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Advanced pelvic organ prolapse in a Tunisian cohort: clinical associations and compartment-specific severity patterns

Abstract

Backgrougnd: Pelvic organ prolapse (POP) is a common pelvic floor disorder that adversely affects women's quality of life and is strongly associated with aging and obstetric factors, particularly vaginal delivery and high parity. Data describing the clinical and anatomical characteristics of advanced POP in North African populations remain limited despite distinct demographic and reproductive patterns. This study aimed to compare the demographic, clinical, obstetric, and anatomical characteristics of women with and without advanced POP in a Tunisian tertiary-care center and to describe compartment-specific prolapse severity and associated pelvic floor dysfunction signs.

Methods: This case-control study included 50 women with advanced POP (Baden–Walker grade ≥2 in at least one compartment) and 50 women without clinically significant prolapse. Demographic, obstetric, and clinical variables, including stress urinary incontinence (SUI), vaginal atrophy, and vulvar gaping, were systematically recorded. The anatomical distribution and severity of prolapse across the anterior, middle, and posterior compartments were analyzed descriptively among women with advanced prolapse.

Results: No statistically significant differences were observed between cases and controls regarding age, body mass index, gravidity, or parity. Menopausal status was significantly more frequent among cases than controls (98% vs 80%, $p = 0.004$). Clinical signs of pelvic floor dysfunction were significantly more prevalent among women with advanced prolapse, including SUI (54% vs 18%, $p < 0.001$), vaginal atrophy (62% vs 36%, $p = 0.009$), and vulvar gaping (58% vs 14%, $p < 0.001$). Among the 50 women with advanced prolapse, cystocele was the most frequent anatomical defect (98%), followed by uterine prolapse and rectocele (96% each). However, severe grade 4 defects were proportionally most frequent in the posterior compartment (20%), compared with the anterior (4%) and middle (6%) compartments.

Conclusion: Women with advanced POP in this Tunisian cohort exhibited a high prevalence of associated clinical signs of pelvic floor dysfunction and predominant anterior compartment involvement. Although cystocele was the most common prolapse component, severe defects were proportionally more frequent in the posterior compartment. These findings underscore the importance of comprehensive compartment-specific assessment during routine prolapse evaluation.

Keywords: pelvic organ prolapsed, pelvic floor dysfunction, stress urinary incontinence, rectocele, cystocele

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Introduction

Pelvic organ prolapse (POP) is a highly prevalent pelvic floor disorder that significantly impairs the quality of life of millions of women worldwide.[1,2] The pathogenesis of POP is multifactorial, involving a complex interplay of aging, hypoestrogenism, and cumulative mechanical trauma to the pelvic connective tissues and musculature.[3] Among these factors, obstetric trauma—particularly vaginal delivery and high parity—is widely recognized as a major contributor to the progressive deterioration of pelvic support mechanisms.[4,5]

Despite its high global prevalence, the urogynecological literature remains largely dominated by epidemiological data derived from Western and East Asian populations. Consequently, the clinical and anatomical presentation of advanced POP in regions with distinct demographic and obstetric characteristics remains incompletely understood.[1] In North Africa, older generations of women frequently have a history of high parity and vaginal delivery, often under conditions that differ substantially from those reported in high-income settings. These demographic characteristics may influence both the occurrence and presentation of pelvic floor disorders. Nevertheless, data describing POP in North African and Arabic-speaking populations remain limited,[6] and few studies have reported compartment-specific prolapse severity using a case-control design.

Pelvic organ prolapse is traditionally classified according to the anatomical compartment involved, namely the anterior (cystocele), middle (uterine prolapse), and posterior (rectocele) compartments. However, differences in the anatomical distribution and severity of prolapse across these compartments remain incompletely characterized, particularly in underrepresented populations. Furthermore, anatomical defects frequently coexist with clinical manifestations of pelvic floor dysfunction, including stress urinary incontinence, vaginal atrophy, and vulvar gaping.[7] A better understanding of these associated findings may contribute to more comprehensive clinical assessment and individualized management strategies.

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Therefore, the primary objective of this case-control study was to compare the demographic, clinical, obstetric, and anatomical characteristics of women presenting with advanced pelvic organ prolapse and women without clinically significant prolapse in a Tunisian tertiary care setting. A secondary objective was to describe the compartment-specific distribution and severity of prolapse and to characterize the associated clinical signs of pelvic floor dysfunction observed among affected women.

Materials and methods

Study objective

The primary objective of this case-control study was to compare the demographic, clinical, obstetric, and anatomical characteristics of women presenting with advanced pelvic organ prolapse against women without clinically significant prolapse. Given the limited data available from North African populations, a secondary objective was to describe the anatomical distribution and severity of prolapse across the anterior, middle, and posterior pelvic compartments among affected women.

Data collection

Demographic variables included age and body mass index (BMI). Obstetric characteristics included gravidity, parity, history of perineal tears, and previous macrosomic delivery (>4000 g). Clinical variables systematically recorded during the gynecological examination included menopausal status, stress urinary incontinence, vulvar gaping, and vaginal atrophy.

Anatomical evaluation

Pelvic organ prolapse was assessed according to the Baden–Walker classification. The anterior compartment (cystocele), middle compartment (uterine prolapse), and posterior compartment (rectocele) were evaluated at rest and during the Valsalva maneuver. For each compartment, prolapse severity was classified from Grade 0 to Grade 4 according to the Baden–Walker system. The distribution of severity within each compartment was analyzed descriptively.

Statistical analysis

Continuous variables were expressed as mean ± standard deviation and compared using Student's t-test. Categorical variables were expressed as frequencies and percentages and compared using Pearson's chi-square test. Statistical significance was defined as $p < 0.05$.

Ethical considerations

The study protocol was approved by the Ethics Committee of Ibn Jazzar University Hospital, Sousse, Tunisia and was conducted in accordance with the Declaration of Helsinki. Patient confidentiality was maintained through anonymization of all collected data.

Results

Demographic, clinical, and obstetric characteristics

A total of 100 women were included in the study, comprising 50 women with advanced pelvic organ prolapse (cases) and 50 women without clinically significant prolapse (controls).

The demographic, clinical, and obstetric characteristics of the study population are summarized in Table 1. No statistically significant differences were observed between cases and controls regarding age, BMI, gravidity, or parity. The mean age was 62.9 ± 9.0 years among cases and 63.9 ± 4.2 years among controls ($p = 0.46$). Mean BMI was 29.8 ± 4.8 kg/m² in the prolapse group and 30.8 ± 4.9 kg/m² in the control group ($p = 0.31$).

Table 1 Demographic, clinical, and obstetric characteristics of the study population

Variable	Cases (n=50)	Controls (n=50)	p-value
Age (years), mean ± SD	62.9 ± 9.02	63.86 ± 4.24	0.46
BMI (kg/m²), mean ± SD	29.80 ± 4.76	30.77 ± 4.86	0.31
Gravidity, mean ± SD	7.9 ± 2.60	6.9 ± 1.63	0.5
Parity, mean ± SD	6.54 ± 2.66	5.68 ± 1.67	0.56
Menopause, n (%)	49 (98%)	40 (80%)	0.004
Stress urinary incontinence, n (%)	27 (54%)	9 (18%)	<0.001
Vaginal atrophy, n (%)	31 (62%)	18 (36%)	0.009
Vulvar gaping, n (%)	29 (58%)	7 (14%)	<0.001
History of perineal tears, n (%)	16 (32%)	10 (20%)	0.17
Macrosomic delivery (>4000 g), n (%)	14 (28%)	8 (16%)	0.15

Menopausal status was significantly more frequent among women with advanced prolapse than among controls (98% versus 80%, $p = 0.004$). Clinical signs associated with pelvic floor dysfunction were also significantly more prevalent in the case group. Stress urinary incontinence was observed in 54% of women with prolapse compared with 18% of controls ($p < 0.001$). Vaginal atrophy was identified in 62% and 36% of women, respectively ($p = 0.009$), while vulvar gaping was present in 58% of cases and 14% of controls ($p < 0.001$).

No statistically significant differences were observed regarding a history of perineal tears (32% versus 20%, $p = 0.17$) or previous macrosomic delivery (28% versus 16%, $p = 0.15$).

Anatomical severity distribution

The anatomical distribution of prolapse according to the Baden–Walker classification is presented in Table 2. Cystocele represented the most prevalent anatomical defect, affecting 49 women (98%). Uterine prolapse and rectocele were each identified in 48 women (96%). Given these high frequencies, the vast majority of patients inherently presented with concurrent defects across multiple compartments.

Table 2 Severity distribution of pelvic organ prolapse by compartment among women with advanced prolapse (n=50)

Baden–Walker Grade	Cystocele n (%)	Uterine prolapse n (%)	Rectocele n (%)
Grade 0	1 (2%)	2 (4%)	2 (4%)
Grade 1	5 (10%)	8 (16%)	3 (6%)
Grade 2	20 (40%)	19 (38%)	18 (36%)
Grade 3	22 (44%)	18 (36%)	17 (34%)
Grade 4	2 (4%)	3 (6%)	10 (20%)

Grade 2 and Grade 3 defects constituted the predominant severity levels across all compartments. Grade 3 cystocele was the most frequent anterior compartment abnormality, affecting 22 women (44%). Similarly, Grade 2 and Grade 3 uterine prolapse combined accounted for 74% of middle compartment defects.

The posterior compartment exhibited a distinct distribution pattern. Although rectocele was not more prevalent overall than the other compartment defects, it demonstrated the highest proportion of Grade 4 prolapse (20%), compared with 4% for cystocele and 6% for uterine prolapse.

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While cystocele represented the most common anatomical defect overall, severe Grade 4 prolapse was proportionally most frequent in the posterior compartment (Figure 1).

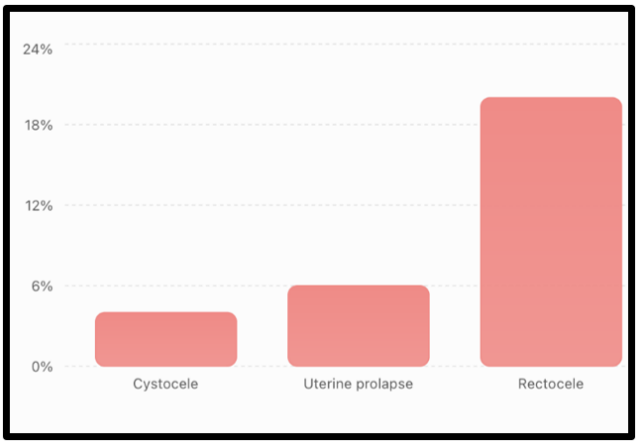

Figure 1 Proportion of women with severe (Grade 4) defects according to pelvic compartment.

Discussion

The present study compared the demographic, clinical, obstetric, and anatomical characteristics of women with advanced pelvic organ prolapse and women without clinically significant prolapse in a Tunisian tertiary care setting. The principal findings were the high prevalence of associated clinical signs of pelvic floor dysfunction among women with advanced prolapse, the predominance of anterior compartment involvement, and the distinct severity distribution observed across the different pelvic compartments.

To our knowledge, few studies from North Africa have simultaneously described compartment-specific prolapse severity and associated clinical signs of pelvic floor dysfunction in a case-control design. Although the present study was not intended to establish causal relationships, it provides a detailed clinical and anatomical profile of women presenting with advanced prolapse in a population that remains sparsely represented in the international literature. In particular, the relatively high proportion of severe posterior compartment defects observed in our cohort deserves further investigation in future studies.

Anatomical assessment demonstrated that cystocele was the most frequent prolapse component, affecting 98% of women in the case group. Uterine prolapse and rectocele were also highly prevalent, being observed in 96% of patients. The predominance of anterior compartment defects observed in our cohort is consistent with previous epidemiological studies reporting cystocele as the most frequent manifestation of pelvic organ prolapse.[8,9] For instance, large-scale evaluations by Swift et al. and Hendrix et al. similarly identified anterior compartment involvement as the most prevalent anatomical defect among women undergoing prolapse assessment.[10,11] The predominance of cystocele observed in our cohort is consistent with current anatomical concepts describing the anterior vaginal compartment as a common site of pelvic support failure.[12,13]

Although cystocele represented the most prevalent defect, the distribution of prolapse severity differed between compartments. Interestingly, although rectocele was not more prevalent than cystocele or uterine prolapse, it exhibited the highest proportion of grade 4 defects. This finding suggests that the clinical burden of posterior compartment involvement may be underestimated when attention is focused primarily on prevalence rather than severity. While this observation should be interpreted cautiously because of the limited sample size, it highlights the importance of careful posterior compartment assessment during routine prolapse evaluation. Furthermore, interpretation of compartment-specific severity patterns should nevertheless be approached cautiously because prolapse grading was performed using the Baden–Walker classification. Differences in grading methodology may partially explain discrepancies with studies using the POP-Q system.

The clinical findings observed in this study are equally noteworthy. Women with advanced prolapse exhibited significantly higher frequencies of stress urinary incontinence, vaginal atrophy, and vulvar gaping compared with controls. These abnormalities likely reflect the broader functional consequences of pelvic floor dysfunction. Stress urinary incontinence is frequently associated with alterations in urethral support mechanisms and may coexist with prolapse because both conditions share common risk factors and pathophysiological pathways.[14] Similarly, vulvar gaping may reflect the weakening of perineal support structures, while vaginal atrophy is commonly observed in postmenopausal women due to hypoestrogenic changes affecting vaginal tissues.[15] From a practical perspective, these findings emphasize that women presenting with advanced prolapse frequently exhibit concomitant pelvic floor abnormalities. Consequently, clinical assessment should extend beyond anatomical staging and include evaluation for urinary symptoms, vaginal trophicity, and perineal support defects, all of which may influence treatment planning.

Postmenopausal status was significantly more frequent among women with advanced prolapse than among controls. Estrogen deficiency has been associated with reduced collagen synthesis, decreased tissue elasticity, and progressive weakening of connective tissue support structures, all of which may contribute to prolapse development and progression.[16,17] However, although menopause was significantly more frequent among cases (98%), it was also highly prevalent among controls (80%). This observation reflects the age structure of the study population and suggests that menopause alone is unlikely to explain prolapse occurrence. Rather, prolapse development probably results from the cumulative interaction of age-related tissue changes and other lifelong mechanical and obstetric factors.[18]

Contrary to expectations, parity and gravidity did not differ significantly between the two groups. This finding should be interpreted with caution because both groups were characterized by high reproductive histories, with mean parity exceeding five deliveries. Such limited variability may have reduced the ability of these variables to discriminate between cases and controls. Similarly, no significant association was observed between BMI and advanced prolapse in the present study. Given the relatively homogeneous BMI distribution in both groups and the limited sample size, the absence of statistical significance should not be interpreted as evidence against a role of obesity in prolapse pathophysiology**.** Likewise, no significant differences were observed regarding previous macrosomic delivery or a history of perineal tears. Although both factors have been implicated in pelvic floor trauma,[19] the present study may have lacked sufficient statistical power to detect modest associations within this specific demographic.

The present study contributes data from a North African population that remains underrepresented in the international urogynecological literature. The high parity observed in both groups reflects demographic characteristics typical of older generations of Tunisian women and may influence both the prevalence and clinical presentation of pelvic floor disorders in this setting. Consequently, these findings provide valuable regional information that complements

evidence derived predominantly from European, North American, and Asian populations.

Strengths of this study include the prospective design, the standardized clinical examination of all participants, and the systematic anatomical assessment of each pelvic compartment. Nevertheless, several limitations must be acknowledged. First, the relatively small sample size and single-center design may limit the generalizability of the findings. Second, the absence of multivariable analysis precluded adjustment for potential confounding variables. Third, certain risk factors traditionally associated with prolapse, such as chronic constipation, chronic cough, and detailed occupational exposures, were not evaluated. Finally, prolapse severity was assessed using the Baden–Walker classification rather than the POP-Q system currently recommended by the International Continence Society.[20,21] Although Baden–Walker represented the standard method of assessment in our institution during the study period, comparisons with contemporary POP-Q-based studies should be interpreted cautiously.

Conclusion

Women with advanced pelvic organ prolapse in this Tunisian cohort exhibited a distinct clinical and anatomical profile characterized by a high prevalence of stress urinary incontinence, vaginal atrophy, and vulvar gaping, together with predominant anterior compartment involvement. While cystocele represented the most common prolapse component, severe grade 4 defects were proportionally more frequent in the posterior compartment, highlighting potential differences between prolapse prevalence and prolapse severity across pelvic compartments.

These findings underscore the importance of comprehensive clinical assessment that combines anatomical staging with evaluation of associated pelvic floor dysfunction. They also provide valuable data from a North African population that remains underrepresented in the urogynecological literature and contribute to a better characterization of advanced prolapse in this setting.

Future multicenter studies involving larger populations, contemporary POP-Q assessment, and multivariable analytical approaches are needed to confirm these observations and further clarify the determinants of compartment-specific prolapse severity.

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Conflicts of interest

The authors declare that there are no actual or potential conflicts of interest regarding the publication of this article. There are no affiliations, financial relations, financial or political interests, or other liabilities in the manuscript as a whole or in part that could result in the withholding or deliberate corruption of data or adversely influence its interpretation.

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