

Prevalence of Pelvic Floor Dysfunction among Women in the Qassim Region, Saudi Arabia

Emad Alwashmi^{1*}, Yaqeen Alrubaish¹, Haifa Alfouzan¹, Faris Alhumaid¹, Marya Algblan¹, Ibrahim Alrsaini¹, Raghad Albarrak¹, Abdurahman Alsughayyir¹, Saleh Alwashmi¹, Abdullah Alresheedi¹

College of Medicine, Qassim University, Buraydah, Kingdom of Saudi Arabia

Abstract

Background: Pelvic floor dysfunction (PFD) in women is attributed to several disorders that affect the supporting structures of the female pelvic organs and cause urinary incontinence, pelvic pain, and sexual dysfunction. Studies indicate a significant global prevalence of pelvic floor dysfunction, affecting almost half of the women worldwide. At the same time, the complex underlying mechanisms and specific risk factors remain complex. This study aims to investigate the prevalence of PFD in the Qasim region of Saudi Arabia.

Methods and Results: The cross-sectional study involved 427 women in the Qassim region. The study utilized a convenience sampling technique to recruit participants. The questionnaire, covering socio-demographic data, clinical characteristics, and risk factors, was distributed online through social media platforms like Telegram and WhatsApp. The data collected was analyzed using SPSS version 27.0.

The four components of PFD (sexual function, bowel function, prolapse symptoms, and bladder function) were analyzed. The prevalence of sexual function, bowel function, prolapse symptoms, and bladder function were 42.5%, 42.8%, 58.2%, and 63.3%, respectively. In each group, there were statistically significant differences ($P < 0.05$) in the following areas: age at first pregnancy, history of abdominal or perineal surgery, history of using laxatives and non-steroid anti-inflammatory medicine, and prevalence of bowel dysfunctions.

Conclusion: Our study highlights a high prevalence of PFD among women in the Qassim region of Saudi Arabia. Targeted public health interventions and the development of clinical guidelines for effective prevention and treatment of PFD are reasonable and necessary. (*International Journal of Biomedicine*. 2024;15(1):112-118.)

Keywords: pelvic floor • prolapse • bladder dysfunction • bowel dysfunction

For citation: Alwashmi E, Alrubaish Ya, Alfouzan H, Alhumaid F, Algblan M, Alrsaini I, Albarrak R, Alsughayyir A, Alwashmi S, Alresheedi A. Prevalence of Pelvic Floor Dysfunction among Women in the Qassim Region, Saudi Arabia. *International Journal of Biomedicine*. 2024;15(1):112-118. doi:10.21103/Article15(1)_OA10

Introduction

Pelvic floor dysfunction (PFD) encompasses a range of interrelated clinical disorders affecting the pelvic floor in many adult women.¹ These disorders include urinary incontinence, pelvic organ prolapse, fecal incontinence, and pelvic-perineal pain syndrome.² According to Wu et al.³, most adult women have at least one of these dysfunctions that form PFD. Pelvic floor dysfunction significantly impacts patients' quality of life, influencing their mobility, sexual health, and social and psychological well-being.⁴

Due to the sensitive nature of the pelvic floor region, PFD impairs a person's ability to perform daily tasks and

maintain personal and intimate relationships. The prevalence of pelvic floor problems ranges from just below 2% to almost 50% across different regions and age groups.⁵ Specifically, the prevalence of pelvic organ prolapse ranges from 3% to 50%.^{6,7} Effective public health policies to address PFD require detailed research on prevalence rates and associated risk factors within specific regions.

Current data on the prevalence of PFD in Saudi Arabia are either inconclusive or too general to inform region-based health decisions.⁸ Further, most authors recommend additional research to understand better the condition, its risk factors, and ways of reducing the development of associated pathologies. As knowledge and awareness of PFD continue to rise, the

need to enhance existing information on the condition is also high. Additionally, most existing data on the condition's prevalence mainly focuses on urinary incontinence.² Yet, according to Walker et al.,¹⁰ the other conditions, which include pelvic organ prolapse, fecal incontinence, and pelvic-perineal region pain syndrome, are similarly prevalent as urinary incontinence. Among the PFD patients who give birth experiencing urinary incontinence, 50% experience pelvic organ prolapse, and 10% experience fecal incontinence. Affected women's psychological, social, and sexual well-being frequently significantly worsens as a result of these illnesses.¹¹ According to a recent study by Elbiss et al.,¹² PFD frequently goes undiagnosed and untreated. This emphasizes the need for improved screening procedures and patient and healthcare provider education to promote early detection and intervention. This study aims to investigate the prevalence of PFD in the Qasim region of Saudi Arabia.

Materials and Methods

Study Design

This research utilized a cross-sectional design and was carried out between September 2023 and March 2024. The study encompassed the adult population of the Qassim Region, Saudi Arabia. The primary objective was to determine the prevalence of pelvic floor dysfunction among women in this region.

Inclusion and Exclusion Criteria

Adult females living in the Qassim region who were willing to engage in the study and who were at least 18 years old met the inclusion criteria. The exclusion criteria included males, females under 18, and individuals living outside the Qassim region.

Sampling Technique

A convenience sampling technique was employed to recruit respondents based on their availability and willingness during the data collection period. While convenient, this technique may limit the generalizability of the findings.

Sample Size

We determined the sample size using the Cochran sample size approach, as outlined

$$n = d^{-2} Z^2 p(1-p),$$

where n represents the sample size, Z denotes the critical statistic for a 95% confidence interval, p signifies the anticipated prevalence set at 25%, and d is the margin of error set at 0.05. The minimum acceptable sample size was found to be 288; however, we opted for a larger sample size of 427 respondents.

Data Collection Tools and Procedures

A questionnaire was designed based on the study's objectives and relevant literature. Instead of piloting, a validated instrument previously tested for feasibility, understandability, and readability was used. The questionnaire, covering socio-demographic data, clinical characteristics, and risk factors, was distributed online through social media platforms such as Telegram and WhatsApp.

Following the data collection phase, a comprehensive data cleaning process was conducted. The process

involved removing duplicates, scrutinizing for outliers, and addressing missing entries. Later, the Sciences (SPSS) program version 27.0 was used to code and enter the data. Baseline characteristics were summarized as frequencies and percentages for categorical variables. Group comparisons concerning categorical variables were performed using the Chi-square test. A probability value of $P < 0.05$ was considered statistically significant.

Ethical Considerations

The study was conducted in accordance with the ethical principles of the WMA Declaration of Helsinki (1964, ed. 2013) and approved by the Ethics Committee of Qassim University. Written informed consent was obtained from all participants.

Results

Demographic data analysis showed that 410 individuals (9.2%) were Saudis, 305(71.1%) were under 40 years old, 246(57.6%) were married, and 361(84.6%) had completed post-secondary education. Only 166(38.9%) women had jobs. Furthermore, 5.15% of the study population were smokers. Regarding BMI, 162 individuals (37.9%) had a normal BMI, while 112(26.2%) were overweight and 117(27.3%) were obese (Table 1).

Table 1.

Demographic characteristics of the study participants (n= 427).

Variable	Category	n (%)
Nationality	Saudi	410 (96.0%)
	Non-Saudi	17 (4.0%)
Age	18-29	192 (45.0%)
	30-39	113 (26.5%)
	40-49	90 (21.1%)
	50-59	30 (7.0%)
	60 and above	2 (0.5%)
Marital status	Married	246 (57.6%)
	Separated	22 (5.2%)
	Single	157 (36.8%)
Education	Primary level	17 (4.0%)
	Secondary level	49 (11.5%)
	Intermediate level	20 (4.7%)
	College level	341 (79.9%)
Occupation	Student	101 (23.7%)
	Working	166 (38.9%)
	Not working	160 (37.4%)
Smoking status	Smoker	22 (5.15%)
	Non-smoker	405 (94.8%)
BMI	Nonresponse (no exact data on height and weight)	2 (0.5%)
	Underweight	34 (8.0%)
	Normal weight	162 (37.9%)
	Overweight	112 (26.2%)
	Obese	117 (27.4%)

Among 427 respondents, 142 women (33.3%) had previously taken laxatives and non-steroidal anti-inflammatory drugs, 212(49.6%) had given birth spontaneously, 131(30.7%) had more than one cesarean section, and different birth instruments were used for 64(15%) women (Table 2). Additionally, 175(41%) respondents were over 20 years old when they became pregnant for the first time. Furthermore, 194(45.4%) participants had one or more episiotomies. Furthermore, 176(41.2%) reported a history of heavy weight lifting, and 138(32.3%) reported a history of perineal or abdominal surgery.

Table 2.
Clinical characteristics of the study participants.

Variable	Category	n (%)
History of taking laxatives and non-steroidal anti-inflammatory drugs	Yes	142 (33.3%)
	No	285 (66.7%)
Number of spontaneous virginal births	0	215 (50.4%)
	1	45 (10.5%)
	2	42 (9.8%)
	3	43 (10.1%)
	4	27 (6.3%)
	>4	55 (12.9%)
Number caesarean sections	0	296 (69.3%)
	1	60 (14.1%)
	2	39 (9.1%)
	>2	32 (7.5%)
Incidences of birth with tools	None	363 (85.0%)
	Tweezers	20 (4.7%)
	Suction	44 (10.3%)
Age at first pregnancy	Unknown	42 (9.8%)
	Not yet	161 (37.7%)
	≤19	49 (11.5%)
	20-29	154 (36.1%)
	30-39	20 (4.7%)
	≥40	1 (0.2%)
Number of episiotomies	0	233 (54.6%)
	1	75 (17.6%)
	2	57 (13.3%)
	3	29 (6.8%)
	>3	33 (7.7%)
	History of lifting heavy weights	Yes
	No	251 (58.8%)
History of abdominal or perineal surgery	Yes	138 (32.3%)
	No	289 (67.7%)

Table 3 demonstrates the prevalence of the four components of PFD (sexual function, bowel function, prolapse symptoms, and bladder function), which ranged from 42.5% to 63.3%. The component with the highest prevalence was connected to bowel dysfunction, while the

component with the lowest prevalence was related to bladder functional issues.

Table 3.
Prevalence of PFD components.

Components	n (%)	95% CI
Bladder dysfunctions	182 (42.6%)	39.5–45.4
Bowel dysfunctions	271 (63.5%)	60.1–66.5
Prolapse symptoms	183 (42.8%)	39.6–45.9
Sexual dysfunctions	249 (58.3%)	55.1–61.5

A statistically significant association was found between age and the prevalence of bladder function problems ($P=0.002$), with individuals aged 40 years and above having a higher prevalence than those below 40 years (Table 4). Additionally, the number of spontaneous vaginal births and the number of episiotomies were significantly different ($P<0.05$), with a higher prevalence in those who had four or more spontaneous births and in those who had one or more three episiotomies.

Table 4.
The factors associated with the prevalence of bladder function problems

Factors	Present n (%)	Absent n (%)	P-value
Nationality			0.685
Saudi	175 (42.7%)	235 (57.3%)	
Non-Saudi	7 (41.2%)	10 (58.8%)	
Age group			0.002
18-29	66 (34.4%)	126 (65.6%)	
30-39	46 (40.7%)	67 (59.3%)	
40-49	49 (54.4%)	41 (45.6%)	
50-59	20 (66.7%)	10 (33.3%)	
60 and above	1 (50%)	1 (50%)	
Marital status			0.255
Married	112 (45.5%)	134 (54.5%)	
Separated	11 (50%)	11 (50%)	
Single	59 (31.7%)	100 (62.9%)	
BMI			0.052
Underweight	12 (35.3%)	22 (64.7%)	
Normal Weight	55 (34.0%)	107 (66.0%)	
Overweight	56 (50.0%)	56 (50.0%)	
Obese	59 (49.6%)	60 (50.4%)	
History of taking laxatives and non-steroidal anti-inflammatory drugs			0.146
Yes	69 (48.6%)	73 (51.4%)	
No	113 (39.6%)	172 (60.4%)	
Number of spontaneous virginal births			0.019
0	76 (35.3%)	139 (64.7%)	
1	21 (46.7%)	24 (53.3%)	
2	20 (47.6%)	22 (52.4%)	
3	17 (39.5%)	26 (60.5%)	
4	17 (63.0%)	10 (37.0%)	
>4	31 (56.4%)	24 (43.6%)	

Table 4 (continued).

The factors associated with the prevalence of bladder function problems.

Factors	Present n (%)	Absent n (%)	P-value
Age at first pregnancy			0.070
Not yet pregnant	74 (36.5%)	129 (63.5%)	
≤19	25 (51.0%)	24 (49.0%)	
20-29	72 (46.8%)	82 (53.2%)	
30-39	11 (55.0%)	9 (45.0%)	
≥40	0 (0.00%)	1 (100.0%)	
Number of episiotomies			0.010
0	82 (35.2%)	151 (64.8%)	
1	43 (57.3%)	32 (42.7%)	
2	27 (47.4%)	30 (52.6%)	
3	12 (41.4%)	17 (58.6%)	
>3	18 (54.5%)	15 (45.5%)	
History of lifting heavy weights			0.677
Yes	76 (43.2%)	100 (56.8%)	
No	106 (42.2%)	145 (57.8%)	
History of abdominal or perineal surgery			0.071
Yes	69 (50.0%)	69 (50.0%)	
No	113 (39.1%)	176 (60.9%)	

There was a statistically significant difference ($P<0.05$) in the associations between the prevalence of bowel dysfunctions and the following factors: age at first pregnancy, history of abdominal or perineal surgery, history of using laxatives and non-steroidal anti-inflammatory drug use, and marital status (Table 5).

Table 5.

The factors associated with the prevalence of bowel dysfunctions.

Factors	Present n (%)	Absent n (%)	P-value
Nationality			0.108
Saudi	257 (62.7%)	153 (37.3%)	
Non-Saudi	14 (82.4%)	3 (17.6%)	
Age group			0.251
18-29	112 (58.3%)	80 (41.7%)	
30-39	76 (67.3%)	37 (32.7%)	
40-49	61 (67.8%)	29 (32.2%)	
50-59	20 (66.7%)	10 (33.3%)	
60 and above	2 (100%)	0 (0.00%)	
Marital status			0.035
Married	169 (68.7%)	77 (31.3%)	
Separated	12 (54.5%)	10 (45.5%)	
Single	90 (56.6%)	69 (43.4%)	

Table 5 (continued).

The factors associated with the prevalence of bowel dysfunctions.

Factors	Present n (%)	Absent n (%)	P-value
BMI			0.151
Underweight	18 (52.9%)	16 (47.1%)	
Normal weight	106 (65.4%)	56 (34.6%)	
Overweight	76 (67.9%)	36 (32.1%)	
Obese	71 (59.6%)	48 (40.4%)	
History of taking laxatives and non-steroidal anti-inflammatory drugs			0.029
Yes	101 (71.1%)	41 (28.9%)	
No	170 (59.6%)	115 (40.4%)	
Number of spontaneous virginal births			0.193
0	128 (59.5%)	87 (40.5%)	
1	29 (64.4%)	16 (35.6%)	
2	28 (66.7%)	14 (33.3%)	
3	26 (60.5%)	17 (39.5%)	
4	17 (63.0%)	10 (37.0%)	
>4	43 (78.3%)	12 (21.8%)	
Age at first pregnancy			0.042
Not yet pregnant	115 (56.7%)	88 (43.3%)	
≤19	31 (63.3%)	18 (36.7%)	
20-29	110 (71.4%)	44 (28.6%)	
30-39	15 (75.0%)	5 (25.0%)	
≥40	0 (0.00%)	1 (100.0%)	
Number of episiotomies			0.080
0	138 (59.2%)	95 (40.8%)	
1	51 (68.0%)	24 (32.0%)	
2	34 (59.6%)	23 (40.4%)	
3	23 (79.3%)	6 (20.7%)	
>3	25 (75.8%)	8 (24.2%)	
History of lifting heavy weights			0.087
Yes	103 (58.5%)	73 (41.5%)	
No	168 (66.9%)	83 (33.1%)	
History of abdominal or perineal surgery			0.035
Yes	98 (71.0%)	40 (29.0%)	
No	173 (59.9%)	116 (40.1%)	

Table 6 shows that there was a statistically significant ($P<0.05$) association between the prevalence of prolapse symptoms and the following factors: age at first pregnancy, number of episiotomies, history of abdominal or perineal surgery, history of using laxatives and non-steroidal anti-inflammatory drug use, marital status, and BMI.

Table 6.
The factors associated with the prevalence of prolapse symptoms.

Factors	Present n (%)	Absent n (%)	P-value
Nationality			0.559
Saudi	177 (43.2%)	233 (56.8%)	
Non-Saudi	6 (35.3%)	11 (64.7%)	
Age group			0.089
18-29	68 (35.4%)	124 (64.6%)	
30-39	55 (48.7%)	58 (51.3%)	
40-49	42 (46.7%)	48 (53.3%)	
50-59	17 (56.7%)	13 (43.3%)	
60 and above	1 (50%)	1 (50%)	
Marital status			0.002
Married	123 (50.0%)	123 (50.0%)	
Separated	10 (45.5%)	12 (55.5%)	
Single	50 (68.0%)	109 (91.0%)	
BMI			0.016
Underweight	9 (26.5%)	25 (73.5%)	
Normal Weight	62 (38.3%)	100 (61.7%)	
Overweight	47 (42.0%)	65 (58.0%)	
Obese	63 (58.8%)	54 (41.2%)	
History of taking laxatives and non-steroidal anti-inflammatory drugs			0.003
Yes	77 (54.2%)	65 (45.8%)	
No	106 (37.2%)	179 (62.8%)	
Number of spontaneous vaginal births			0.062
0	76 (35.3%)	139 (64.7%)	
1	25 (55.6%)	20 (44.4%)	
2	21 (50.0%)	21 (50.0%)	
3	23 (53.5%)	20 (46.5%)	
4	13 (48.1%)	14 (51.9%)	
Age at first pregnancy			0.001
Not yet pregnant	65 (32.0%)	138 (68.0%)	
≤19	24 (49.0%)	25 (51.0%)	
20-29	82 (53.2%)	72 (46.8%)	
30-39	11 (55.0%)	9 (45.0%)	
≥40	1 (100.0%)	0 (0.00%)	
Number of episiotomies			0.001
0	76 (32.6%)	157 (67.4%)	
1	49 (65.3%)	26 (34.7%)	
2	26 (45.6%)	31 (54.4%)	
3	15 (51.7%)	14 (48.3%)	
>3	17 (51.5%)	16 (48.5%)	
History of lifting heavy weights			0.685
Yes	75 (42.6%)	101 (57.4%)	
No	108 (43.0%)	143 (57.0%)	
History of abdominal or perineal surgery			0.019
Yes	72 (52.2%)	66 (47.8%)	
No	111 (38.4%)	178 (61.6%)	

The association between age, marital status, and prevalence of sex dysfunctions was significantly different across the groups ($P < 0.05$ (Table 7)). The prevalence of sexual dysfunctions was higher among individuals aged 30 years and above, as well as among those who were separated or married.

Table 7.
The factors associated with the prevalence of sex dysfunctions.

Factors	Present n (%)	Absent n (%)	P-value
Nationality			0.288
Saudi	237 (57.8%)	173 (42.2%)	
Non-Saudi	12 (70.6%)	5 (29.4%)	
Age group			0.002
18-29	91 (47.4%)	101 (52.6%)	
30-39	78 (69.0%)	35 (31.0%)	
40-49	61 (67.8%)	29 (32.2%)	
50-59	18 (60%)	12 (40%)	
60 and above	1 (50%)	1 (50%)	
Marital status			0.001
Married	168 (68.3%)	78 (31.7%)	
Separated	17 (77.3%)	5 (22.7%)	
Single	64 (40.3%)	95 (59.7%)	

Discussion

This study aimed to assess the prevalence, risk factors, and effect of pelvic floor dysfunction among the affected women in the Qassim region of Saudi Arabia. The prevalence of the four components of PFD (sexual function, bowel function, prolapse symptoms, and bladder function) ranged from 42.5% to 63.3%, with bowel dysfunction being the most prevalent and bladder functioning problems the least. Specifically, the prevalence rates were 42.5% for bladder function problems, 58.2% for sexual dysfunctions, 63.3% for bowel dysfunctions, and 42.8% for prolapse symptoms. These findings align with those of Malaekah et al. in Saudi Arabia, who reported the prevalence of bladder dysfunctions was 44.1%, sexual dysfunctions 55.4%, bowel dysfunctions 67.7%, and prolapse symptoms 20.9%.¹³ In contrast, a study in Oman reported lower prevalence rates (14.0% to 55%), which may be attributed to differences in study design and population.¹ However, this variation can be attributed to the divergence in the study design and study population.

The study found a statistically significant association between age and the prevalence of bladder function problems ($P = 0.002$), with individuals aged 40 years and above having a higher prevalence than those under 40. Additionally, the number of spontaneous vaginal births and the number of episiotomies were statistically significant ($P < 0.05$). Women with four or more spontaneous births and those with one or more than three episiotomies showed higher prevalence rates. These results are consistent with a study in Spain, which reported an increased risk of PFD with the number of spontaneous vaginal births.¹

The study found statistically significant correlations ($P<0.05$) between the prevalence of bowel dysfunction, age at first pregnancy, history of abdominal or perineal surgery, history of using laxatives, and non-steroidal anti-inflammatory drug use. The prevalence of prolapse symptoms was found to be statistically significantly correlated ($P<0.05$) with the following factors: age at first pregnancy, number of episiotomies, history of abdominal or perineal surgery, history of using laxatives and non-steroidal anti-inflammatory drug use, married status, BMI, and age at first pregnancy. Consistent with these results, a study conducted by Kenne et al. revealed that prolapse symptoms were significantly predicted by age, race, and BMI, underscoring the complex nature of prolapse and bowel dysfunction.¹⁴

The prevalence of prolapse symptoms was found to be statistically significantly correlated with the following factors: age at first pregnancy, number of episiotomies, history of abdominal or perineal surgery, BMI, history of using laxatives and non-steroidal anti-inflammatory drug use, and marriage status ($P<0.05$). Similar to these findings, a study in Texas in the United States reported that BMI, parity, and the number of vaginal births were associated with the high prevalence of PFD. The researchers further noted that prolapse symptoms were linked to higher parity and more vaginal deliveries.¹⁵ Furthermore, an Ethiopian study found that the history of perineal surgery and the quantity of episiotomies contributed to the high prevalence of PFD and prolapse symptoms in women.¹⁶

Finally, the study found statistically significant associations between age, marital status, and the prevalence of sexual dysfunctions ($P<0.05$). Sexual dysfunctions were more prevalent among individuals aged 30 and above, as well as among those who were separated or married. A study in Australia supported these findings, showing that the rate of sexual dysfunction is highly influenced by age.¹⁷ Additionally, Carrillo-Izquierdo et al.¹⁸ noted that married and separated depressed women experience high levels of sexual dysfunction and a lower quality of life, particularly among older women. These results suggest that PFD is significantly influenced by marital status and age.

The study had several limitations. It included participants from the Qassim region only. The online survey excluded illiterate women or those without internet access, making it difficult to generalize the findings. Hence, it wasn't easy to generalize our findings. Moreover, this study did not evaluate risk factors like intense physical exercise programs and neurological and muscular disorders. Additionally, important risk factors such as intense physical exercise programs and neurological and muscular disorders were not evaluated. Future research should involve a larger, more comprehensive study covering both rural and urban areas of the Qassim region to address these limitations.

Conclusion

Our study highlights a high prevalence of PFD in the Qassim region of Saudi Arabia. The findings reveal significant prevalence rates of PFD components, with variations observed

compared to the studies from other regions. Age, childbirth-related factors, and medical history emerged as notable contributors to PFD prevalence, consistent with international research. Further studies involving a larger cohort of women in other parts of the Kingdom of Saudi Arabia to investigate risk factors for PFD and its prevention are highly warranted.

Competing Interests

The authors declare that they have no competing interests.

References

1. Peinado-Molina RA, Hernández-Martínez A, Martínez-Vázquez S, Rodríguez-Almagro J, Martínez-Galiano JM. Pelvic floor dysfunction: prevalence and associated factors. *BMC Public Health*. 2023 Oct 14;23(1):2005. doi: 10.1186/s12889-023-16901-3. PMID: 37838661; PMCID: PMC10576367.
2. Bo K, Frawley HC, Haylen BT, Abramov Y, Almeida FG, Berghmans B, Bortolini M, Dumoulin C, Gomes M, McClurg D, Meijlink J, Shelly E, Trabuco E, Walker C, Wells A. An International Urogynecological Association (IUGA)/International Continence Society (ICS) joint report on the terminology for the conservative and nonpharmacological management of female pelvic floor dysfunction. *Neurourol Urodyn*. 2017 Feb;36(2):221-244. doi: 10.1002/nau.23107. Epub 2016 Dec 5. PMID: 27918122.
3. Wu JM, Vaughan CP, Goode PS, Redden DT, Burgio KL, Richter HE, Markland AD. Prevalence and trends of symptomatic pelvic floor disorders in U.S. women. *Obstet Gynecol*. 2014 Jan;123(1):141-148. doi: 10.1097/AOG.000000000000057. PMID: 24463674; PMCID: PMC3970401.
4. Nygaard I, Barber MD, Burgio KL, Kenton K, Meikle S, Schaffer J, Spino C, Whitehead WE, Wu J, Brody DJ; Pelvic Floor Disorders Network. Prevalence of symptomatic pelvic floor disorders in US women. *JAMA*. 2008 Sep 17;300(11):1311-6. doi: 10.1001/jama.300.11.1311. PMID: 18799443; PMCID: PMC2918416.
5. Raizada V, Mittal RK. Pelvic floor anatomy and applied physiology. *Gastroenterol Clin North Am*. 2008 Sep;37(3):493-509, vii. doi: 10.1016/j.gtc.2008.06.003. PMID: 18793993; PMCID: PMC2617789.
6. Eickmeyer SM. Anatomy and Physiology of the Pelvic Floor. *Phys Med Rehabil Clin N Am*. 2017 Aug;28(3):455-460. doi: 10.1016/j.pmr.2017.03.003. Epub 2017 May 27. PMID: 28676358.
7. Bozkurt M, Yumru AE, Şahin L. Pelvic floor dysfunction, and effects of pregnancy and mode of delivery on pelvic floor. *Taiwan J Obstet Gynecol*. 2014 Dec;53(4):452-8. doi: 10.1016/j.tjog.2014.08.001. PMID: 25510682.
8. Al-Badr A, Saleem Z, Kaddour O, Almosaieed B, Dawood A, Al-Tannir M, AlTurki F, Alharbi R, Alsanee N. Prevalence of pelvic floor dysfunction: a Saudi national survey. *BMC Womens Health*. 2022 Feb 4;22(1):27. doi: 10.1186/s12905-022-01609-0. Erratum in: *BMC Womens Health*. 2023 May 19;23(1):274. doi: 10.1186/s12905-023-02432-x. PMID: 35120501; PMCID: PMC8815131.

9. Malaekah H, Al Medbel HS, Al Mowallad S, Al Asiri Z, Albadrani A, Abdullah H. Prevalence of pelvic floor dysfunction in women in Riyadh, Kingdom of Saudi Arabia: A cross-sectional study. *Womens Health (Lond)*. 2022 Jan-Dec;18:17455065211072252. doi: 10.1177/17455065211072252. PMID: 35100887; PMCID: PMC8811438.
10. Walker GJ, Gunasekera P. Pelvic organ prolapse and incontinence in developing countries: review of prevalence and risk factors. *Int Urogynecol J*. 2011 Feb;22(2):127-35. doi: 10.1007/s00192-010-1215-0. Epub 2010 Jul 9. PMID: 20617303.
11. Verbeek M, Hayward L. Pelvic Floor Dysfunction And Its Effect On Quality Of Sexual Life. *Sex Med Rev*. 2019 Oct;7(4):559-564. doi: 10.1016/j.sxmr.2019.05.007. Epub 2019 Jul 24. PMID: 31351916.
12. Elbiss HM, Rafaqat W, Khan KS. Prevalence of pelvic floor disorders in the Eastern Mediterranean region: A meta-analysis. *Saudi Med J*. 2023 Feb;44(2):128-136. doi: 10.15537/smj.2023.44.2.20220510.
13. Malaekah H, Al Medbel HS, Al Mowallad S, Al Asiri Z, Albadrani A, Abdullah H. Prevalence of pelvic floor dysfunction in women in Riyadh, Kingdom of Saudi Arabia: A cross-sectional study. *Womens Health (Lond)*. 2022 Jan-Dec;18:17455065211072252. doi: 10.1177/17455065211072252. PMID: 35100887; PMCID: PMC8811438.
14. Kenne KA, Wendt L, Brooks Jackson J. Prevalence of pelvic floor disorders in adult women being seen in a primary care setting and associated risk factors. *Sci Rep*. 2022 Jun 14;12(1):9878. doi: 10.1038/s41598-022-13501-w. PMID: 35701486; PMCID: PMC9198100.
15. High R, Thai K, Virani H, Kuehl T, Danford J. Prevalence of Pelvic Floor Disorders in Female CrossFit Athletes. *Female Pelvic Med Reconstr Surg*. 2020 Aug;26(8):498-502. doi: 10.1097/SPV.0000000000000776. PMID: 31498240.
16. Dheresa M, Worku A, Oljira L, Mengiste B, Assefa N, Berhane Y. One in five women suffer from pelvic floor disorders in Kersa district Eastern Ethiopia: a community-based study. *BMC Womens Health*. 2018 Jun 15;18(1):95. doi: 10.1186/s12905-018-0585-1. PMID: 29902997; PMCID: PMC6003007.
17. Bodner-Adler B, Kimberger O, Laml T, Halpern K, Beitl C, Umek W, Bodner K. Prevalence and risk factors for pelvic floor disorders during early and late pregnancy in a cohort of Austrian women. *Arch Gynecol Obstet*. 2019 Nov;300(5):1325-1330. doi: 10.1007/s00404-019-05311-9. Epub 2019 Oct 10. PMID: 31599348; PMCID: PMC6814848.
18. Carrillo-Izquierdo MD, Slim M, Hidalgo-Tallon J, Calandre EP. Pelvic floor dysfunction in women with fibromyalgia and control subjects: Prevalence and impact on overall symptomatology and psychosocial function. *Neurourol Urodyn*. 2018 Nov;37(8):2702-2709. doi: 10.1002/nau.23723. Epub 2018 Jul 4. PMID: 29974511.
-
- *Corresponding author:** Emad A. Alwashmi, Department of Surgery, College of Medicine, Qassim University, Buraydah, Qassim, Saudi Arabia. E-mail: E.alwashmi@qu.edu.sa
-