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Related Risk Factors for Pelvic Floor Disorders in Postpartum Women: A Cross-sectional Study

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Abstract

Objectives: Pelvic floor disorders (PFDs) during pregnancy and after delivery, and related risk factors are still debatable topics for research. Thus, the aim of the present study was to assess the probable risk factors associated with PFDs in Iran.

Materials and Methods: This cross-sectional study was conducted in two state and private hospitals in Tabriz, Iran from the 1st of June to the 31st of August, 2018. The participants were 650 postpartum women, aged between 15 and 47 years six months after delivery. The type of delivery, type of hospital, history of episiotomy and induction, anesthesia, multiparity, the mother's birth age, the infant's weight and head circumference, the mother's weight gain during pregnancy, and a wide variety of probably related risk factors were studied based on the study objective. According to their answer to the questions of PFDs, 147 women responded yes and completed the Pelvic Floor Distress Inventory-20 questionnaire.

Results: Between the investigated risk factors, type of the hospital (OR: 0.27, CI: 0.126-0.564) and the amount of the mother's weight gain during pregnancy (OR: 1.066, CI: 1.024-1.109) were significantly associated with PFDs. Finally, the number of PFDs and severity of dysfunctions according to PFDI-20 were higher in state hospitals, and excessive weight gain of the mother during pregnancy was related to the higher incidence of PFDs.

Conclusions: Type of the hospital and the mother's weight gain during pregnancy are the only two related risk factors in this study. This study was the first one to discuss the type of the hospital in such related risk factor studies. Accordingly, it is predictable that better supervision of medical attends in state hospitals is highly important for decreasing the rate of PFDs after delivery.

Keywords: Pelvic floor disorders, Risk factors, Post-partum

Introduction

Pelvic floor muscles and fascia close the pelvic bony outlet and give support to pelvic organs. Pelvic floor muscle contractions play an important role in preventing involuntary loss of the urine or rectal contents (1). Hence, according to Hallock and Handa (2), problems in the structures of the pelvic floor may lead to pelvic floor disorders (PFDs) including urinary incontinence (UI), fecal incontinence (FI), and pelvic organ prolapse (POP). UI is a storage symptom and defined as the complaint of any involuntary loss of urine. FI is defined as any involuntary loss of the fecal material and POP is defined as the symptomatic descent of one or more of the anterior vaginal wall(s), the posterior vaginal wall, and the apex of the vagina (cervix/uterus), or vault (cuff) after hysterectomy (3). It has been reported that 23.7% of women in the United States experience at least one type of PFDs which doubles in older women (4). Additionally, 76.7% of Iranian women aged 15-29 years suffer from UI (5) and approximately half of the Iranian women experience some degrees of POP throughout their lives (6).

Although PFDs are rarely life-threatening, the symptoms can reduce the quality of life. If left untreated, they may lead to social isolation, sexual inhibition, job limitations, and potential loss of independence (7). Therefore, PFD is important for determining the predisposing factors according to its high prevalence and bothering nature. Previous studies suggested several factors related to PFDs, including the mode of delivery (7-14), mother age (7-9), number of deliveries (7,8,15,16), episiotomy (9,16), the mother's weight (9,10,14,15,17), the mother's weight gain during pregnancy (10), the infant's birth weight and head circumference (18), and education (16). Other related factors were familial positive history of PFDs (13,17), chronic cough, type of anesthesia, and history of induction (13), the number of pregnancies (13,17), history of instrumental or operative vaginal deliveries (9,10,13,19), and smoking (17,19).

However, many of these factors are related to cultural, ecological, and economic features which may vary across different countries. Thus, determining the most important risk factors of PFD in Iranian women is an issue of interest for domestic health services and families. Therefore,

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Key Messages

- Different risk factors from pregnancy and childbirth affect the prevalence of pelvic floor disorders, which is important to study in most developing countries, including Iran.
- This cross-sectional study was performed to investigate a wide range of risk factors during pregnancy and childbirth.
- The rate of maternal weight gain during pregnancy and the type of hospital and to some extent the type of delivery were identified as risk factors for pelvic floor disorders.
- One of the most important factors for the superiority of a private hospital to a teaching hospital is the use of experienced staff in natural childbirth, which minimizes the damage to the pelvic floor. This problem may be minimized by adequate and continuous supervision by gynecology and midwifery professors in teaching hospitals and needs to be considered in the policy-making of specialized women's hospitals.
- Prescribing a proper diet and supporting low-income families can be effective in reducing injuries.

this study sought to determine the main risk factors throughout a wide range of potential factors that may be related to PFD in Iranian women six months after delivery. A "six months" period is the minimum physiological time for the repair of muscles and connective tissues (20). This study is the first one investigating a wide variety of related risk factors and their relationship using a standardized questionnaire in Iran. The results of this study may help anticipate and prevent some PFDs in postpartum women.

Methods and Materials

Study Design

This cross-sectional observational study was performed to determine the probable risk factors for PFDs due to childbirth according to the recommendations of Strengthening the Reporting of Observational Studies in Epidemiology statement (21).

This study was conducted in two state and private hospitals (Alzahra and Shahriar) in Tabriz, Iran from 1st June to 31st August 2018.

Sample Size Calculation

It was a cross-sectional study and the following formula was used for sample calculation:

$$N = \frac{Z^2_{1-\alpha/2} P(1-P)}{d^2}$$

where $Z^2_{1-\alpha/2} = 1.96$, $\alpha = 0.05$, and the error band was 4%. A total sample size of 648 was obtained by assuming a prevalence of 50% (to get the maximum sample size) and considering the non-response rate of 8%.

Participants

A sample of 650 postpartum women aged between 15 and 47 years (mean ± SD: 28.81 ± 6.22 participated in this study. All participants agreed and signed informed consent forms.

Inclusion and Exclusion Criteria

Women delivered in Alzahra and Shahryar hospitals at Tabriz in least 6 months prior to our data collection and showing a willingness for participation (9) were included in this study. They were excluded if they had urogenital surgeries, mental or cognitive problems (22), pregnancy 6 months after the previous delivery (10), UI, FI, or POP before delivery, and chronic or systemic illnesses such as diabetes, hypertension, and urinary tract infection (9).

Data Collection

Socio-demographic and personal characteristics were obtained from hospital medical records and telephone interviews with each participant.

Among 650 participants, 147 women answered "yes" to the PFD question and filled out the (PFDI-20) Pelvic Floor Distress Inventory (PFDI) short-form (20) questionnaire (23).

According to the previous study (24), a score of 62 in PFDI-20 was set as the base of having PFDs, and 560 women without PFDs and 90 women with detectable signs of PFDs were identified accordingly (Figure 1).

At the beginning of the interview, the main symptoms and complaints of each PFD category were explained for each participant according to the ICS definition by familiar words, and they were asked "Do you have these signs and symptoms?" If the participant answered "yes", she was categorized as with PFDs and the PFDI-20 questionnaire was completed for her.

A validated Persian version of PFDI was used in our study (25). It has 20 questions divided into three subgroups as follows:

1. Urinary Distress Inventory 6 (UDI-6): Six questions for urinary distress inventory having a score of 0-24;
2. Pelvic Organ Prolapse Distress Inventory 6 (POPDI-6): Six questions for POP distress inventory having a score of 0-24;
3. Colorectal-Anal Distress Inventory 8 (CRADI-8): Eight questions for colorectal and distress inventory having a score of 0-32.
4. Each distress is expressed in percentage (%) thus the total score is in the range of 0-300%. The investigated risk factors are listed in Table 1.

Figure 1 shows the number of each group according to PFDI-20 questionnaire results.

Statistical Analysis

All data were entered into SPSS (version 22, IBM Corp) according to questionnaire records and analyzed accordingly. Descriptive data were described as n (%) for categorical variables and as the mean (± standard deviation) for numerical variables and presented in related

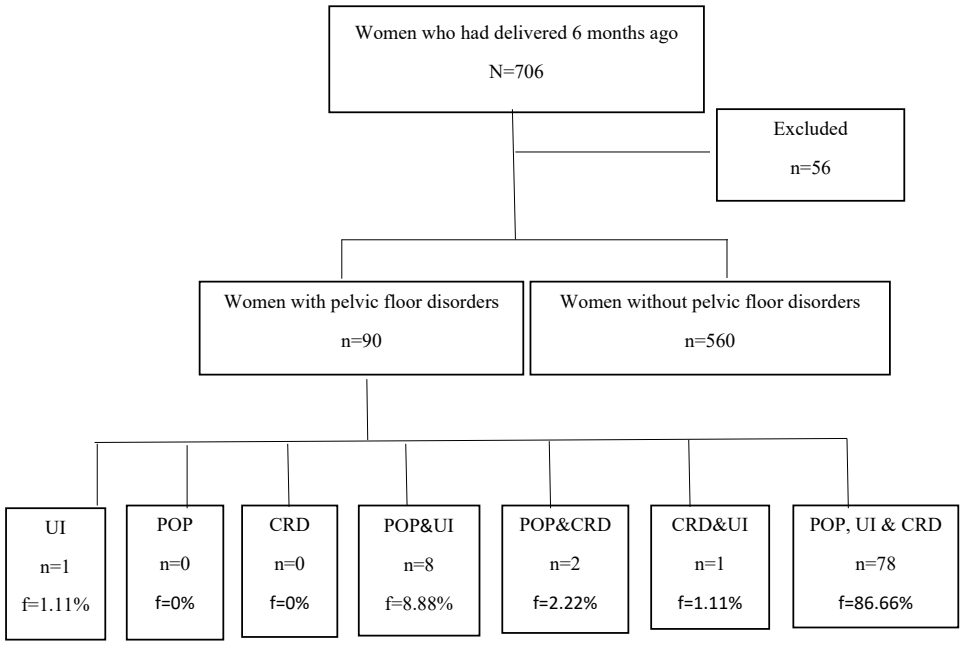

Figure 1. Flow Diagram of the Study. *Note*. UI: Urinary incontinence; POP: Pelvic organ prolapse; CRD: colorectal dysfunction.

tables. The univariable binary logistic model was used to compare the differences between the groups with and without PFD, followed by a mixed binary logistic model to test the association between independent variables and PFD. All predictor variables with $P < 0.2$ were included in the enter/stepwise logistic regression model. The strength of the association was presented as the odds ratio (OR) and a 95% confidence interval.

Results

The descriptive statistics of the participants are represented in Tables 2 and 3. Based on the univariate analysis of categorical qualitative and quantitative factors (Tables 2 and 3, respectively), delivery in state hospitals, the amount of the mother's weight gain during pregnancy, and the type of delivery were significantly associated with PFD in post-partum women ($P < 0.05$).

In the multivariate analysis when the aforementioned variables were entered in the multivariate model, only the type of the hospital (odds ratio [OR]: 0.27, CL: 0.126-0.564) and the amount of the mother's weight gain during pregnancy (OR: 1.066, CL: 1.024-1.109) were significantly associated with PFD. According to PFDI-20, the number of PFDs and severity of dysfunctions were higher in state hospitals, and much weight gain of the mother during pregnancy was related to a higher incidence of PFDs. The results of the logistic multivariate model are summarized in Table 4.

Discussion

This cross-sectional study investigated the related risk factors in Iranian postpartum women six months after delivery.

The results showed that the mother's much weight

Table 1. Studied Risk Factors for PFDs in Postpartum Women

Studied Risk Factors for PFDs in Postpartum Women			
1.	Type of delivery: Vaginal birth or cesarean	2.	Smoking or alcohol
3.	Type of the hospital: Public or state	4.	Educational level
5.	History of episiotomy	6.	History of multiparity
7.	History of induction	8.	Mother's birth age
9.	Anesthesia	10.	Infant's weight
11.	History of surgery in the abdomen, pelvic, or spine	12.	Infant's head circumference
13.	History of back pain	14.	Mother's weight gain during pregnancy
15.	History of chronic coughing	16.	Number of previous pregnancies
17.	Familial positive history of PFDs	18.	Number of previous deliveries

Note. PFD: Pelvic floor disorders.

Table 2. Descriptive Statistics of Categorical Explanatory Variables Selected for the Multiple Logistic-regression Model of Risk Factors for PFDs Among Study Participants Living in Tabriz, Iran, 2017 (n=650)

Characteristics	All	With PFD (%)	Without PFD (%)	OR	CI	*P* Value
Hospital type	650 (100.0%)	90 (100.0%)	560 (100.0%)			
Public	158 (24.3%)	82 (91.1%)	410 (73.2%)	0.267	0.126-0.564	0.001
Private	492 (75.7%)	8 (8.9%)	150 (26.8%)			
Delivery mode	650 (100.0%)	90 (100.0%)	560 (100.0%)			
Cesarean	347 (53.4%)	31 (34.4%)	316 (56.4%)	2.465	1.547-3.927	0.000
Vaginal	303 (46.6%)	59 (65.6%)	244 (43.6%)			
Episiotomy	303 (100.0%)	59 (100.0%)	244 (100.0%)			
Yes	238 (78.5%)	49 (83.1%)	189 (77.5%)	0.701	0.333-1.475	0.350
No	65 (21.5%)	10 (16.9%)	55 (22.5%)			
Induction	303 (100.0%)	59 (100.0%)	244 (100.0%)			
Yes	199 (65.7%)	42 (71.2%)	157 (64.3%)	0.730	0.392-1.360	0.322
No	104 (34.3%)	17 (28.8%)	87 (35.7%)			
Anesthesia mode	347 (100.0%)	31 (100.0%)	316 (100.0%)			
Epidural anesthesia	247 (71.2%)	26 (83.9%)	221 (69.9%)	2.235	0.833-5.997	0.110
General anesthesia	100 (28.8%)	5 (16.1%)	95 (30.1%)			
Multiparity history	650 (100.0%)	90 (100.0%)	560 (100.0%)			
Yes	16 (2.5%)	1 (1.1%)	15 (2.7%)	2.450	320-18.775	0.389
No	634 (97.5%)	89 (98.9%)	545 (97.3%)			
Coughing history	650 (100.0%)	90 (100.0%)	560 (100.0%)			
Yes	35 (5.4%)	4 (4.4%)	31 (5.5%)	1.260	0.434-3.648	0.671
No	615 (94.6%)	86 (95.6%)	529 (94.5%)			
History of surgery in the spine, pelvic, or abdomen	650 (100.0%)	90 (100.0%)	560 (100.0%)			
Yes	24 (3.7%)	3 (3.3%)	21 (3.8%)	0.130	0.330-3.868	0.846
No	626 (96.3%)	87 (96.7%)	539 (96.3%)			
History of dysfunctions in mother or sister	650 (100.0%)	90 (100.0%)	560 (100.0%)			
Yes	26 (4.0%)	1 (1.1%)	25 (4.5%)	4.159	0.557-31.080	0.165
No	624 (96.0%)	89 (98.9%)	535 (95.5%)			
Alcohol or cigar history[a]	650 (100.0%)	90 (100.0%)	560 (100.0%)			
Yes	0 (0)	0 (0)	0 (0)	-	-	-
No	650 (100.0%)	90 (100%)	560 (100%)			
Back pain history	650 (100.0%)	90 (100.0%)	560 (100.0%)			
Yes	46 (7.1%)	5 (5.6%)	41 (7.3%)	1.343	0.516-3.495	0.546
No	604 (92.9%)	85 (94.4%)	519 (92.7%)			
Educational level	650 (100%)	90 (100.0%)	560 (100.0%)	1.024	0.787-1.332	0.860
- diploma	272 (41.8%)	45 (50.0%)	227 (0.5%)	-	-	-
+ diploma and diploma	237 (36.5%)	23 (25.6%)	214 (38.2%)	0.510	0.201-1.292	0.155
Bachelor's	116 (17.8%)	15 (16.7%)	101 (118.0%)	0.276	0.104-0.731	0.010
+ bachelor's	25 (3.8%)	7 (7.8%)	18 (3.2%)	0.382	0.137-1.067	0.066

Note. PFDs: Pelvic floor disorders; OR: Odds ratio; CI: Confidence interval. [a]This variable was not analyzed because no one answered yes in this regard.

Table 3. Definition and Distribution (Mean ± SD) of Quantitative Explanatory Variables Selected for the Multiple Logistic-regression Model of Risk Factors for PFDs Among Study Participants Living in Tabriz, Iran, 2017 (n=650)

Characteristics	All (Mean ± SD)	With PFD (Mean ± SD)	Without PFD (Mean ± SD)	OR	CI	*P* Value
Mothers age	28.81 ± 6.23 (15-47)	29.15±5.90	28.76±6.28	0.990	0.995-1.026	0.575
Infant's weight	3.23 ± 0.43 (1.53-4.80)	3.22±0.41	3.23±0.43	1.088	0.646-1.832	0.752
Infant's head circumference	34.84 ± 1.27 (31-38)	34.76±1.25	34.86±1.28	1.060	0.891-1.261	0.509
Mother's weight gain	10.70 ± 6.08 (0-30)	8.82±6.02	11±6.04	1.066	1.024-1.109	0.002
Number of previous pregnancies	0.77 ± 0.89 (0-5)	0.76±0.90	0.77±0.89	1.020	0.794-1.311	0.876
Number of previous deliveries	0.71 ± 0.86 (0-4)	0.71±0.86	0.71±0.86	1.002	0.773-1.299	0.989

Note. SD: Standard deviation; PFDs: Pelvic floor disorders; OR: Odds ratio; CI: Confidence interval.

Table 4. Final Mixed Logistic-regression Model for PFDs Among Study Participants Living in Tabriz, Iran, 2017 (n= 650)

Characteristics	OR	CI	*P* Value
Hospital type	0.270	0.092-0.797	0.018
Mother's weight grow	1.095	1.023-1.173	0.009

Note. Intercept: -0.771; PFDs: Pelvic floor disorders; OR: Odds ratio; CI: Confidence interval.

gain during pregnancy in Iranian postpartum women and delivery in a state hospital increase the risk of PFDs. According to univariate analysis, the type of delivery was considerable.

In favor of our hypothesis, the higher risk of PFDs in women was related to delivering in state hospitals. Socioeconomic factors such as lesser costs of health care services in state hospitals may make these hospitals "the choice" for people with lower incomes. Moreover, most of these clients have harder life conditions due to their more stressful physical and psychological work and personal situations. Additionally, the economic situation of those women at younger ages may affect their nutrition and this malnutrition causes their tissue weakness including the pelvic floor tissue. Furthermore, procedures are usually performed by experts in private hospitals, in state ones, which are typically educational centers, and procedures are done by less experienced midwifery students and residents, it is obvious that if medical attends have had better supervision, the quality of service had gotten better.

Therefore, the findings revealed that mothers with higher weight gain during pregnancy were at a higher risk of PFDs. This is in line with the results of some other studies (10,26) while being inconsistent with those of some other studies (27,28). Weight gain in pregnancy is the result of the growing fetus and pregnancy-related organs. However, it is not necessarily in relation to the incidence of UI. Hormonal changes such as relaxin during pregnancy protect muscles and ligaments against the effects of weight gain (29).

The type of delivery was considerable in our study. Supported by several studies, vaginal delivery is one of the most important risk factors for PFD (9-12,30) although few studies have reported that the type of delivery does not play an important role in this regard (26,31,32). Vaginal delivery is the major risk factor for the development of POP, as well as UI and FI as a result of damage to the pelvic floor muscles, nerves, and connective tissues (33). It is also associated with a higher number of levator ani muscle injuries, puborectalis defects, increased bladder neck mobility, and enlargement of the hiatal area (30). Furthermore, parameters such as forceps delivery, vacuum extraction, the prolonged second stage of labor, and perineal tears have been indicated as the most important risk factors for postpartum UI, anal incontinence, and sexual dysfunction (34,35).

Conclusions and Suggestions

This study was the first one to evaluate type of the hospital. It could be discussable and useful for the health management system to change some related risk factors. The early identification of these risk factors is extremely important to prevent, diagnose, and treat anything that harms a women's physical and emotional health. Generally, the type of the hospital, type of delivery, and mother's weight gain during pregnancy are really important for preventing future problems. It is suggested that future studies be performed with more accurate tools and objective examinations for the type and severity of dysfunctions.

Limitations

Health status was self-reported or based on medical reports and no medical examination was conducted to diagnose their PFDs. However, a validated questionnaire was used to assess the presence of PFDs.

Our study design was of retrospective cross-sectional type, it would be better if we could do a prospective cohort study.

Authors' Contribution

NS: Project development and data collection; FG: Project development, data collection, and manuscript writing and editing; TG and FA: Statistical analysis, and manuscript writing and editing; MAJ: Statistical analysis.

Conflict of Interests

Authors declare that they have no conflict of interests.

Ethical Issues

This study was approved by the Regional Research Ethics Committee of Tabriz University of Medical Sciences (IR.TBZMED.REC.1397.183).

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