

Prevalence of Symptomatic Pelvic Floor Disorders among Japanese Women

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Abstract

Objective: There is little epidemiological data regarding pelvic organ prolapse (POP) in Japan, despite it being recognized as a disease can be treated in the outpatient or inpatient settings. Our aim was to estimate the prevalence of symptomatic POP among Japanese women.

Methods: This cross-sectional study evaluated 8,407 randomly selected women (20-90 years old) who were employed at the Japanese Agriculture Group. Trained research assistants distributed a Japanese self-administered questionnaire that was specifically designed for this study. The participants were asked to provide information regarding their demographic characteristics and symptoms of POP or urinary incontinence (UI). The potential risk factors included age, body mass index, self-reported conditions or comorbid diseases, parity, heavy lifting at work, perceived health status, and occupation.

Results: The weighted prevalence of POP was 5.64% (95% CI: 5.15-6.13%), the prevalence of UI was 44.25% (95% CI: 43.19-45.31%), and at least one pelvic floor disorder was reported by 46.15% of the women (95% CI: 45.09-47.22%). The proportion of women who reported having symptomatic POP generally increased with age and peaked at the age of 70-79 years (20-29 years old: 0.86%, 30-39 years old: 3.45%, 40-49 years old: 3.59%, 50-59 years old: 5.79%, 60-69 years old: 6.12%, 70-79 years old: 6.27%, and ≥80 years old: 5.37%; $p < 0.001$).

Conclusion: The present study provided the first population-based estimate of the prevalence of POP among Japanese women. The prevalence of symptomatic POP increased with age and peaked at 70-79 years. Approximately half of adult Japanese women reported experiencing symptoms of at least one pelvic floor disorder (POP and/or UI).

Keywords: Pelvic organ prolapse; Prevalence; Japanese women; Pelvic floor disorder; Urinary incontinence

Introduction

Pelvic organ prolapse (POP) a symptomatic pelvic floor disorder that involves the downward descent of the pelvic organs and can result in protrusion from the vagina [1]. POP typically affects some combination of the anterior vagina wall, posterior wall, and/or the uterus or apex of the vagina [2]. POP does not directly cause severe morbidity or mortality [3], although pelvic floor disorders (POP, urinary and fecal incontinence, voiding, and sexual dysfunction) has adverse effects on daily life [4], health status [5], and quality of life [3,4,6]. POP has numerous risk factors, including parity [7-9], older age [7,10,11], obesity [12,13], hysterectomy [14], chronic medical conditions [7], heavy lifting [15], constipation [5], smoking status [16,17], employment [18], and race/ethnicity [7,19]. Furthermore, >200,000 surgeries are performed each year in the US to treat POP, which is the most common indication for hysterectomy among middle-aged women [5,20], and the annual economic burden of POP is >\$1 billion in the US [5,10]. POP is also the most common non-cancer indication for hysterectomy among American menopausal women [21]. There is little epidemiological data regarding POP in

Japan, despite it being recognized as a disease can be treated in the outpatient or inpatient settings. Moreover, only a few studies have evaluated the distributions of POP according to racial, geographical, and socioeconomic status in the American [7,10,22], British [17], Italian [23], French [24], Turkish [25], Australian [26], and Swedish populations [27]. Therefore, this study aimed to identify the risk factors and prevalence of symptomatic POP among Japanese women.

Methods

The present 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. The population for the present study included JA office staff, service women, teachers, nurses, part-time workers, sales women, part-time agricultural workers, and full-time agricultural workers. Six JA medical centers served the JA employees: the Kumamoto and Oita centers (Kyushu, South Japan), the Yamaguchi and Aichi centers (middle Japan), and the Chiba and Iwate centers (North Japan). These centers were chosen through the Kumamoto University community health network. This study used a 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. Women were considered eligible to participate if they were >20 years old and were not currently pregnant. Trained research assistants distributed self-administered questionnaires that were

designed for this study. 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, a designated collection box, or directly to the participating centers within two weeks (Table 1).

Age (years): Height (cm): Weight (kg):	
Q1: Please indicate if you have any of the following symptoms (multiple answers are allowed).	1: Do you experience bulging near your vagina or something protruding (falling out) of your vagina? Yes/No
	2: Has your vagina bulged? Yes/No
	3: Can you see or feel your uterus? Yes/No
	4: Can you see something that has dropped 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 but not treated
	4: Was examined and did not need treatment
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 bladder
	5: Frequently need to urinate: During the day (>8 times) or At night (>3 times)
Q4: Do you feel constipated?	Yes/No
Q5: Please indicate the number of times you have delivered a child in the following methods.	1: Vaginal delivery-time(s): 2: Caesarean section-time(s): 3: Dystocia-time(s):
Q6: Please identify any conditions that you have (multiple answers are allowed)	a) Hypertension, b) hyperlipidaemia, c) diabetes mellitus, d) intracerebral haemorrhage, e) subarachnoid haemorrhage, f) stroke, g) myocardial infarction, h) angina pectoris, i) cardiac failure, j) arrhythmia, k) cystitis, and l) pyelonephritis
Q7: Would you describe your health as	1) Poor 2) fair 3) good 4) excellent
Q8: Are you employed as a	1) JA office staff 2) Part-time agricultural worker 3) Full-time agricultural worker 4) Other (please describe your role)
Q9: Do you routinely 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

Table 1: Questionnaire representing the study.

When the present study was initiated, there was no validated tool for assessing POP and the related symptoms among Japanese women. The questionnaire was constructed with expert's group works and was modeled on the lot of previously validated questionnaires [18,22,25,27,28] and tools that are used to evaluate outpatients during gynecological visits in Japan. Based on these findings, we developed a nine-question self-reported questionnaire to identify patients with symptomatic POP (Table 1). The participants recorded their age (years), height (cm), and weight (kg), and then answered several questions regarding the symptoms of POP:

1) Do you experience bulging near your vagina or something protruding? 2) Has your vagina bulged? 3) Can you see or feel your uterus? and 4) Can you see something that has dropped in your pelvis? Women who answered any of the questions using "yes" were defined as having symptomatic POP. Urinary incontinence was defined as the self-reported presence of any of the following symptoms: 1) urine leaking during sneezing or coughing, 2) urine leaking during heavy lifting, 3) urine leaking during the urge to toilet, 4) difficulty emptying the bladder, or 5) frequent urination (>8 times during the day or >3 times at night). The presence of one or more pelvic floor disorders was assessed based on the participants' responses regarding POP symptoms

and urinary incontinence. Responses were assigned scores of 0 for “no” and 1 for “yes”.

Body mass index was calculated as weight divided by height squared (kg/m^2), and the participants were categorized as being underweight ($<18.5 \text{ kg/m}^2$), normal weight ($18.5\text{-}24.9 \text{ kg/m}^2$), overweight ($25.0\text{-}29.9 \text{ kg/m}^2$), or obese ($\geq 30.0 \text{ kg/m}^2$). Participants were asked to self-report their parity as the total number of vaginal and cesarean deliveries. Participants were also asked to report their existing medical conditions, and the responses were categorized based on the total number of positive responses: zero, one, two, and three or more. Ages were categorized in 10-year increments (20-29 years old to ≥ 80 years old). The internal consistency of the questionnaire was good (Cronbach's $\alpha=0.87$). The test-retest reliability was tested, 50 subjects were randomly selected from expectation assessment group, who filled in the questionnaire twice, two weeks days apart ($r=0.84$).

Weighted prevalence estimates and 95% confidence intervals (CI) were calculated using SPSS software (version 20.0; SPSS Inc., Chicago, IL). Pearson's χ^2 test was used to assess the association between pelvic floor disorders and the participants' demographic characteristics. Differences were considered statistically significant at a P-value of <0.05 .

Results

Among the 20,900 selected women, 12,383 women did not respond. Eight thousand five hundred seventeen (40.8%) questionnaires were returned. One hundred ten of these women were missing age or POP data and were excluded. Thus, our final study sample included 8,407 women. The mean participant age was 61.1 ± 11.5 years (range: 20-90 years) and the median parity was 2 (range: 0-8).

Women with and without pelvic floor disorders exhibited similar distributions for most age categories ($p>0.05$), with the exception of the 20-29 year old group and the ≥ 80 year old group. Symptoms of least one pelvic floor disorder were reported by 46.15% of the women (95% CI: 45.09-47.22%). Symptomatic POP was reported by 5.64% of the women (95% CI: 5.15-6.13%), and urinary incontinence was reported by 44.25% of the women (95% CI: 43.19-45.31%). The proportion of symptomatic POP generally increased with age (Table 2) and peaked at the age of 70-79 years (20-29 years old: 0.86%, 30-39 years old: 3.45%, 40-49 years old: 3.59%, 50-59 years old: 5.79%, 60-69 years old: 6.12%, 70-79 years old: 6.27%, and ≥ 80 years old: 5.37%; $p<0.001$) (Table 2).

Variables	No. of Women	Weighted prevalence (%)		
		POP	UI	One or more pelvic Floor disorder
		(n=474)	(n=3,720)	(n=3,880)
Overall	8,407	5.64 (5.15-6.13)	44.25 (43.19-45.31)	46.15 (45.09-47.22)
Age (years)				
20-29	116	0.86 (0.82-2.54)	7.76 (2.89-12.63)	8.62 (3.15-13.73)
30-39	290	3.45 (1.35-5.55)	22.76 (17.93-27.58)	23.45 (18.57-28.32)
40-49	808	3.59 (2.31-4.87)	40.35 (36.96-43.73)	41.21 (37.82-44.61)
50-59	2,123	5.79 (4.80-6.79)	49.69 (47.57-51.82)	51.25 (49.12-53.37)
60-69	3,057	6.12 (5.27-6.97)	46.29 (44.52-48.05)	48.64 (46.87-50.41)
70-79	1,771	6.27 (5.14-7.40)	42.69 (40.38-44.99)	44.95 (42.63-47.26)
≥ 80	242	5.37 (2.53-8.21)	38.43 (32.30-44.56)	40.50 (34.31-46.68)
P-value		0.01	<0.001	<0.001
BMI (kg/m^2)				
<18.5	415	3.89 (2.22-5.56)	26.26 (22.46-30.07)	27.04 (23.20-30.88)
18.5-24.9	6,216	5.34 (4.78-5.90)	41.63 (40.41-42.86)	43.52 (42.28-44.75)
25.0-29.9	1,553	6.70 (5.45-7.94)	55.38 (52.90-57.85)	57.57 (55.11-60.02)
≥ 30.0	223	8.07 (4.50-11.65)	61.43 (55.05-67.82)	63.76 (57.36-69.99)
P-value		0.063	<0.001	<0.001
Self-reported conditions or comorbidities (cumulative count)				
0	4,478	4.53(3.92-5.14)	39.08 (37.65-40.51)	40.62 (39.18-42.06)
1	2,710	5.79(4.91-6.67)	46.83 (44.95-48.71)	48.75 (46.86-50.63)

2	913	8.65 (6.83-10.48)	54.98 (51.76-58.21)	58.05 (54.85-61.25)
≥ 3	306	11.44 (7.87-15.00)	65.03 (59.69-70.38)	68.63 (63.43-73.83)
P-value		<0.001	<0.001	<0.001
Parity				
0	1,228	2.36 (1.51-3.21)	31.27 (28.68-33.86)	31.76 (29.16-34.36)
1	525	4.00 (2.32-5.68)	38.10 (33.94-42.25)	40.00 (35.81-44.19)
2	2,901	5.76 (4.91-6.60)	44.92 (43.11-46.73)	47.26 (45.44-49.08)
≥ 3	3,753	6.85 (6.04-7.66)	48.84 (47.24-50.44)	50.87 (49.27-52.47)
P-value		<0.001	<0.001	<0.001
Heavy lifting at work				
Never (0)	4,223	4.05 (3.45-4.64)	37.18 (35.72-38.63)	38.50 (37.04-39.97)
A few times-Each month (1)	1,707	5.67(4.48-6.65)	49.85 (47.48-52.23)	51.73 (49.36-54.10)
A few times-Each week (2)	1,253	8.70 (7.14-10.26)	53.07 (50.31-55.84)	56.50 (53.76-59.25)
A few times-Every day (3)	1,224	8.09 (6.56-9.62)	51.80 (49.00-54.60)	54.17 (51.38-56.96)
P-value		<0.001	<0.001	<0.001
Perceived health status				
Poor (0)	605	8.10 (5.93-10.27)	44.63 (40.67-48.59)	46.45 (42.47-50.42)
Fair (1)	2,108	8.25 (7.08-9.43)	54.08 (51.95-56.21)	56.97 (54.86-59.09)
Good (2)	5,061	4.35 (3.79-4.91)	41.95 (40.59-43.31)	43.41 (42.04-44.78)
Excellent (3)	633	4.90 (3.22-6.58)	29.54 (25.99-33.10)	31.75 (28.13-35.38)
P-value		<0.001	<0.001	<0.001
Occupation				
JA office staff (0)	572	4.90 (3.13-6.66)	32.52 (28.68-36.36)	33.74 (29.87-37.62)
Others (1)*	4,225	5.09 (4.43-5.75)	47.62 (44.36-50.88)	42.25 (40.76-43.74)
Part-time				
Agrarian (2)	903	6.42 (4.82-8.02)	51.46 (49.58-53.34)	50.17 (46.90-53.43)
Agrarian (3)	2,707	6.39 (5.47-7.31)	40.50 (39.02-41.98)	53.53 (51.65-55.41)
P-value		0.075	<0.001	<0.001

Table 2: Weighted prevalence of pelvic floor disorders according to demographic characteristics among Japanese women. [POP: Pelvic Organ Prolapse; UI: Urinary Incontinence; BMI: Body Mass Index; JA: Japanese Agriculture. Data are in % (95% Confidence Interval), and p-values were calculated using Pearson's χ^2 test with appropriate sampling weights; *Others included teacher, nurse, housewife, part-time worker, and sales women].

The prevalence of symptomatic POP was associated with the following demographic factors: self-reported medical conditions (no conditions: 4.53%, one condition: 5.79%, two conditions: 8.65%, three or more conditions: 11.44%; $p < 0.001$), parity (nulliparous: 2.36%, 1 delivery: 4.00% 2 deliveries: 5.76%, and ≥ 3 deliveries: 6.85%; $p < 0.001$), heavy lifting at work (never: 4.05%, a few times each month: 5.67%, a few times each week: 8.70%, every day: 8.09%; $p < 0.001$), and perceived health status (poor: 8.10%, fair: 8.25%, good: 4.35%, excellent: 4.90%; $p < 0.001$). Similar patterns were observed among participants with

urinary incontinence or more than one pelvic floor disorder. The prevalence of POP exhibited marginal associations with body mass index ($p = 0.063$) and occupation ($p = 0.075$). The prevalence of constipation decreased with age (20-29 years old: 41.38%, 30-39 years old: 40.69%, 40-49 years old: 35.40%, 50-59 years old: 28.64%, 60-69 years old: 21.49%, 70-79 years old: 22.36%, ≥ 80 years old: 21.07%; $p < 0.001$). We found the 46.0% of the women did not undergo evaluations for their symptoms, 21.1% of the women were examined, 10.5% of the women were examined but did not need treatment, 1.9%

of the women needed treatment but were not examined, and 20.5% of the women had missing data.

Discussion

In Japan, treatment for POP in the outpatient or inpatient setting is typically covered by national health insurance. However, Japanese epidemiological data are rare, despite POP being the common indication for gynecological surgery. The present study provided the first population-based estimates of the prevalence of symptomatic POP among Japanese women. Our data indicate that approximately 5.64% of Japanese women experience symptoms that are consistent with POP, and that the prevalence of POP increased with age and peak at the age of 70-79 years (6.3%).

Several previous studies have reported that older age was associated with higher prevalence for POP in different countries [4,5]. For example, Jennifer et al. reported that the prevalence peaked at 5.1% among 60-69 year old American women [7]. In 2015, >29.65% of Japanese women were ≥ 65 years old [29], compared to only 16.32% of American women being ≥ 65 years old [30]. Therefore, the minor differences in the peak prevalence of POP may be related to the different age distributions of the Japanese and American populations.

According to the 2015 Japanese census, the total Japanese population is expected to decline from 126.6 million in 2015 to 97.1 million in 2050 [29]. In contrast, the total American population is expected to grow from 312.3 million in 2015 to 403.7 million in 2050 [30]. Our findings agree with findings from previously studies, which revealed that the prevalence of POP increases with age [7,10,11,22]. Thus, patient age is an important risk factor to consider, especially based on the changing demographics of older Japanese women. For example, 33.95 million (26.82%) Japanese individuals were ≥ 65 years old in 2015, and this population is expected to grow to 37.68 million (38.81%) by 2050 [29]. Similarly, the ≥ 70 year old population is expected to increase from 24.24 million in 2015 to 31.04 million in 2050. In addition, women greatly outnumber men in the ≥ 65 year old age group, with Japan having 4.65 million more elderly women in 2015, compared to the population of elderly men [29]. This disparity increases with age, as women account for 51% of 65-69 year old Japanese individuals, 65% of 85-89 year old Japanese individuals, and 82% of 95-99 year old individuals [29]. Given the aging Japanese population, and the increasing proportion of women in older age groups, it is expected that the prevalence of POP will exhibit substantial increases during the next several decades. Although many observers have casually made this claim, there have been no reliable data to justify this claim. Therefore, our findings provide valuable information that may be used to model the future need for healthcare and medical services among Japanese women. Furthermore, this information may help policy makers predict the future public health burden of pelvic floor disorders, and highlight the importance of funding research to study the etiology, prevention, and treatment of these conditions [1,10].

The present study also aimed to establish a system for predicting the prevalence of POP, similar to the system that is used by the Pelvic Floor Disorder Network. Our data indicate that the prevalence of POP and/or urinary incontinence may be affected by several risk factors, such as obesity, comorbid medical conditions, heavy lifting, constipation, and parity. However, further studies are needed to evaluate these associations in greater detail. Our questionnaire also evaluated whether women sought care when they experienced

symptoms of POP (question 2), and we found that approximately one-half of the women did not seek an evaluation or treatment when they developed symptoms of POP. This result may be related to a lack of knowledge regarding normal and abnormal support for pelvic organs among Japanese women.

The limitations of our study include the high non-response rate, which may have resulted in overestimation or underestimation of the actual prevalence of POP and urinary incontinence. However, the large sample size may help to decrease any error that is related to overestimation or underestimation. Furthermore, we compared the age distributions between our study population and the general Japanese population, which revealed that our participants were significantly older, compared to the general Japanese population.

Conclusion

Our results clearly indicate that the epidemiological characteristics of POP among Japanese predict an increase in the prevalence of symptomatic POP. Therefore, these data should be seen as a call to action for the Japanese healthcare community, which must prepare for the rapidly growing segment of ≥ 65 year old women who may require health support and treatment for POP.

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