

Predictive Factors of Pelvic Organ Prolapse and the Quality of Life Among Jordanian Women: A Case-Control Study

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Background: Pelvic organ prolapse (POP) is a common gynecological problem. Several risk factors have been identified to contribute to the main pathophysiological mechanism of prolapse development. However, the POP data in the Eastern Mediterranean region, including Jordan, are limited, and the risk factors associated with POP were mainly obesity and high number of vaginal deliveries. Since Jordan has a high prevalence of obesity, parity, and type 2 diabetes, the present study aimed primarily to identify the modifiable and non-modifiable factors associated with POP in Jordanian women, and secondly, to evaluate the impact of POP stages on their quality of life.

Methods: This study was an age-matched case-control study conducted at the gynecology outpatient clinics at Jordan University Hospital from March 1, 2022, to December 15, 2022. The POP quantification system was used as a standardized method to identify the cases and controls. Sociodemographic, obstetrics, and gynecological characteristics were obtained and correlated with POP. Multivariable logistic regression was performed to determine the independent predictive factors of prolapse occurrence. The Prolapse Quality of Life questionnaire was employed to assess the impact of prolapse across the stages of prolapse.

Results: One hundred fifty cases and 150 controls were enrolled in this study, with a median age of 44.5 years. Cystocele and rectocele were the most identified types of prolapse. Nearly 65% of women reported that they had an episiotomy during their deliveries, and 14% reported that there was a family history of prolapse. Multivariable logistic regression revealed that obesity (AOR = 2.31, 95% CI 1.07–5.84, $p = 0.03$), episiotomy (AOR = 2.88, 95% CI 1.41–5.89, $p = 0.004$) and family history of prolapse (AOR = 3.45, 95% CI 1.3–9.2, $p = 0.013$) were associated with POP. Impairment in the quality of life was significantly higher across prolapse severity stages.

Conclusion: In Jordan, obesity, episiotomy, and a family history were associated with POP. Quality of life for women with POP was notably impaired as the severity of the prolapse increased.

Keywords: pelvic organ prolapse, quality of life, odds factors, Jordan

Introduction

Pelvic organ prolapse (POP), part of pelvic floor dysfunction, was defined by international associations¹ as the downward anatomical displacement of any of the following: the anterior vaginal wall, the posterior vaginal wall, the uterus, or the apex of the vagina. It is estimated that 40% of women worldwide will experience POP, and this percentage is expected to rise with the aging of populations.² Although most cases of POP are asymptomatic and do not require treatment,^{3,4} a good percentage of the cases develop several symptoms, including urinary, bowel, sexual, and local symptoms.⁵ These



functional symptoms are related to the abnormal anatomical displacement of the pelvic organ.¹ The symptoms were also found to interfere with daily activities and detrimentally affect women's quality of life (QOL). Fortunately, several treatment modalities are available for POP, including lifestyle changes, physical therapy, use of pessaries, and surgery, of which surgical intervention was found to have a substantial improvement in the quality of life. The success of the treatment was established beyond fixing the anatomical defect, but rather on how it reflects on the quality of life.^{6,7} The reported symptoms, along with clinical examination and with the help of imaging modalities, can lead to the diagnosis of POP.¹ Depending on the method that establishes the diagnosis, the prevalence of POP showed a wide range between 3% and 50%.^{8–10} The lifetime risk of undergoing surgery for POP was found to reach as high as 20%,³ and the recurrence rate was moderately high following repair surgery,^{11,12} presenting POP as a rising health issue concerning women with an impactful economic burden.^{13,14} A recent study showed that the financial burden of managing POP in the United States has increased substantially, with an estimated national cost for POP surgeries was approximately \$1.523 billion per year.¹⁴ Risk factors have been identified to contribute to POP by precipitating the main pathophysiological event of prolapse, which is the disruption of the supportive structures of the pelvis, including the supporting muscles, connective tissue, integral nerve supply, and vasculature. These factors include but are not limited to modifiable factors such as parity, obesity, and non-modifiable factors such as aging, family history of prolapse, and menopause.^{13,15–20} Furthermore, other factors such as chronic cough, constipation, and repeated heavy lifting may contribute to POP.^{4,16}

The POP data in the Eastern Mediterranean region, including Jordan, are limited.²¹ The latter meta-analysis study showed that POP prevalence in the Eastern Mediterranean countries was in the range of 21–57%, and the risk factors associated with POP were mainly obesity and high number of vaginal deliveries.^{22–24} Women's QOL is at higher risk of developing depression symptoms.²⁵ In Jordan, there are no studies on the risk factors associated with POP. Since POP prevalence is high in the region, and Jordan has a high prevalence of obesity, parity, and type 2 diabetes,^{26,27} the present study aimed primarily to identify the modifiable and non-modifiable factors associated with POP in Jordanian women, and secondly, to evaluate the impact of POP stages on their quality of life. It is essential to increase our understanding of the factors associated with POP so that preventative measures can be taken, especially in high-risk women.

Methods

Study Design, Location, and Ethical Approval

This study was an age-matched case-control study conducted at the gynecology outpatient clinics at Jordan University Hospital (JUH) from March 1, 2022, to December 15, 2022. JUH is a tertiary hospital located in Amman, the capital city of Jordan, and serves as a national reference center in urogynecology for women with POP. The study was approved first by the scientific research committee at the Faculty of Medicine of the University of Jordan and then by the Institutional Review Board (IRB) at the University of Jordan Hospital (IRB # 10/2022/4249). The study was performed according to the Declaration of Helsinki. At the time of enrollment, all study participants provided verbal and written consent to participate in the study. Confidentiality of the collected data and findings of clinical examination was assured.

Sample Size

The sample size was calculated by assuming 40% as the exposure probability of the control group, a minimal odds ratio to be detected of 2, α (Type I error) equal to 0.05, and a power of 80%. A total of 280 participants were required to establish the sample size; however, 300 women were enrolled to compensate for any non-response. The case-to-control ratio was 1:1. Data collection and study participant recruitment continued until the sample size was reached.

Study Process and Inclusion and Exclusion Criteria

Based on previous studies that included POP prevalence, women ≥ 30 years old who attended the gynecological clinics were asked to participate in this study (24,28–30). Initially, women who complained from sensation of vaginal bulge, heaviness or a sensible protrusion at or beyond opening of the vagina, lower abdominal or back pain relieved when lying or sitting, sensation of incomplete empty of the bladder, urinary or fecal incontinence, and sexual dysfunction. Eligible cases were confirmed by the Pelvic Organ Prolapse Quantification system (POP-Q) with POP-Q stages ≥ 1 .²⁸ On the

other hand, the control subjects were women attending a gynecology clinic for a reason unrelated to POP and who showed no evidence of prolapse on the clinical examination (Stage 0). The study excluded pregnant women, those with a postpartum period, a medical history of gynecological cancer, chronic illness affecting reproductive health, participants who were unable to perform a deep cough or Valsalva maneuver during POP-Q, and who were unable to provide informed consent. Cases were individually matched to controls based on age (± 2 years), parity, and gravidity to reduce potential confounding factors.

At enrollment, the participants were asked to report on their socio-demographic and lifestyle characteristics, including their age, educational level, occupational status, smoking history, and caffeine use. Furthermore, the presence of chronic medical conditions such as reported asthma, diabetes mellitus (DM), and the obstetrics and gynecological history of the study respondents were obtained. The latter history included information about gravidity, parity, history of vaginal delivery, number of vaginal deliveries, history of cesarean section, number of cesarean section, number of babies ≥ 4 kg at delivery, instrumental delivery, episiotomy, age at first delivery, mode of first delivery, first delivery infant weight (Kg), menopause, and family history of prolapse. Secondly, women were asked about the most common symptoms, according to the International Urogynecological Association (IUGA) and the International Continence Society (ICS),⁵ known to be reported in prolapse including frequency of recurrent urinary tract infections (UTIs), urinary incontinence, incomplete bowel emptying, bulge sensation and feeling of pelvic pressure using. The occurrence frequency scale was ranged from 0 (none of the time) to 4 (all the time). Any study participant who scored ≥ 1 was considered positive for the corresponding symptom.

Thirdly, after completion, every woman underwent a clinical examination performed by trained obstetrics and gynecology residents and confirmed by a urogynecology specialist, who was blinded to the results of Prolapse Quality of Life questionnaire (P-QOL). All women were examined in the lithotomy position and asked to cough or perform Valsalva. The POP-Q utilized in the study is a reliable method that helps identify prolapse by using the hymen as a reference point.²⁸ POP-Q Stage 0 correlates with no prolapse being demonstrated, stage I: the most distal portion of the prolapse is more than 1 cm above the level of the hymen, stage II: the most distal portion of the prolapse is situated between 1 cm above the hymen and 1 cm below the hymen, stage III: the most distal portion of the prolapse is more than 1 cm beyond the plane of the hymen, but not completely everted and stage IV: complete eversion or eversion to within 2 cm of the total vaginal length of the lower genital tract is demonstrated.

Stages and Types of Prolapse

In a joint report by the ICS and the IUGA, types of prolapse were defined as follows: (1) Uterine/cervical prolapse includes the downwards displacement of the uterus or uterine cervix; (2) Vaginal vault (cuff scar) prolapse involves the vaginal vault or cuff scar after hysterectomy; (3) Anterior vaginal wall prolapse involves the anterior vaginal wall and is most commonly due to bladder protrusion (cystocele); and (4) Posterior vaginal wall prolapse involves the posterior vaginal wall and is most commonly due to rectal protrusion (rectocele) or enterocele at higher stages of prolapse (3). Each identified case was assigned to the corresponding stage and type of prolapse. Notably, more than one compartment can be involved in prolapse, and more than one stage can be identified in a single affected individual. The overall severity stage was designated according to the type of prolapse, with the highest stage.

Prolapse Quality of Life Questionnaire (P-QOL)

The P-QOL questionnaire²⁹ underwent translation by two bilingual experts, who translated it into Arabic and then reversed the translation into English. Then, an expert panel of researchers and translators finalized the Arabic version of the P-QOL questionnaire. To establish appearance validity, expert professors evaluated the linguistic integrity of the questions and cultural and norms appropriateness, and reformulated paragraphs to ensure suitability to study objectives. A pilot study was performed on 15 cases and 15 control women who fulfilled the inclusion criteria to assess the questionnaire's comprehensibility, readability, and cultural adjustment validity. The translated P-QOL questionnaire was reported to have strong internal consistency (Cronbach's Alpha Coefficient greater than 0.80), indicating a good reliability coefficient.

P-QOL questionnaire is a validated tool that helps capture the effect of POP on various aspects of women's quality of life.²⁹ P-QOL questionnaire contains 20 questions across nine quality of life domains: Health perception (1 item), prolapse impact (1), role (2), physical (2), social limitations (3), emotional well-being (3) and sleep and energy (2) and severity of symptoms measures (4). Each question is assessed using a four-point scale that assesses the extent to which prolapse influences the quality of life, ranging from "not at all", "slightly", "moderately", and "a lot". Each domain was transformed into values that range from 0 to 100. In all domains except health perception, "0" was reflective of no degree of effect, and 100 was reflective of the highest degree of effect. Regarding health perception, lower scores were used to express poor health perception, while higher scores reflected excellent or good health perception.

The P-QOL data were collected using the interview-guided structured questionnaire by the investigators and qualified research assistants. The data were coded in Excel and were checked and double-checked following the data entry. Then, the data were transferred to Stata for statistical analysis (StataCorp. 2015. Stata Statistical Software: Release 14. College Station, TX: StataCorp LP).

Statistical Analyses

Categorical variables were expressed using frequencies and percentages, and continuous variables were expressed using median with interquartile range (IQR) or mean with standard deviation (SD) following the normality testing. The normality of the continuous variable was checked using the Shapiro–Wilk test. Differences in frequencies or means between POP cases and controls were performed using the Chi-square test for categorical variables and the Mann–Whitney *U*-test for continuous variables. Adjusted multivariable logistic regression was performed to determine factors associated with POP, and the results were expressed as adjusted odds ratio (AOR) with 95% confidence interval (CI). The analysis was adjusted for all confounding factors that reached statistical associations from Chi-square (educational level, BMI, smoking history, caffeine use, DM, gravidity, parity, number of vaginal deliveries, number of infants weighing $\geq$ 4Kg at birth, history of episiotomy, age at first delivery and family history of prolapse). The median values of the reported P-QOL were compared using the Kruskal–Wallis test across POP stages. A *p*-value < 0.05 was considered statistically significant.

Results

Sociodemographic and Obstetric Characteristics of the Study Population

The overall mean ($\pm$ SD) age of the study population was 46.0 ± 10.3 years. Seventy-six percent were housewives, and 41.6% received a college education. Thirty-seven percent of the study population was obese. Regarding smoking history, 16.3% of women reported being current smokers, and 18.3% were past smokers. Nineteen percent of women were diabetic, and 9.7% had asthma (Table 1). The mean ($\pm$ SD) of gravidity and parity among the enrolled women was $6.1 (\pm 3.3)$ and $4.7 (\pm 2.7)$, respectively. Most women (93.7%) reported that they had at least one vaginal delivery, 64.7% of women reported that they had episiotomy during their deliveries, and 14% reported that there was a family history of prolapse (Table 2).

Prolapse Types and Stages

One hundred fifty cases and 150 controls were recruited in this case-control study, yielding 300 participants. Using the POP-Q, we identified the compartment involved and the stage of prolapse in reference to the hymen. The most common POP types were cystocele and rectocele that either occurred alone (15.3 and 17.3%, respectively) or combined (44%) or cystocele and rectocele and with other parts (11.3%) (Figure 1). All in all, 73% of women had cystocele and 73% had rectocele. Furthermore, most prolapse cases (45.3%) had Stage III, 36% had Stage II, 10.7% had Stage I, and 8% had Stage IV (Figure 2).

Factors Associated with POP

In bivariate analysis, several factors showed significant association with POP, which included low educational level ($p = 0.009$), and higher BMI ($p=0.002$) (Table 1). Furthermore, smoking (current or past, $p = 0.042$ or 0.02 , respectively) and caffeine use ($p = 0.013$) were also associated with POP (Table 1).

Table 1 Sociodemographic Characteristics of 150 Pelvic Organ Prolapse Cases and 150 Controls

Variable	Category	Cases		Controls		Total	p
Age	Mean (SD)	46.5 (10.5)		45.6 (10.0)		46.0 (10.3)	0.48
		n	(%)	n	(%)	n (%)	
Educational level	Elementary or below	33	(62.3)	20	(37.7)	53 (17.7)	0.009*
	Secondary/ High school	67	(54.9)	55	(45.1)	122 (40.7)	
	College/ University or higher	50	(40)	75	(60)	125 (41.6)	
Occupation	Housewife	116	(50.9)	112	(49.1)	228 (76)	0.5
	Worker	34	(47.2)	38	(52.8)	72 (24)	
Heavy work	Yes	13	(65)	7	(35)	20 (6.7)	0.073
BMI (Kg/m ²)	≤ 24.9	31	(37.8)	51	(62.2)	82 (27.3)	0.002*
	25 – 29.9	45	(46.9)	51	(53.1)	96 (32)	
	≥ 30	71	(62.8)	42	(37.2)	113 (37.7)	
Smoking history	Current	31	(63.3)	18	(36.7)	49 (16.3)	0.042*
	Past	35	(63.6)	20	(36.7)	55 (18.3)	0.02*
Caffeine use	Yes	112	(54.9)	92	(45.1)	204 (68)	0.013*
Asthma	Yes	19	(65.5)	10	(34.5)	29 (9.7)	0.07
Diabetes Mellitus	Yes	38	(66.7)	19	(33.3)	57 (19)	0.005*

Notes: Values are presented as row frequencies. *Statistically significant p value < 0.05.

Abbreviations: IQR, interquartile range; BMI, body mass index; Kg, kilogram; m², meter squared.

Table 2 Obstetrics and Gynecological Characteristics of 150 Pelvic Organ Prolapse Cases and 150 Controls

Variable	Category	Cases		Controls		Total	p
		n.	(%)	n.	(%)	n.	
Gravidity	Mean ± SD	6.6 ± 3.2	—	5.5 ± 3.3	—	6.1 ± 3.3	0.003*
	<4	23	(31.94)	49	(68.06)	72	<0.001*
	≥ 4	127	(55.7)	101	(44.3)	228	
Parity	Mean ± SD	5.1 ± 2.5	—	4.3 ± 2.8	—	4.7 ± 2.7	0.002*
	< 4	40	(36.7)	69	(63.3)	109	<0.001*
	≥ 4	110	(57.59)	81	(42.41)	191	
History of vaginal delivery	Yes	148	(52.67)	133	(47.33)	281	0.005*
Number of vaginal deliveries	≤ 1	10	(25.64)	29	(74.36)	39 (13)	0.001*
	2–3	38	(47.5)	42	(52.5)	80 (26.7)	
	≥ 4	101	(58.38)	72	(41.62)	173 (57.7)	
History of cesarean section	Yes	30	(47.62)	33	(52.38)	63 (21)	0.54

(Continued)

Table 2 (Continued).

Variable	Category	Cases		Controls		Total	p
		n.	(%)	n.	(%)	n.	
Number of cesarean sections	≤ 1	141	(52.42)	128	(47.58)	269 (89.7)	0.184
	2–3	5	(29.41)	12	(70.59)	17 (5.7)	
	≥ 4	3	(50)	3	(50)	6 (2)	
Number of babies ≥ 4kg at delivery	Mean ± SD	0.8 ± 1.6	—	0.6 ± 1.5	—	0.7 ± 1.6	0.012*
Instrumental delivery	Yes	24	(52.17)	22	(47.83)	46 (15.3)	0.97
Episiotomy	Yes	121	(62.37)	73	(37.63)	194 (64.7)	<0.001*
Age at first delivery	Mean ± SD	21.6 ± 4.3	—	23.0 ± 4.6	—	22.3 ± 4.5	0.005*
	< 25	114	(55.34)	92	(44.66)	206 (68.7)	0.006*
	≥ 25	29	(37.18)	49	(62.82)	78 (26%)	
Mode of first delivery	Cesarean section	10	(45.45)	12	(54.55)	22 (7.3)	0.58
	Vaginal delivery	139	(51.48)	131	(48.52)	270	
First delivery infant weight (Kg)	Mean ± SD	3.2 ± 0.6	—	3.14 ± 0.5	—	3.2 ± 0.5	0.44
Menopause	Yes	62	(53.45)	54	(46.55)	116 (38.7)	0.34
Family history of prolapse	Yes	30	(71.43)	12	(28.57)	42 (14)	0.005*

Notes: Values are presented as row frequencies. *Statistically significant p value < 0.05.

Abbreviations: SD, standard deviation; Kg, kilogram.

Regarding comorbidities, diabetes mellitus was significantly associated with POP ($p = 0.005$). Many obstetrics variables were also significantly associated with POP. Of these were high number of pregnancies and deliveries (≥ 4) ($p < 0.001$), history of vaginal delivery ($p = 0.005$) and the number of vaginal deliveries ($p = 0.001$) (Table 2).

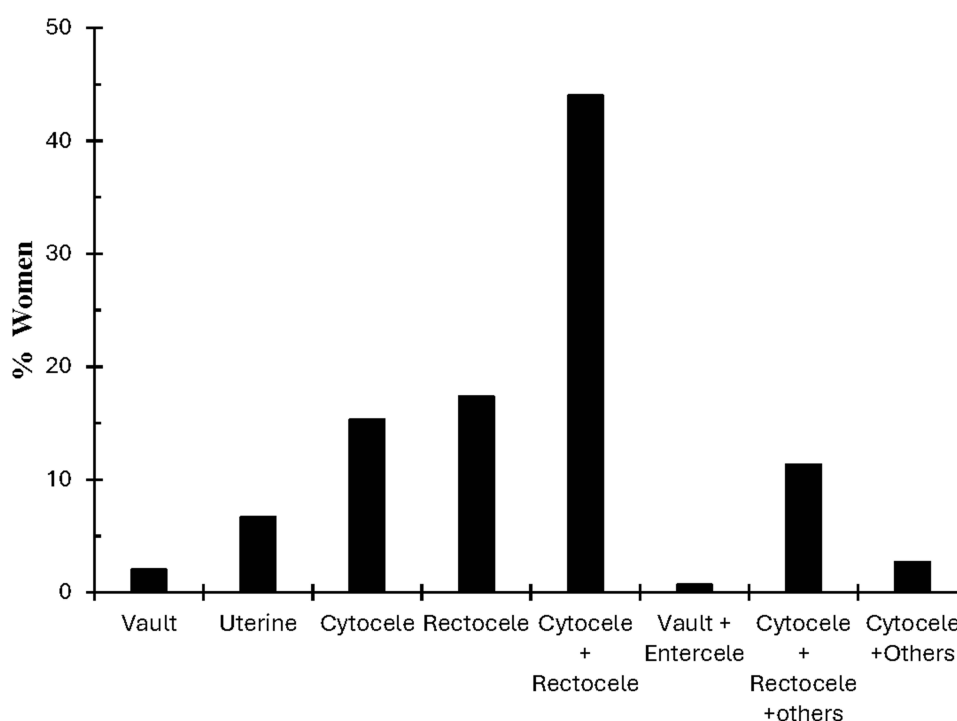


Figure 1 Types of POP among 150 cases in Jordanian women. The most frequent cases of POP were combined cystocele with rectocele, followed by rectocele, and then cystocele.

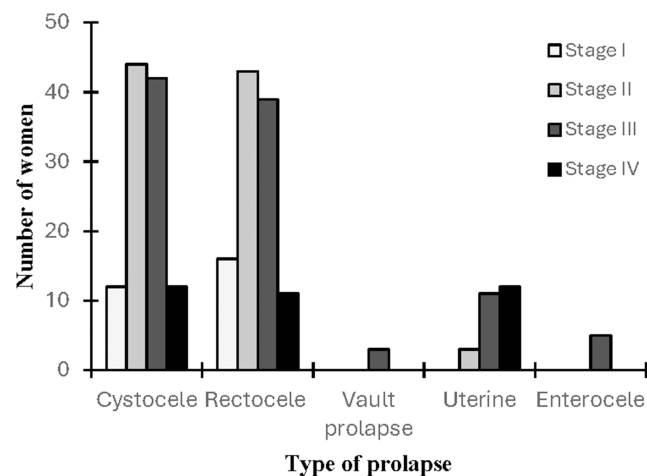


Figure 2 Types of POP are stratified by stage among 150 cases in Jordanian women. Most of the cystocele and rectocele prolapse cases were Stage III followed by Stage II.

Furthermore, episiotomy ($p < 0.001$), age at first delivery ($p = 0.006$), and family history of prolapse ($p = 0.005$) were significantly associated with POP. The higher number of births of a macrosomic baby (≥ 4 KG) was also associated with POP ($p = 0.012$) (Table 2).

The multivariable logistic regression model was performed and adjusted for all significant confounding factors. Of which, high BMI remained an associated factor with a two times higher odds of POP (AOR = 2.31, 95% CI 1.07–5.84, $p = 0.03$) (Table 3). Episiotomy showed approximately three times higher odds of POP than women with no history of

Table 3 Multivariable Logistic Regression for Factors Predictive of Pelvic Organ Prolapse

Variable	Category	AOR	(95% CI)	p
Educational level	Elementary or below	Ref.		—
	Secondary/ High school	0.74	(0.27–1.98)	0.55
	College/ University or higher	0.59	(0.19–1.76)	0.34
BMI (Kg/m ²)	≤ 24.9	Ref.		—
	25 – 29.9	1.94	(0.87–4.35)	0.1
	≥ 30	2.31	(1.07–5)	0.03*
Smoking history	Current smoker (ref: no)	0.89	(0.13–5.84)	0.9
	Past smoker (ref: no)	2.53	(0.43–14.81)	0.3
Caffeine use	Ref: No	1.36	(0.68–2.69)	0.37
Diabetes mellitus	Ref: No	1.85	(0.85–4.04)	0.12
Gravidity	<4	Ref.		—
	≥ 4	1.63	(0.51–5.14)	0.4
Parity	<4	Ref.		—
	≥ 4	0.54	(0.09–3.26)	0.5

(Continued)

Table 3 (Continued).

Variable	Category	AOR	(95% CI)	p
Number of vaginal deliveries	≤ 1	Ref.		—
	2–3	2.37	(0.75–7.49)	0.14
	≥ 4	3.22	(0.49–20.99)	0.22
Number of babies ≥ 4kg at delivery	Mean (SD)	0.97	(0.79–1.18)	0.77
Episiotomy	Ref: No	2.88	(1.41–5.89)	0.004*
Age at 1st delivery	< 25	Ref.		—
	≥ 25	0.57	(0.25–1.27)	0.17
Family history of prolapse	Ref: No	3.45	(1.3–9.2)	0.013*
AUC		0.7731		—

Note: *Statistically significant p value < 0.05.

Abbreviations: AOR, adjusted odds ratio; CI, confidence interval, ref.; reference; BMI, body mass index; Kg, kilogram; m², meter squared; AUC, area under the curve.

episiotomy (AOR = 2.88, 95% CI 1.41–5.89, $p = 0.004$). Furthermore, women with a positive family history of prolapse were at three times higher odds of developing POP compared to those who did not have a family history (AOR = 3.45, 95% CI 1.3–9.2, $p = 0.013$) (Table 3).

POP Symptoms and Quality of Life

The symptoms of recurrent urinary tract infection, incomplete bowel emptying, bulge sensation, pelvic pressure, and incontinence were higher in women with POP compared to controls ($p < 0.001$). However, the frequency of urination was comparable in both groups ($p = 0.15$) (Figure 3A). Regarding symptoms and POP stage, 100% of women in stage IV reported urinary frequency, recurrent UTIs, bulge sensation and pelvic heaviness, as well as urinary and urge incontinence. In addition, as prolapse severity increased, the percentage of women with each symptom (except urinary frequency) significantly increased ($p < 0.001$) (Figure 3B).

Quality of life was measured by the P-QOL and evaluated across the different POP stages (Table 4). Higher limitations in the quality-of-life domains were significantly observed with higher POP staging (stages III and IV). The lowest scored health perception was among stage IV women (Table 4). On the other hand, emotions as feeling depressed, anxious, or bad, were reported higher in women with stage III.

Discussion

In this study, family history of prolapse, high BMI, and history of episiotomy were independently associated with POP in women from Amman, Jordan, and the most common types of prolapse were cystocele and rectocele. Although it is not surprising to link the above factors to POP, the bivariate analysis also showed that multiparity and vaginal delivery were significantly associated with POP. Despite not yielding statistical significance in the multivariate model, prior reports from different populations have established that parity is a well-established risk factor for prolapse.^{15,25,26,30–37} In a 5-year longitudinal study from the United States, Blomquist et al³⁸ have linked the cumulative incidence of POP with pelvic muscle strength following vaginal births but not with cesarean delivery. On another note, a study conducted in the Democratic Republic of Congo aligned with our findings regarding parity, which explained that the circumstances surrounding birth hold greater significance than merely the number of births.³⁶

Several studies have found that obesity is associated with POP,^{33,34,37,39} mainly due to the increase in intra-abdominal pressure that causes weakening of pelvic floor muscles and fascia.³⁹ Moreover, conditions such as asthma, which also lead to chronic increases in intra-abdominal pressure, have been shown to contribute to pelvic floor stress without significant

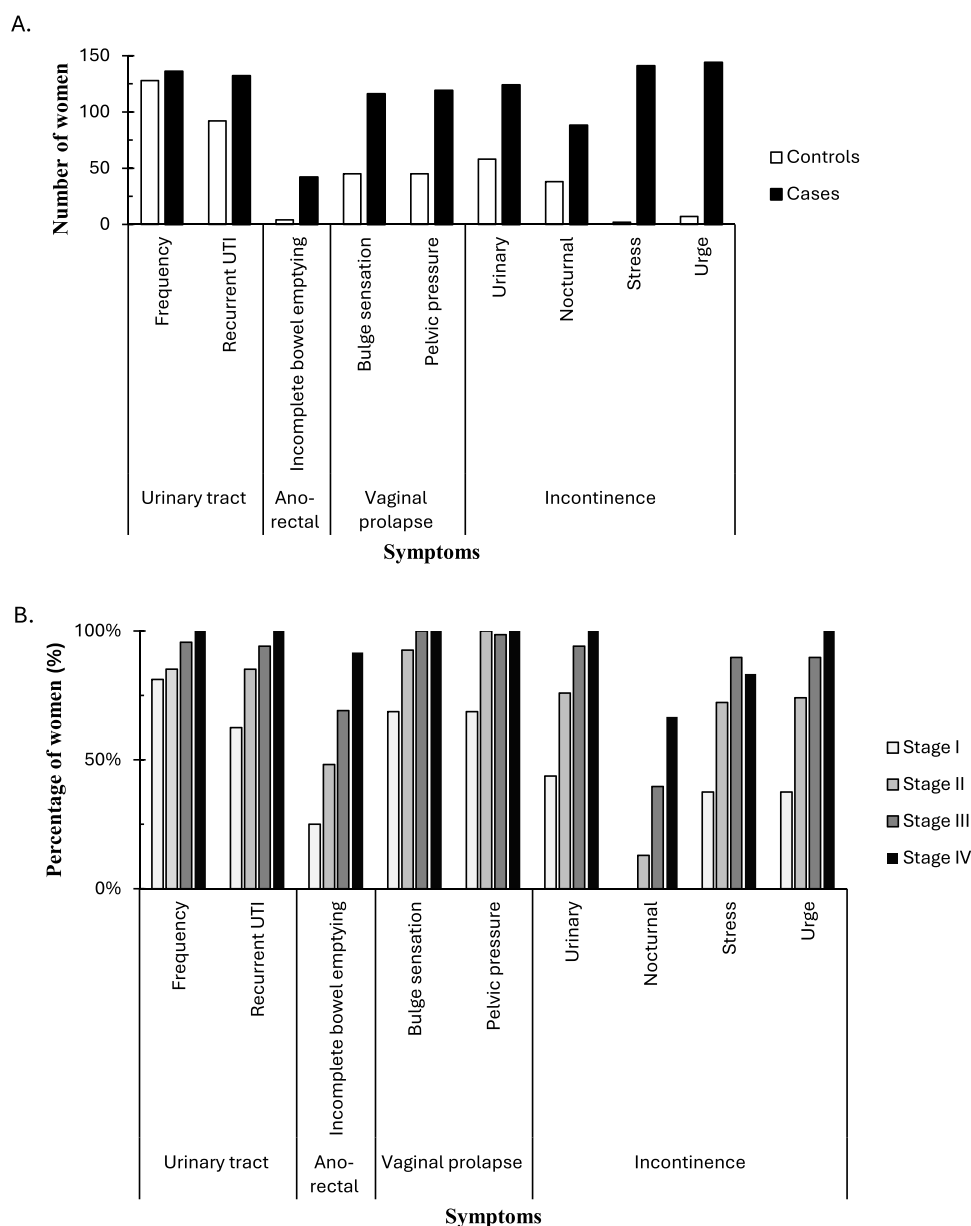


Figure 3 The reported symptoms among (A) the 150 POP cases and controls, and (B) among POP cases with staging in Jordanian women. (A) The symptoms of recurrent urinary tract infection, incomplete bowel emptying, bulge sensation, pelvic pressure, and incontinence were higher in women with POP compared to controls ($p < 0.001$), but not the frequency of urination. (B) All women (100%) in Stage POP IV reported urinary frequency, recurrent UTIs, bulge sensation, and pelvic heaviness, as well as urinary and urge incontinence. The percentage of women with each symptom (except urinary frequency) significantly increased ($p < 0.001$) with high staging.

differences in outcomes, consistent with findings by Gillor et al.⁴⁰ On the other hand, some studies demonstrated that a low BMI (< 18) is also associated with a higher risk of prolapse.^{35,36} Ilunga-Mbaya et al.³⁶ explained their findings by considering that obese women were from better socioeconomic backgrounds and therefore were less likely to be exposed to other factors that can contribute to POP. A cross-sectional study highlighted that women engaged in manual labor and those with an annual household income less than \$10,000 exhibited an increased likelihood of severe POP, defined as protrusion extending 1 cm beyond the hymen. These findings suggest a nexus between occupational demands, socioeconomic status, and POP severity since they are associated with other factors, such as frequent heavy lifting and limited access to healthcare, that may contribute to the observed associations.⁴¹ Regardless of the latter findings, obesity is associated with POP in Jordanian women and in many other populations.^{33,34,37,39} Since obesity is also associated with other chronic diseases, it is essential to combat this phenomenon in Jordanian women by applying a community-based multiple strategies.²⁷

Table 4 Quality of Life Among Pelvic Organ Prolapse Cases Measured by the Prolapse Quality of Life (P-QOL)

Quality of Life	POP Stage				p
	Stage I	Stage II	Stage III	Stage IV	
	Median (IQR)				
Health perception	80 (70–80)	80 (60–80)	80 (60–80)	60 (60–80)	0.04*
Prolapse impact	0 (0–0)	0 (0–50)	37.5 (0–75)	50 (37.5–62.5)	0.001*
Role limitations	0 (0–18.8)	12.5 (0–25)	25 (0–50)	25 (12.5–62.5)	0.022*
Physical/ social limitations	0 (0–18.8)	6.3 (0–25)	25.0 (6.3–50.0)	34.4 (18.8–46.9)	0.002*
Personal relationships	29.2 (12.5–33.3)	33.3 (16.7–58.3)	41.7 (25.0–58.3)	58.3 (41.7–66.7)	0.003*
Emotions	8.3 (0–37.5)	25.0 (8.33–41.7)	50.0 (16.7–70.8)	37.5 (16.7–54.2)	0.0007*
Sleep/Energy	12.5 (12.5–37.5)	25.0 (12.5–62.5)	50 (25–75)	50.0 (31.3–75.0)	0.003*
Severity measures	0 (0–0)	0 (0–50)	50.0 (12.5–100.0)	50.0 (50.0–62.5)	0.0001*

Notes: Values are presented as medians with IQR (25% percentile – 75% percentile). *Statistically significant p value < 0.05.

Abbreviations: POP, pelvic organ prolapse; IQR, interquartile range.

In the current study, 65% of the cases reported at least one delivery where they had undergone episiotomy. Although this study comprised only 300 cases, the percentage of episiotomy use is similar to other studies from the Middle East area, and much higher than in the United States, Canada, or the World Health Organization's recommendation.⁴² Furthermore, this study showed that episiotomy was associated with POP. The current findings were consistent with prior reports from Congo and Hungary.^{36,37} On the other hand, a cohort study from the United States reported that perineal laceration and forceps delivery significantly increased the odds of prolapse, but not episiotomy.⁴³ Additional studies have further suggested that women who underwent assisted vaginal delivery faced a fourfold increase in the likelihood of developing prolapse compared to those who did not, attributed to the potential injury inflicted by instruments on the supportive structures of the pelvis.³⁵ However, instrumental delivery using forceps or vacuum in the present study did not show statistical significance as a predictive factor of prolapse, possibly because it is not a common practice in the JUH.

Pelvic organ support is established due to the continuous contraction of the levator ani muscle and the integrity of the surrounding connective tissue, which is made of fiber and collagen and provides essential support despite any increase in intra-abdominal pressure. Compromise of the integrity of these structures, which can occur during parturition, has been proposed to contribute to pelvic floor dysfunction.⁴⁴ For instance, collagen plays an integral role as a muscle component and in the strength of the pelvic floor fascia. Considering the genetic attribution to the quality of the body's collagen, a family history of prolapse has been recognized as a risk factor for prolapse development. In the current study, women with a positive family history of prolapse were associated with POP. The current finding is supported by a similar study from Japan.¹⁷ The presence of certain types of collagens, such as collagen type 3 alpha 1 (COL3A1) rs1800255 genotype AA, has shown a 4.7 times higher risk in the development of POP,^{13,45} and also single nucleotide polymorphisms (SNIP) in the enzyme involved in collagen and elastin fiber maturation was linked to POP occurrence.⁴⁶ More studies on SNIP are needed to pinpoint the hereditary effect of POP in Jordanian women.

In the present study, the quality of life showed significant deterioration across the POP stages. Symptoms of vaginal prolapse, anorectal, urinary and sexual dysfunction were related to POP.⁵ These symptoms emerge due to the anatomical disturbance of the surrounding pelvic organs when prolapse occurs. In our study, the highest percentage of women who reported positive symptoms was among those with stage IV. An observational study assessed POP stages and the presence of seven related symptoms; sensation or visualization of a vaginal bulge, low back pain at the end of the day or after standing, urinary, fecal, or flatus incontinence and splinting to defecate along with their associated bother. The study established a significant linear association between the extent of descent of the leading edge of prolapse in relation to the

hymen and the symptoms, along with an escalation in reported bother, particularly when the leading edge of prolapse extended by +1 cm beyond the hymen, a trend that was more apparent as the descent beyond the hymen increased (+4 through +7).¹⁰ Other reports showed weak to moderate correlation regarding increase in symptoms and increase in prolapse severity and even showed inverse correlation between urinary incontinence, stress urinary incontinence, and enuresis with the increasing severity of anterior vaginal wall prolapse.⁴⁷

Prolapse entails emotional distress, encompassing a spectrum of feelings ranging from frustration to anxiety and depression. Compromised emotional well-being can also hinder individuals from seeking medical care.⁴⁸ In the current study, quality of life was expressed using the P-QOL questionnaire, which compared the reported medians with IQR across POP stages. It was apparent that when the stage of prolapse was higher, the level of impairment and the perception of health became significantly worse, further demonstrating that POP was a morbid condition that infiltrated several aspects of quality of life. Nonetheless, in a follow-up study that assessed quality of life among women who underwent POP repair surgery using multiple validated instruments, including P-QOL, significant impairment was noted in the personal and physical aspects.⁴⁹ However, this detrimental effect was significantly alleviated in women who had undergone surgery, as observed by the decrease in the impairment scores of the quality of life.⁴⁹ Furthermore, the pelvic floor exercises can improve the symptoms in mild and moderate cases of POP,⁵⁰ and other treatments such as selective estrogen receptor modulators may improve urinary incontinence and reduce UTI associated with POP,^{51,52} as well as vaginal native tissue repair that may improve POP-related symptoms and QOL.⁷ Although pelvic exercise was not addressed in the present study, it should be encouraged at the gynecology clinics and nationally implemented for all women in Jordan.

The current study has limitations. The nature of the study required participants to recall obstetrical events, experienced symptoms, and the impact of their prolapse on their quality of life, which could subject our data to recall bias and over- or underestimation. Furthermore, although JUH is a tertiary hospital that serves many women in Amman, the capital, and the communities around Amman, it still lacks generalization of the risk associated with POP to the Jordanian population. In addition, the reported symptoms were evaluated as an occurrence frequency; any positive symptom reported was accounted for. However, the presence of symptoms does not indicate the extent of bother, subjecting our results to overestimation. Further studies evaluating the occurrence of prolapse symptoms and their associated bother are warranted using validated questionnaires. However, among the strengths of the study was the use of a validated and reliable method in identifying the cases and controls (POP-Q), and a validated instrument that can reliably capture the impact on the quality of life (P-QOL) was used.

In conclusion, the present study showed that obesity, family history of prolapse, and episiotomy were associated with POP in Jordanian women. Cystocele and rectocele were the most common types of prolapse observed among the cases. Quality of life was notably impaired as the severity of the prolapse increased. This study provides baseline data for further warranted epidemiological studies on multiparity, instrumental delivery, and genetic predisposition studies to advance knowledge on POP in Jordan and the Eastern Mediterranean region in order to reduce the risk of developing POP.

Data Sharing Statement

The datasets used and/or analysed during the current study are available from the corresponding author upon request.

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Disclosure

The authors declare that they have no conflicts of interest in this work.

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