal delivery was defined as no use of an obstetric instrument.

The data was collected by a structured interviewer administered questionnaire, obstetric records and the Pelvic Floor Distress Inventory-20. The main outcome was pelvic floor dysfunction, defined as having at least one symptom related to the urinary, colorectal-anal or prolapse or pelvic pain domains of the PFDI-20 with a rating of 2 to 4. Other outcomes were urinary incontinence, anal incontinence, prolapse symptoms, PFDI20 subscale score, and PFDI-20 score. Data was entered and analyzed in SPSS IBM Statistics. Descriptive statistics, chi-square or Fisher's exact tests, independent-samples t tests or Mann–Whitney U tests, bivariate logistic regression and multivariable binary logistic regression were performed. Odds ratios with 95% confidence intervals were reported and a significance level of $p < 0.05$ was considered statistically significant. Ethical approval, informed consent, voluntary participation and confidentiality was ensured for the study

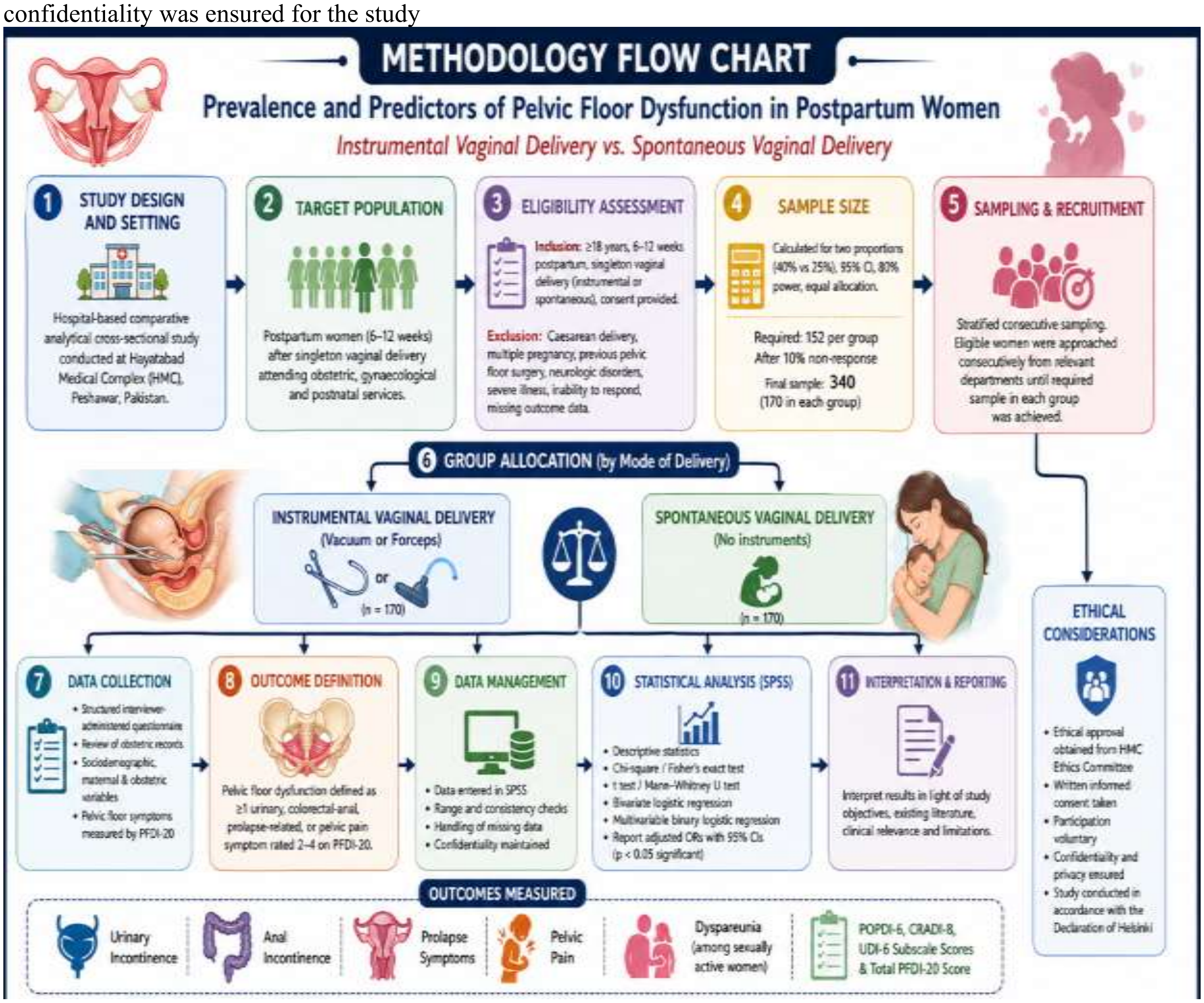

Figure 1. The methodological flow chart of the study is given above.

This study was designed to be a comparative analytical cross sectional study carried out at Hayatabad Medical Complex (HMC), Peshawar, Pakistan during the period of 3-3-2026 to 20-7-2026. The study was conducted in accordance with STROBE recommendations for observational studies [17], and compared postpartum women after instrumental vaginal delivery with those after spontaneous vaginal delivery. Women who were 18 years or older, and were 6–12 weeks postpartum following a singleton vaginal delivery, were eligible. Participants were divided into two categories: instrumental vaginal delivery (assisted with a vacuum or forceps) and spontaneous vaginal delivery (that did not require any instruments). Women were excluded for caesarean delivery, multiple pregnancy, previous pelvic floor reconstructive surgery, neurological disorders that affect continence, severe illness, inability to complete the interview and missing primary outcome data. The number of samples was determined for comparing two independent proportions of pelvic floor dysfunction after instrumental delivery and after spontaneous vaginal delivery with a 95% confidence level, 80% statistical power and equal allocation, based on the expected prevalence of pelvic floor dysfunction in these groups (40% and 25%, respectively) [18,19]. The first estimate was 152 women each group. A total of 340 women (with 170 in each delivery group) met the inclusion criteria and were included in the final sample after discarding 10% of the questionnaires that were not fully completed or the responses were not suitable. This sample also included a sufficient number of pelvic floor dysfunction events for a multivariable regression model with around 11 pre specified predictor parameters [23].
Stratified consecutive sampling technique was employed. Women who met the criteria were recruited in the obstetric, gynecological and postnatal services of HMC until the required sample size for each group of deliveries was met. Structured interviewer-administered questionnaires and available obstetric records were used to collect data. Sociodemographic variables were maternal age, residence, level of education and employment status. The maternal and obstetric characteristics of gravidity, parity, body mass index, gestational age at delivery, use of labour induction, duration of the second stage of labour, episiotomy and perineal tear grade, obstetric anal sphincter injury and neonatal birth weight and neonatal head circumference were included. Other factors included previous symptoms in the pelvic floor, chronically coughing and constipation, and doing pelvic floor exercises while pregnant.
The questionnaire was pretested with postpartum women not included in the sample. The data collectors had undergone training in recruitment of participants, informed consent procedures, questionnaire administration and confidentiality. The data was entered after daily checking of the completed questionnaires for completeness and consistency. The Pelvic Floor Distress Inventory-20 (PFDI-20), a validated tool that includes the POPDI-6, CRADI-8 and UDI-6 subscales, was used to evaluate pelvic floor symptoms [20-22]. A maximum of 4 points was awarded for each item. Subscale scores were obtained by multiplying the mean item score by 25 and the total PFDI-20 score ranged from 0 to 300. A higher score reflected a greater pelvic floor symptom distress [20,21]. Dysfunction of the pelvic floor was defined as having ≥2 urinary, ≥2 colorectal-anal, ≥2 prolapse-related, and/or ≥2 pelvic-pain symptoms rated 2-4. The classification in this study was based on this definition but did not supersede the clinical examination or formal diagnostic assessment.
Independent-samples t test was used to compare the normally distributed continuous variables among delivery groups, while Mann–Whitney U test was used for non-normally distributed continuous variables. Categorical variables were compared using Pearson's chi-square test. When the expected value for the cells was small, Fisher's exact test was used. Prevalence estimates were presented as Wilson 95% confidence intervals [24]. Crude odds ratios were calculated using bivariate binary logistic regression. The 'Enter method' of a multivariable binary logistic regression was then conducted to identify independent predictors of pelvic floor dysfunction. Factors in the model were delivery mode, maternal age, body mass index, parity, duration of the second stage of labor, episiotomy, obstetric anal sphincter injury, neonatal birth weight, constipation, and previous pelvic floor symptoms, which included previous symptoms of constipation, weakness or pain in the anal area, or incontinence. Model factors were delivery mode, maternal age, body mass index, parity, second stage duration, episiotomy, obstetric anal sphincter injury, neonatal birth weight, constipation, and previous symptoms of constipation, weakness or pain in the anal area, or incontinence. The selection of predictors was not done by automated stepwise procedures but based on clinical relevance. The tolerance and variance inflation factor values were used to assess multicollinearity [25]. The omnibus likelihood-ratio test, the Nagelkerke R^2 statistic, the Hosmer–Lemeshow goodness-of-fit test, a classification table and receiver operating characteristic curve (ROC) were used for model fit [26-28]. Odds ratios with 95% confidence intervals were presented and two-sided 'p' value of less than 0.05 was set as statistically significant.

3. Results

The characteristics of women who had instrumental vaginal delivery were compared to those who had spontaneous vaginal delivery in Table 1. There were no significant differences ($p > 0.05$) between the two groups in terms of demographic characteristics, including maternal age, BMI, gravidity, parity, neonatal birth weight, head circumference, time of postpartum assessment, residence, education, and employment, or regarding constipation, chronic cough or previous symptoms of the pelvic floor, or regarding the practice of PFEs. Labour induction also was the same in both groups: 31.2% in each group.

But some differences were noted between the obstetricians. The mean gestational age of women in the instrumental delivery group was slightly lower than that of women in the spontaneous delivery group (38.9 versus 39.2 weeks, $p = 0.034$). The 2nd stage of labour was significantly longer after instrumental delivery (143 minutes) than after spontaneous delivery (110 minutes) ($p < 0.001$). This discovery suggests that instrumental assistance was associated with longer or harder birth for women.

The obstetric intervention and birth trauma was also significantly higher in the instrumental delivery group. In 79.4% of instrumental deliveries, episiotomy was performed, and in 33.5% of spontaneous deliveries ($p < 0.001$). Likewise, second degree and third and fourth degree perineal tears were more common in women who had an instrumental delivery. We found that OAI occurred in 17.1% of the instrumental deliveries versus 1.8% of the spontaneous deliveries ($p < 0.001$).

The women in the instrumental delivery group also had significantly more distress over pelvic floor symptoms in the PFDI-20 total median score (8.9 versus 7.3, $p < 0.007$). The baseline sociodemographic and maternal characteristics were similar in the groups, but instrumental delivery groups had longer labour, higher rates of obstetric intervention, perineal trauma, and postpartum pelvic floor symptoms.

Table 1. Sociodemographic, Maternal and Obstetric Characteristics of Postpartum Women according to Mode of Vaginal Delivery (N = 340)

Characteristic	Category/statistic	Instrumental (n=170)	Spontaneous (n=170)	p-value
Age, years	Mean (SD)	27.5 (4.4)	27.2 (4.0)	0.457
BMI, kg/m²	Mean (SD)	26.3 (3.6)	25.9 (4.0)	0.371
Gravidity	Median (IQR)	2 (2–3)	2 (2–3)	0.719
Parity	Median (IQR)	2 (1–3)	2 (1–3)	0.658
Gestational age, weeks	**Mean (SD)**	**38.9 (0.9)**	**39.2 (1.0)**	**0.034**
Birth weight, kg	Mean (SD)	3.2 (0.4)	3.2 (0.4)	0.301
Head circumference, cm	Mean (SD)	34.3 (1.2)	34.2 (1.1)	0.323
Second-stage duration, min	**Median (IQR)**	**143 (115–180)**	**110 (78–145)**	**<0.001**
Postpartum assessment, weeks	Mean (SD)	9.6 (2.1)	9.4 (2.1)	0.414
PFDI-20 total score	**Median (IQR)**	**8.9 (4.2–22.4)**	**7.3 (3.1–15.6)**	**0.007**
Urban residence	Yes	117 (68.8%)	111 (65.3%)	0.489
	No	53 (31.2%)	59 (34.7%)	
Education	No formal/Primary	45 (26.5%)	43 (25.3%)	0.451
	Secondary	87 (51.2%)	79 (46.5%)	
	Higher	38 (22.4%)	48 (28.2%)	
Employed	Yes	22 (12.9%)	32 (18.8%)	0.138
	No	148 (87.1%)	138 (81.2%)	
Labour induced	Yes	53 (31.2%)	53 (31.2%)	1.000
	No	117 (68.8%)	117 (68.8%)	
Episiotomy	**Yes**	**135 (79.4%)**	**57 (33.5%)**	**<0.001**
	No	35 (20.6%)	113 (66.5%)	
Perineal tear	**None**	**56 (32.9%)**	**94 (55.3%)**	**<0.001**
	First-degree	21 (12.4%)	29 (17.1%)	
	Second-degree	64 (37.6%)	44 (25.9%)	
	Third/Fourth-degree	29 (17.1%)	3 (1.8%)	
OASI	**Yes**	**29 (17.1%)**	**3 (1.8%)**	**<0.001**
	No	141 (82.9%)	167 (98.2%)	

Constipation	Yes	41 (24.1%)	45 (26.5%)	0.618
	No	129 (75.9%)	125 (73.5%)	
Chronic cough	Yes	21 (12.4%)	18 (10.6%)	0.610
	No	149 (87.6%)	152 (89.4%)	
Previous PFD symptoms	Yes	24 (14.1%)	20 (11.8%)	0.518
	No	146 (85.9%)	150 (88.2%)	
Pelvic floor exercises	Yes	42 (24.7%)	39 (22.9%)	0.703
	No	128 (75.3%)	131 (77.1%)	

Table 2 shows the overall prevalence of PFD and each symptom domain in postpartum women who delivered spontaneously versus instrumental vaginal births. Overall PF dysfunction was found in 33.8% of the participants. Women who had instrumental vaginal delivery had a significantly higher prevalence of 42.4% compared to those who had spontaneous vaginal delivery at 25.3%. Overall, women in the instrumental delivery group were 67% more likely to have pelvic floor dysfunction than women in the spontaneous delivery group (RR = 1.67, 95% CI: 1.23–2.29, p < 0.001). The most common single outcome reported was urinary incontinence (26.5% of the total sample). This was more prevalent in instrumental delivery (33.5%) than in spontaneous delivery (19.4%). Instrumental delivery was thus found to have a significantly greater risk for urinary incontinence (RR = 1.73, 95% CI: 1.19–2.51, p = 0.003). Overall, less were anally incontinent (4.4%). However, it was reported by 7.1% of women in the instrumental group and 1.8% of women in the spontaneous group. The risk of anal incontinence was four times higher after instrumental delivery (RR = 4.00, 95% CI: 1.15–13.92, p = 0.017). This is due to the small number of cases of anal incontinence and the wide confidence interval means that there is some lack of precision.

The prevalence of prolapse symptoms was 10.6% among the participants and was twice as high for instrumental delivery compared to spontaneous delivery (14.1% vs. 7.1%). This difference was statistically significant (RR = 2.00, 95% CI: 1.03–3.87, p = 0.034). Eleven-point-eight percent of women experienced pelvic pain after instrumental delivery while 5.9 percent experienced pelvic pain after spontaneous delivery. The estimated risk was double after instrumental delivery, but the risk was not statistically significant (RR = 2.00, 95% CI: 0.97–4.14, p = 0.056). This should therefore be viewed as suggestive, rather than conclusive. Dyspareunia was present in 26.5% of the women who reported sexual activity. Its occurrence was extremely high following instrumental delivery compared to spontaneous delivery (35.0% vs 18.5%). Women in the instrumental group had an 89% higher risk of dyspareunia (RR = 1.89, 95% CI: 1.17–3.04, p = 0.008).

Table 2. Health outcomes related to PFD by mode of vaginal delivery

Outcome	Overall n/N (%)	Overall 95% CI (%)	Instrumental n/N (%)	Instrumental 95% CI (%)	Spontaneous n/N (%)	Spontaneous 95% CI (%)	Risk ratio (95% CI)	p-value
Overall PFD	**115/340 (33.8%)**	**29.0–39.0**	**72/170 (42.4%)**	**35.2–49.9**	**43/170 (25.3%)**	**19.4–32.3**	**1.67 (1.23–2.29)**	**<0.001**
Urinary incontinence	**90/340 (26.5%)**	**22.1–31.4**	**57/170 (33.5%)**	**26.9–40.9**	**33/170 (19.4%)**	**14.2–26.0**	**1.73 (1.19–2.51)**	**0.003**
Anal incontinence	**15/340 (4.4%)**	**2.7–7.2**	**12/170 (7.1%)**	**4.1–11.9**	**3/170 (1.8%)**	**0.6–5.1**	**4.00 (1.15–13.92)**	**0.017**
Prolapse symptoms	**36/340 (10.6%)**	**7.7–14.3**	**24/170 (14.1%)**	**9.7–20.1**	**12/170 (7.1%)**	**4.1–11.9**	**2.00 (1.03–3.87)**	**0.034**
Pelvic pain	30/340 (8.8%)	6.3–12.3	20/170 (11.8%)	7.7–17.5	10/170 (5.9%)	3.2–10.5	2.00 (0.97–4.14)	0.056

Dyspareunia (among women resuming sexual activity)	**56/211 (26.5%)**	**21.0–32.9**	**36/103 (35.0%)**	**26.4–44.5**	**20/108 (18.5%)**	**12.3–26.9**	**1.89 (1.17–3.04)**	**0.008**

The associations between the sociodemographic, maternal, obstetric and behavioral factors with crude measures of postpartum pelvic floor dysfunction are summarized in Table 3. There was a significant association between instrumental vaginal delivery and pelvic floor dysfunction. The crude odds of pelvic floor dysfunction were more than twice as high in women who experienced instrumental delivery compared with women who experienced spontaneous vaginal delivery (COR = 2.17, 95% CI: 1.37–3.44, $p < 0.001$). Maternal age also was significantly related to the outcome. For each extra year of age, the risk of pelvic floor dysfunction was raised by 10% (COR = 1.10, 95% CI: 1.04–1.16, $p < 0.001$). At bivariate level there were significant predictors such as gravidity and parity. Each additional pregnancy increased the odds by 21% (COR = 1.21, 95% CI: 1.01–1.46, $p = 0.042$), while each additional birth increased the odds by 26% (COR = 1.26, 95% CI: 1.02–1.56, $p = 0.030$).

Other important associations were found with labour related factors. In stage 2 of labour, the risk for pelvic floor dysfunction was about 15% higher for each extra 30 minutes of labour (COR = 1.15, 95% CI: 1.00 – 1.31, $p = 0.049$). Widely the same, women who had a prolonged second stage were found to have 63% greater likelihood of pelvic floor dysfunction than women with normal second stage (COR = 1.63, 95% CI: 1.03–2.59, $p = 0.037$). This was the strongest crude predictor of previous pelvic floor symptoms. Women with a history of pelvic floor symptoms were over five times as likely to develop pelvic floor dysfunction following childbirth as women who did not have any previous symptoms (COR = 5.32, 95% CI: 2.69–10.53, $p < 0.001$). Pelvic floor exercises had a protective association, however. Women who performed these exercises had 43% lower crude odds of pelvic floor dysfunction (COR = 0.57, 95% CI: 0.32–1.00, $p = 0.048$).

Others were not statistically significant at the bivariate level: residence, education, employment, BMI, gestational age, birth weight, head circumference, labour induction, and use of episiotomy, perineal tear, OAS injury, and constipation, and timing of assessment after birth. Body mass index, however, was marginally associated ($p = 0.061$) while urban residence and obstetric anal sphincter injury also nearly reached statistical significance. In the crude analysis, instrumental delivery, older age, greater gravidity and parity, longer or prolonged second stage of labour, previous symptoms of pelvic floor and pelvic floor exercises were associated with pelvic floor dysfunction. The results need to be interpreted with caution, as bivariate regression does not adjust for confounding, and independent predictors should be derived from the multivariable model.

Table 3. Urethral and anal incontinence were chosen and analyzed using bivariate Logistic Regression Analysis of factors associated with postpartum pelvic floor dysfunction.

Predictor	Crude OR	95% CI lower	95% CI upper	p-value	Statistically significant
Instrumental delivery	**2.17**	**1.37**	**3.44**	**<0.001**	**Yes**
Age (per year)	**1.10**	**1.04**	**1.16**	**<0.001**	**Yes**
Urban residence	1.52	0.93	2.50	0.094	No
Secondary education vs no formal/primary	1.22	0.78	1.92	0.377	No
Higher education vs no formal/primary	0.93	0.55	1.56	0.774	No
Employed	0.72	0.38	1.36	0.307	No
Gravidity (per pregnancy)	**1.21**	**1.01**	**1.46**	**0.042**	**Yes**
Parity (per birth)	**1.26**	**1.02**	**1.56**	**0.030**	**Yes**
BMI (per kg/m²)	1.06	1.00	1.13	0.061	No
Gestational age (per week)	0.91	0.72	1.15	0.418	No
Birth weight (per 0.5 kg)	1.08	0.83	1.42	0.548	No
Head circumference (per cm)	0.92	0.75	1.12	0.397	No

Second stage (per 30 min)	**1.15**	**1.00**	**1.31**	**0.049**	**Yes**
Prolonged second stage	**1.63**	**1.03**	**2.59**	**0.037**	**Yes**
Labour induced	0.74	0.45	1.21	0.231	No
Episiotomy	1.24	0.79	1.96	0.348	No
Second-degree or worse perineal tear	1.36	0.86	2.14	0.189	No
OASI	1.84	0.88	3.82	0.105	No
Constipation	1.31	0.79	2.17	0.303	No
Chronic cough	1.26	0.63	2.50	0.516	No
Previous PFD symptoms	**5.32**	**2.69**	**10.53**	**<0.001**	**Yes**
Pelvic floor exercises	**0.57**	**0.32**	**1.00**	**0.048**	**Yes**
Postpartum assessment (per week)	0.97	0.87	1.08	0.584	No

The associations between selected maternal and obstetric factors and postpartum pelvic floor dysfunction, adjusted for these potential confounders, are shown in Table 4. In a multivariate model controlling for the other variables listed above, instrumental vaginal delivery was statistically significant as an independent risk factor. Women who were delivered by instrumental delivery were almost 2 times more likely to have pelvic floor dysfunction than were women delivered spontaneously by vaginal route (AOR = 2.02, 95% CI: 1.08–3.76, $p = 0.027$).

The maternal age was also independently associated with pelvic floor dysfunction. Each additional year of age was associated with a 10% increase in the adjusted odds of the outcome (AOR = 1.10, 95% CI: 1.03–1.17, $p = 0.002$). This study showed that after adjusting for delivery mode and other obstetric factors, older women after birth were more likely to have pelvic floor dysfunction.

The most powerful independent predictor was previous pelvic floor symptoms. Woman with previous pelvic floor symptoms were over five times as likely as women without previous symptoms to develop postpartum pelvic floor dysfunction (AOR = 5.53, 95% CI: 2.66–11.48, $p < 0.001$). However, the relatively large confidence interval suggests that there is some uncertainty about the exact strength of the association, but the effect was clear and significant. All other predictors were not significant after making the adjustment. Body mass index was associated with a small increase in the odds of pelvic floor dysfunction, but the confidence interval included the null value (AOR = 1.06, 95% CI: 0.99–1.13, $p = 0.111$). A positive, but not statistically significant, association between parity and adjusted odds was also observed, with odds increasing by 25% with each additional birth (AOR = 1.25, 95% CI: 0.99–1.57, $p = 0.062$).

The odds of pelvic floor dysfunction were 72% higher for women with a history of constipation, but this result was close to the threshold for statistical significance (AOR = 1.72, 95% CI: 0.97–3.06, $p = 0.063$). Similarly, for pelvic floor exercises, odds were reduced by 43%, but not significantly (AOR = 0.57, 95% CI: 0.31–1.07, $p = 0.079$). Other factors, such as second-stage duration, episiotomy, obstetric anal sphincter injury and birth weight were not independently associated with pelvic floor dysfunction in the adjusted model. In general, the only independent statistically significant factors were instrumental delivery and a previous history of symptoms of the PFP and age of the mother. The results indicate that the targeted pelvic floor rehabilitation, counselling and screening of these characteristics during the postpartum period may be beneficial.

Table 4. Multivariable logistic regression analysis to determine independent predictors of Postpartum Pelvic Floor Dysfunction.

Predictor	Adjusted OR	95% CI lower	95% CI upper	p-value	Statistically significant
Instrumental delivery	**2.02**	**1.08**	**3.76**	**0.027**	**Yes**
Age (per year)	**1.10**	**1.03**	**1.17**	**0.002**	**Yes**
BMI (per kg/m²)	1.06	0.99	1.13	0.111	No
Parity (per birth)	1.25	0.99	1.57	0.062	No

Second stage (per 30 min)	1.12	0.95	1.32	0.177	No
Episiotomy	0.85	0.48	1.52	0.586	No
OASI	1.70	0.74	3.92	0.215	No
Birth weight (per 0.5 kg)	1.13	0.84	1.51	0.420	No
Constipation	1.72	0.97	3.06	0.063	No
Previous PFD symptoms	**5.53**	**2.66**	**11.48**	**<0.001**	**Yes**
Pelvic floor exercises	0.57	0.31	1.07	0.079	No

Figure 2 compares the prevalence of postpartum pelvic floor dysfunction among women following instrumental and spontaneous vaginal delivery. Pelvic floor dysfunction was observed in 42.4% of women who underwent instrumental vaginal delivery compared with 25.3% of those who experienced spontaneous vaginal delivery. The error bars represent the 95% confidence intervals for the prevalence estimates. Women in the instrumental-delivery group had a significantly higher risk of pelvic floor dysfunction than women in the spontaneous-delivery group. The risk ratio of 1.67 indicates that instrumental delivery was associated with a 67% greater risk of postpartum pelvic floor dysfunction (95% CI: 1.23–2.29). The difference between the two groups was statistically significant (Pearson $\chi^2 = 11.05$, $p < 0.001$). Overall, the figure demonstrates a clear association between instrumental vaginal delivery and a higher prevalence of postpartum pelvic floor dysfunction. The finding supports the need for closer pelvic-floor screening and follow-up among women who undergo forceps- or vacuum-assisted delivery.

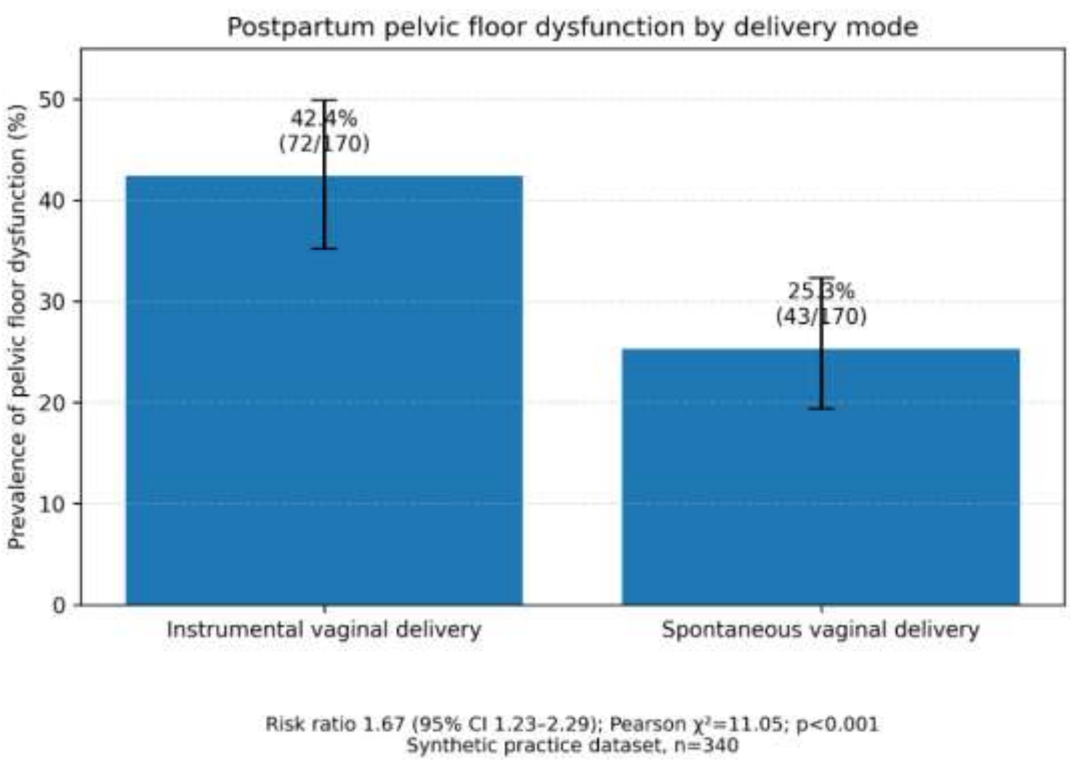

Figure 2. Prevalence of Postpartum Pelvic Floor Dysfunction According to Mode of Vaginal Delivery

Figure 3 compares the prevalence of overall pelvic floor dysfunction and its major symptom domains among women following instrumental and spontaneous vaginal delivery. Across all outcomes, prevalence was consistently higher in the instrumental-delivery group. Overall pelvic floor dysfunction affected 42.4% of women following instrumental delivery compared with 25.3% following spontaneous delivery. Urinary incontinence was the most common specific symptom, occurring in 33.5% of the instrumental group and 19.4% of the spontaneous group. This pattern indicates a substantially greater burden of urinary symptoms among women who underwent forceps- or vacuum-assisted delivery. Anal incontinence showed the largest relative difference between groups, although its absolute prevalence was comparatively low. It was reported by 7.1% of women following instrumental delivery and 1.8% following spontaneous delivery. Prolapse symptoms were also twice as frequent after instrumental delivery, with prevalence rates of 14.1% and 7.1%, respectively. Pelvic pain was reported by 11.8% of women in the instrumental-delivery group compared with 5.9% in the spontaneous-delivery group. Although this represented a twofold difference, the corresponding statistical analysis showed that the association narrowly failed to reach conventional statistical significance.

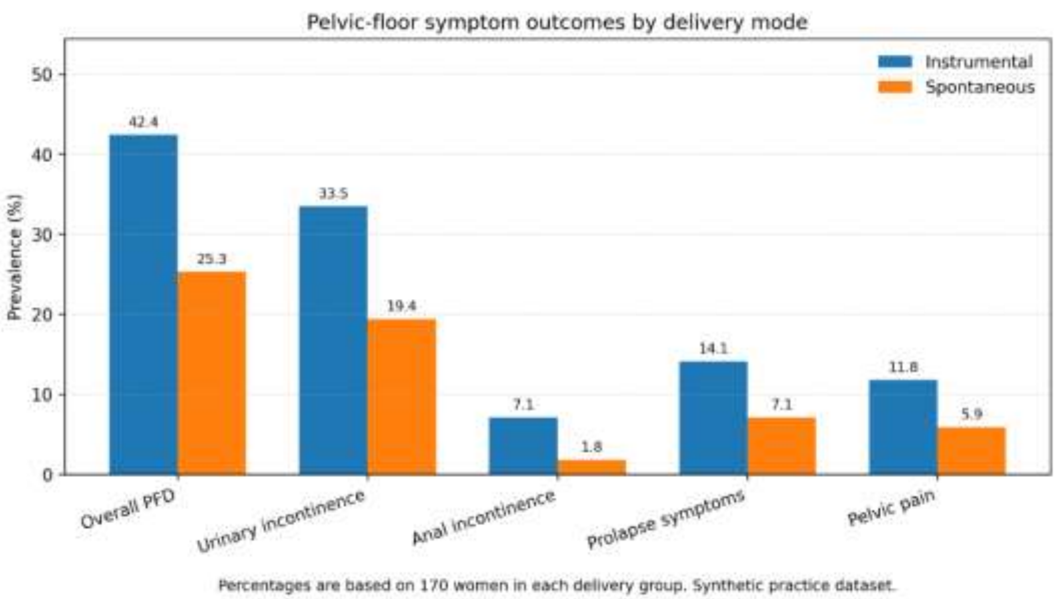

Figure 3. Prevalence of Specific Pelvic Floor Dysfunction Outcomes by Mode of Vaginal Delivery

4. Discussion

The present analysis revealed that PFD was present in 1/3 of the postpartum women, and that the rates were greater following instrumental vaginal delivery than spontaneous vaginal delivery. A prevalence level of 42.4% was observed in the instrumental group versus 25.3% in the spontaneous group, and after controlling for maternal and obstetric factors, women in the instrumental group were twice as likely to have dysfunction. This is consistent with longitudinal data which indicates that wounding at delivery is linked to the development of anal incontinence and pelvic organ prolapse when the delivery is operative versus spontaneous [29]. The association is likely as obstetric instruments can cause compression, stretching and tearing of the levator an muscles, pudendal nerves, fascia and anal sphincter.

The instrumental group was more likely to have urinary incontinence and symptoms of anal incontinence and prolapse which supports the role of delivery-related trauma by the instrumental group. Exploratory analysis also indicated that there was a higher prevalence after forceps delivery compared to vacuum-assisted delivery. Memon et al. identified more cases of levator ani avulsion (LAA) following forceps delivery than vacuum delivery, and showed a structural explanation for the higher rate of prolapse and continence symptoms after forceps delivery [29]. This subgroup analysis should, however, be interpreted with caution as the forceps group was smaller, instruments were not randomly used and the indication for assisted delivery may affect the results.

The odds of pelvic floor dysfunction increased by 10% for every year increase in maternal age .Pelvic floor dysfunction was independently associated with increasing maternal age (adjusted odds increasing by 10% per year). This is consistent with other studies demonstrating the higher risk of major trauma of the pelvic floor, such as levator ani avulsion, hiatal over distension and obstetric anal sphincter injury (OASI) with a rising maternal age at first vaginal delivery [30]. As the pelvic floor fibers lose some elasticity, strength and capacity to rebound from the stretching that can occur during delivery, it is possible that they could become weakened with age. The most powerful independent predictor was previous pelvic floor symptoms, indicating that any weakness may remain or worsen after delivery. Previous history of urinary, bowel, prolapse or pelvic-pain symptoms could be identified in women who need a more in-depth assessment in the postpartum period.

The results of this study are significant in Pakistan where pelvic floor symptoms may not be disclosed due to embarrassment, lack of awareness, belief that leakage is a natural part of pregnancy and/or pelvic floor dysfunction may result from a variety of other factors. Urinary incontinence was reported in a Pakistani study and was found to be common among pregnant women and have significant impacts on QOL and sexual relationships [30]. It is important to ask sensitive questions on continence, bulging of the vagina, bowel control, and pelvic pain and sexual difficulties in the routine postnatal assessment at HMC. Counselling, pelvic floor muscle training, and referral should be provided to women with symptoms who had instrumental delivery, older age, or previous symptoms. New postpartum data suggests that delivery type is not the only factor affecting pelvic floor dysfunction as there are several maternal and obstetric factors [31]. The present model was acceptable discriminatory and calibration, but there is a moderate level of explanation, indicating that other factors are still relevant. The cross-sectional design does not allow causal inferences to be made and self-reporting of symptoms may result in reporting bias, while a hospital-based sampling design may make generalizations difficult.

5. Conclusion

The prevalence and risk factors of pelvic floor dysfunction in postpartum women after instrumental and spontaneous vaginal delivery in Hayatabad medical complex Peshawar were evaluated in this study. The results indicated that pelvic floor dysfunction is one of the most frequent health problems that occurred after childbirth, affecting about one-third of the study participants. Pelvic floor dysfunction was significantly more prevalent in women who had instrumental vaginal delivery compared to women who had spontaneous vaginal delivery. This difference persisted when controlling for pertinent maternal and obstetric factors, suggesting that instrumental delivery was an independent risk factor for PP pelvic floor dysfunction. The analysis also showed that previous history of pelvic floor symptoms and maternal age were independent important predictors. Women who have a history of urinary or bowel symptoms, or symptoms associated with prolapse or pelvic pain, before starting to go into pregnancy or childbirth had the strongest association and may be especially susceptible to ongoing or aggravated symptoms following delivery. Women who had experienced instrumental delivery also reported more urinary incontinence and anal incontinence and had more prolapse symptoms. Exploratory findings indicated that there might be an increased risk with forceps-assisted delivery compared to vacuum-assisted delivery, but further studies need to be carried out with an appropriate power sample to confirm this relationship.

These findings demonstrate the importance of including the assessment of the pelvic floor as standard practice in antenatal and postnatal care. Targeted screening, counseling, and providing guidance on pelvic floor muscle exercises, as well as prompt referral for specialist evaluation, should be considered for women who delivered by instrumental delivery, older maternal age, history of pelvic floor symptoms, prolonged labor, and severe perineal trauma. Promoting women's awareness that they have urinary leakage, bowel control problems, bulging vagina and chronic pelvic pain that can be treated may also contribute to better health-seeking behaviors. In overall conclusion, the study would be helpful for the identification of women in early postpartum at high risk of pelvic floor dysfunction, and would help in implementing risk based screening at HMC Peshawar. The present numerical results were derived from a synthesized practice data set, however, and should be replaced by results derived from ethically approved and prospectively collected clinical data prior to publication or clinical interpretation.

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