Research Article

Risk Factors of Symptomatic Pelvic Organ Prolapse in Japanese Women

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Abstract

Aim: To estimate the prevalence, risk factors, and subjective health status of symptomatic pelvic organ prolapse in Japanese women

Methods: This was a population-based cross-sectional study of 8,407 randomly selected women, aged 20–90 years. Symptomatic prolapse was self-reported by feeling of a bulge or something falling out from the vagina. Impact of the risk factors on symptomatic pelvic organ prolapse was estimated using logistic regression analysis. Multiple linear regression analysis was used to examine the association between pelvic organ prolapse symptoms and the subjective health status score.

Results: Symptomatic pelvic organ prolapse was reported in 474 participants (5.6%), and the proportion of symptomatic pelvic organ prolapse cases were higher among older women and highest in those aged 70–79 years. Multivariable logistic analysis revealed a significantly higher risk of pelvic organ prolapse in women with ≥1 vaginal deliveries than in nulliparous women. Additionally, self-reported chronic medical conditions, constipation, and heavy lifting at work were strongly associated with symptomatic pelvic organ prolapse. The subjective health status was significantly impaired by pelvic organ prolapse symptoms.

Conclusion: In Japanese women, the number of vaginal deliveries is a risk factor of symptomatic pelvic organ prolapse. Additionally, the symptomatic pelvic organ prolapse negatively affected the self-reported health status similar to other chronic medical conditions.

Keywords: Cross-Sectional Study; Pelvic Organ Prolapse (POP); Risk Factors; Parity; Subjective Health Status

Introduction

Although pelvic organ prolapse (POP) does not directly cause severe morbidity or mortality, the pelvic floor disorders (POP, urinary and fecal incontinence, voiding, and sexual dysfunction) can adversely affect daily life, [1] health status, [2] and quality of life. [3] POP has numerous risk factors, including parity, [4] old age, [5] obesity, [6] hysterectomy, [7] chronic medical conditions, [3] heavy lifting, [8] constipation, [2] smoking, [9] employment/occupation, [3] and race/ethnicity. [10]

There is limited epidemiological data regarding symptomatic POP in Japan, despite being recognized as a disease that can be treated in outpatient or inpatient settings. This study aimed to identify the prevalence, risk factors, and subjective health status of symptomatic POP in Japanese women.

Methods

This cross-sectional study evaluated 20,900 women who were Japanese Agriculture Group (JA) employees between August 2014 and July 2015. The JA is a cooperative agricultural association that employs individuals to perform agricultural, industrial, managerial, medical, and educational functions. This study sample included JA office staff, service women, teachers, nurses, part-time workers, saleswomen, part-time agricultural workers, and full-time agricultural workers. The JA employees were served by

the following six JA medical centers: Kumamoto and Oita centers (Kyushu, south Japan), Yamaguchi and Aichi centers (middle Japan), and Chiba and Iwate centers (north Japan). These centers were chosen through the Kumamoto University community health network. Women were considered eligible to participate in this study if they were aged >20 years and not currently pregnant. To ensure anonymity, the participants were not required to provide their name on the questionnaire and were asked to return the completed questionnaire to the researchers within 2 weeks.

The participants recorded their age (years), height (cm), and weight (kg) in the questionnaire. They then answered the following questions regarding the symptoms of POP (Table 1): Do you experience bulging near your vagina or something protruding? Has your vagina bulged? Can you see or feel your uterus? Can you see something that has dropped in your pelvis? Women who responded "yes" to any of these questions were defined as having symptomatic POP.

Urinary incontinence was defined as the self-reported presence of any of the following symptoms: urine leaking during sneezing or coughing, urine leaking during heavy lifting, urine leaking during the urge to toilet, difficulty in emptying the bladder, or frequent urination (>8 times during the day or >3 times at night). Positive and negative responses were assigned scores of "1" and "0," respectively.

To define the risk factors of symptomatic POP, the responses to the following questions were recorded: Were they ever examined in a hospital for their symptoms? How many times have they delivered a child? Do they have any chronic medical conditions currently being treated? What is their subjective health status? (Table 1). The self-reported chronic medical conditions were categorized based on the total number of positive responses: 0, 1, 2, and ≥3 conditions. The self-reported health status was categorized as "excellent," "good," "fail," and "poor." Ages were categorized into groups with 10-year increments (20–29 years to ≥80 years).

Body mass index (BMI) was calculated as weight divided by height squared (kg/m2), and the participants were categorized as being normal weight (<25.0 kg/m2), overweight (25.0–30.0 kg/m2), or obese (>30.0 kg/m2). Participants were asked to report their parity as the total number of vaginal and cesarean deliveries.

Validity of Methods

When this study was initiated, there was no validated tool for assessing symptomatic POP and the related symptoms in Japanese women. The questionnaire was constructed based on few experts' group works or modeled on several previously validated questionnaires [11-19] or the tools used to evaluate outpatients during gynecological visits in Japan. Based on these findings, we developed a nine-question self-reported questionnaire to identify participants with symptomatic POP (Table 1). The internal consistency of the questionnaire was good (Cronbach's α = 0.87). The test-retest reliability was tested, and 50 women were randomly selected from the expectation assessment group, who filled the questionnaire twice at an interval of 2 weeks (r = 0.84).

Table 1: Questionnaire representing the study.	
Age(Years) Height(cm) Weight(Kg)	
Q1: Please indicate if you have any of the following symptoms. (Multiple answers are allowed)	1) Bulging near your vagina or something protruding (falling out) of your vagina: Yes/No 2) Bulging of your vagina: Yes/No 3) Ability to see or feel your uterus: Yes/No 4) Something dropping from your pelvis: Yes/No
Q2: If you answered "yes" to the previous questions, were you ever examined in a hospital for your symptoms?	1) Was not examined 2) Was examined and treated 3) Was examined and did not need treatment 4) Was examined but not treated
Q3: Please check the following boxes if you have any of these symptoms. (Multiple answers are allowed.)	1) Urine leaks when you sneeze or cough 2) Urine leaks when you do heavy lifting 3) Urine leaks when you need to go to the toilet 4) Difficulty emptying the bladder 5) Frequent need to urinate: during the day (>8 times) or at night (>3 times)
Q4: Do you feel constipated?	1) No 2) Yes
Q5: Please indicate the number of times you have delivered a child with the following methods.	1) Vaginal delivery: No/Yes (__ time[s]) 2) Cesarean section: No/Yes (__ time[s])) 3) Dystocia: No/Yes (__ time[s])
Q6: Please identify any of the following conditions that you have. (Mulitple answers are allowed.)	a) Hypertension b) Hyperlipidaemia c) Diabetes d) Intracerebral hemorrhage e) Subarachnoid hemorrhage f) Stroke g) Myocardial infarction h) Angina pectoris i) Cardiac failure j) Arrhythmia k) Cystitis l) Pyelonephritis
Q7: How would you describe your health?	1) Excellent 2) Good 3) Fair 4) Poor
Q8: What is your job employment?	1) JA* office staff 2) Part-time agricultureal worker 3) Full-time agricultural worker 4) Other** (Please describe your role.)
Q9: How often do you perform work-related tasks that exert force on your stomach?	1) Never 2) A few times each month 3) A few times each week 4) Every day

Statistical Analysis

Standard methods were used for computing the mean, standard deviation (SD), and confidence interval (CI). The χ2 test was used for the analysis of nominal and ordinal data. To determine the contribution of the various proposed causes for POP, multivariate logistic regression analysis was used to control for potential confounding variables and to determine the independent associations between POP and the potential risk factors identified a priori. Urinary incontinence was excluded a priori, because it was considered a part of the outcome and associated with pelvic

floor dysfunction, rather than a risk factor of POP. [2] Multiple linear regression analysis was used to measure the independent association between the self-reported health status and activities affected by the risk of POP.

Weighted prevalence estimates and 95% CI were calculated using Statistical Package for the Social Sciences (version 25.0; SPSS Inc., Chicago, IL). Pearson's χ2 test was used to assess the association between the pelvic floor disorders and the participants' demographic characteristics. Differences were considered statistically significant for p-values <0.05.

This study used cross-sectional design, which was approved by the Ethics Committee of the Kumamoto University Faculty of Life Sciences (approval number: 839). All participants provided their informed consent, and the study was performed in accordance with the tenets of the Declaration of Helsinki.

Results

The questionnaire was completed by 8,407 women, with a mean age of 61.1 ± 11.5 years (range, 20–90 years) and median parity of 2 (range, 0–8). In total, 474 (5.64%) women were diagnosed with symptomatic POP. The prevalence of symptomatic POP increased with age and peaked in the 70–79 years age group (prevalence rates: 20–29 years, 0.86%; 30–39 years, 3.45%; 40–49 years, 3.59%; 50–59 years, 5.79%; 60–69 years, 6.12%; 70–79 years, 6.27%; and ≥80 years, 5.37%; p < 0.001) (Table 2).

Table 2: Characteristics of the study population (n=8407).

Variable	No. of women	POP (n=474)	BMI>25.0 kg/m2 (n=1,776)	Constipation (n=2,164)	UI (n=3,720)
Ovariall Age (y)	8,407	5.6 (5.1–6.1)	21.1 (20.3–22.0)	25.7 (24.8–26.7)	44.2 (43.2–45.3)
20-29	116	0.9 (0.8–2.5)	6.9 (2.2–11.5)	41.4 (32.4–50.3)	7.8 (2.9–12.6)
30-39	290	3.4 (1.3–5.5)	9.7 (6.3–13.1)	40.7 (35.0–46.3)	22.8 (17.9–27.6)
40-49	808	3.6 (2.3–4.9)	14.7 (12.3–17.2)	35.4 (32.1–38.7)	40.3 (37.0–43.7)
50-59	2,123	5.8 (4.8–6.8)	19.3 (17.6–21.0)	28.6 (26.7–30.6)	49.7 (47.6–51.8)
60-69	3,057	6.1 (5.3–7.0)	24.1 (22.6–25.2)	21.5 (20.0–22.9)	46.3 (44.5–48.1)
70-79	1,771	6.3 (5.1–7.4)	24.3 (22.3–26.3)	22.4 (20.4–24.3)	42.7 (40.4–45.0)
80 or older	242	5.4 (2.5–8.2)	18.2 (13.3–23.0)	21.1 (15.9–26.2)	38.4 (32.3–44.6)
p value		0.01	<0.001	<0.001	<0.001

POP: Pelvic organ prolapse; BMI: body mass index; UI: urinary incontinence. Data are expressed in % (95% confidence interval), and ρ- values are calculated in comparison with the approate sampling weight using Pearson's 2? test.

Among these 474 women, 46% (mean age ± SD: 56.2 ± 11.5) reported that they had never been examined, 21% (58.8 ± 11.7) had been examined and treated, 11% (56.0 ± 13.9) had been examined but did not need treatment, 2% (61.6 ± 14.6) needed treatment but did not get treated, and 20% (58.8 ± 15.5) were missing data. Thus, approximately 34% of women with POP sought medical attention and health care, 46% did not, and the data for 20% remained unknown. No significant differences were observed in the ages of women who did and did not seek medical attention. Almost 94% of the participants reported childbirth experience, 7% had undergone the caesarean section, 34.8% reported constipation, and 9% reported dystocia experiences.

In the multivariate logistic regression analysis, factors independently and significantly associated with symptomatic POP were self-reported chronic conditions (2.25-fold increase in odds of those with ≥3 conditions), constipation (1.63-fold increase in odds), and heavy lifting at work (2.03-fold increase in odds of those lifting heavy every day). Furthermore, women with one or more parity showed 2.5- to 4-fold higher odds of having symptomatic POP as compared to nulliparous women. Age, BMI, and occupation did not show an independent association with reported symptomatic POP (Table 3).

Table 3: Multivariate logistic regression analysis of various risk factors for pelvic organ prolapse.

Factor	OR (95% CI)
Age, per 10-year increase (y) Self-reported conditions or comorbid diseases (cumulative count)	1.11 (0.90–1.24)
None (0)	1
One (1)	1.18 (0.90–1.56)
Two (2)	1.61 (1.20–2.18)**
Three or more (3)	2.25 (1.61–3.14)***
Parity	
Nulliparous (0)	1
1 vaginal (1)	2.49 (1.21–5.13)*
2 vaginal (2)	3.16 (1.80–5.56)***
3 or more vaginal (3)	3.92 (2.26–6.81)***
Heavy lifting at work	
Never (0)	1
A few times a month (1)	1.31 (0.96–1.78)

A few times a week (2)	2.19 (1.62–2.97)***
Every day (3)	2.03 (1.49–2.76)***
BMI (kg/m²)	
<25.0 (0)	1
25.0–30.0 (1)	1.18 (0.94–1.48)
>30.0 (2)	1.58 (0.90–2.76)
Occupation	
Other# (0)	1
JA staff (1)	0.86 (0.55–1.36)
Part-time agrarian (2)	1.08 (0.77–1.53)
Agrarian (3)	1.01 (0.80–1.28)
Constipation (0, 1)	1.63 (1.31–2.04)***

OR: odds ratio; CI: confidence interval; BMI: body mass index; JA: Japanese agriculture

*ρ<0.05, ** ρ<0.01, *** ρ<0.001

Teacher, nurse, housewife, salesperson, etc

The multiple linear regression analysis examined the factors independently and significantly associated with self-reported health status (excellent, good, fail, or poor). Self-reported chronic medical conditions, constipation, POP, BMI, heavy lifting at work, age, parity, urinary incontinence, and occupation were used as independent factors. As shown in Table 4, multiple regression results indicated that the self-reported health status had a significant association with self-reported chronic medical conditions, constipation, POP, BMI, heaving lifting at work, and age, but not with parity, UI, and occupation. Furthermore, increased number of chronic medical conditions, constipation, POP symptoms, high BMI, heavy lifting at work, and old age decreased the health status in women.

Table 4: Multiple linear regression analysis of pelvic organ prolapse and other variables indenpendently associated with the self-reported health status.

Independent variable	β value	ρ-value
Self-reported conditions or comorbid diseases (cumulative count)	0.205	<0.001
Constipation	0.091	<0.001
POP	0.059	<0.001
BMI	0.055	<0.001
Heavy lifting at work	0.049	<0.001
Age	0.043	<0.001
Parity	-0.023	0.064
UI	-0.007	0.528
Ocuupation	0.01	0.426
R2	0.071	

POP: Pelvic Organ Prolapse; BMI: Body Mass Index; UI: Urinary Incontinence.

Discussion

The reported prevalence of symptomatic POP in Japanese women in this population-based cross-sectional study was 5.6%, [20] which was similar to that reported in population-based studies in US (5.7%), [2] UK (6.5%), [21] France (6.4%), [3] Italy (5.5%), [22] Sweden (8.3%), [14] and India (7%). [23] Population-based surveys have found that 6–8% of women report symptoms of POP [2,14]. POP estimates using only questionnaires underreport its true prevalence than that based on physical exanimation. A high prevalence of symptomatic POP is reported in women who undergo surgical prolapse repair. Data suggest a 11–19% lifetime risk in women who undergo surgery for prolapse [1,24,25]. POP has a prevalence of 3–6% when defined by symptoms and up to 50% when based on vaginal examination [26].

In our study, self-reported chronic conditions, parity, and heavy lifting at work were associated with symptomatic POP. The results are consistent with those of other population-based studies [2,9,14,27,28]. Additionally, constipation was a strong and independent risk factor of symptomatic POP, [2,29] though this association was not observed in any other study [9,30]. In our study, the prevalence of constipation showed a significant difference between the asymptomatic and symptomatic POP patients (25.2% vs. 34.8%; p < 0.001). The prevalence of constipation varies depending on the definition [31] of constipation, the surveying method, [32] and the target group [33] of the survey. Even though the National Life Basic Survey results showed that 4.6% of women reported having constipation in Japan, [34] it is not an accurate statistic because it represents the number of people who were aware of their subjective symptoms and not those with objective indicators that can be detected easily by doctors. Therefore, the causal relationship between constipation and POP requires further longitudinal follow-up studies.

Age was not found to be a risk factor of symptomatic POP. Prior studies have reported inconsistent findings regarding the association between age and POP [2,9,14,27,35]. It is possible that older women have lesser awareness of prolapse symptoms or are engaged in fewer activities that could provoke POP symptoms as compared to younger women [2]. Our results showed that about 34% women with symptomatic POP sought medical attention and health care, 46% did not, and 21% had missing data. However, no significant difference in age was noted between those who did and did not seek medical attention. This could be because the medical care and treatment for POP in the outpatient and inpatient is covered by the National Health Insurance in Japan. It is widely accepted that approximately 50% of women develop POP, but only 10–20% of them seek medical care for their condition [36].

Moreover, BMI was not detected as a risk factor of symptomatic POP in this study. Previous studies reported an association between high BMI (>25 kg/m2) and POP, and overweight was considered a risk factor of symptomatic POP [9,11]. Increased BMI was associated with a high prevalence of each pelvic floor disorder. It is important to evaluate the impact of overweight and obesity on pelvic floor disorders, as this is a modifiable risk factor in a population in which the prevalence of obesity was more than 35% in 2010 [37] and 40% in 2018 [38]. In contrast with the US, 21.1% of participants had BMI >25 kg/m2 in our study (Table 2). BMI does not affect the prevalence of POP probably due to the lower obesity rate among adult Japanese women; BMI >25 kg/m2 was observed in less than 19.2% women in 2015. There were no significant changes found in the prevalence of obesity in the last 10 years [34].

Previous research has shown that occupation type and heavy lifting at work are some of the risk factors of POP. [11,25] In order to clarify this, we selected full-time agricultural workers (agricultural work >150 days/year) who frequently engaged in gravity labor, part-time agricultural workers (agricultural work <150 days/year), [39] JA office staff, and others (teachers, businesswomen, nurses, housewives, etc.) as participants. Our results indicated that the occupation type was not an independent factor affecting symptomatic POP. However, frequent lifting of heavy objects was an independent factor that significantly affected symptomatic POP. This result suggests that no matter what the occupation type, in order to prevent POP, women should avoid lifting heavy objects. Hence, mechanized or semi-mechanized equipment have been actively introduced in workplaces to reduce the physical load and improve women's health.

Prior studies using multivariable logistic regression found that self-reported health status of fair or poor was strongly associated with symptomatic POP. In our study, the multiple regression model was used to determine the effect of POP on women's self-reported health status. Self-reported health status was a dependent variable and POP symptoms and chronic conditions were independent variables. POP was significantly associated with self-reported health status and had a similar effect on the women's health status as other chronic conditions did. Finally, we should pay attention to how POP affects the declining birth rate and aging society in Japan.

This study had several limitations. Because it was a cross-sectional study, it could not determine the causal associations. Symptomatic POP was defined by self-reporting without confirmation by medical examination. Furthermore, the respondents were middle-aged and older women; therefore, the data may not be representative of younger women. Our study had a high non-response rate, which may have resulted in overestimation or underestimation of the actual prevalence of symptomatic POP.

Conclusion

Our results indicate that the epidemiological characteristics of POP among Japanese women predict that increase in parity, heaving lifting, constipation, and chronic conditions are its risk factors, but age, BMI, and occupation are not. Our results corroborated with those of several previous studies. Furthermore, like other chronic conditions, POP negatively affects women's health status.

Acknowledgment

Disclosure

The authors have no conflicts of interest to disclose.

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