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Original Article

Rate of Perceived Exertion and Stress Urinary Incontinence in Women Attending Gyms

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ABSTRACT

Background: Stress urinary incontinence is a common pelvic floor dysfunction characterized by involuntary urine leakage during activities that increase intra-abdominal pressure. Women attending gyms may experience leakage during exercise-related movements, but the relationship between perceived exercise intensity and urinary incontinence symptoms remains insufficiently defined. Objective: To determine the frequency of stress urinary incontinence symptoms among women attending gyms and examine their association with rate of perceived exertion, age group, and body mass index. Methods: This cross-sectional observational study included 323 women aged 25–45 years attending gyms in Sialkot, Daska, and Gujranwala. Participants attending gyms at least three days per week were included, while women with diabetes mellitus, chronic lung disease, urinary tract infection, or previous urinary incontinence surgery were excluded. Data were collected using a structured questionnaire, the Urinary Incontinence Questionnaire, and the Borg 10-point Rating of Perceived Exertion scale. Associations were analyzed using chi-square tests in SPSS version 27.0. Results: The mean age was 33.88 ± 6.48 years, and the mean body mass index was 30.49 ± 6.09 kg/m². Exercise-related leakage on UIQ4 was reported sometimes or often by 83 participants (25.7%). Most participants reported light or moderate perceived exertion. Rate of perceived exertion was not significantly associated with any urinary incontinence item. Age group was significantly associated with UIQ1, UIQ3, UIQ4, UIQ5, UIQ6, and UIQ7, while body mass index was significantly associated with UIQ3 and UIQ4. Conclusion: Stress urinary incontinence-related symptoms were present among gym-attending women, particularly during exercise-related activity. Perceived exertion was not significantly associated with urinary symptoms, whereas age and body mass index showed significant associations with selected urinary incontinence items. Keywords: Body Mass Index; Gyms; Rate of Perceived Exertion; Stress Urinary Incontinence; Women

INTRODUCTION

Urinary incontinence is a common women's health condition defined by involuntary leakage of urine and is associated with physical discomfort, psychosocial distress, activity restriction, and impaired quality of life. Women are particularly vulnerable because continence depends on the coordinated function of pelvic floor muscles, urethral support structures, connective tissue integrity, and neuromuscular control, all of which may be influenced by reproductive history, age-related tissue changes, obesity, and pelvic floor loading (1). Among the major subtypes, stress urinary incontinence is commonly characterized by

urine leakage during activities that increase intra-abdominal pressure, including coughing, sneezing, laughing, lifting, running, jumping, and exercise-related movements (2). Its underlying mechanism is usually linked to impaired pelvic floor support, urethral hypermobility, or intrinsic sphincter dysfunction, resulting in inadequate urethral closure when abdominal pressure rises during exertional tasks (3).

Pelvic floor muscles play an essential role in maintaining continence by supporting pelvic organs and contributing to urethral closure during sudden or repetitive increases in intra-abdominal pressure. When these muscles are weakened, poorly coordinated, or exposed to repeated mechanical overload, their capacity to counteract pressure transmission may be reduced, increasing susceptibility to leakage during physical activity (4). Regular exercise is widely recommended for cardiovascular health, weight control, metabolic fitness, and psychological well-being; however, certain forms of gym-based activity may generate repeated rises in intra-abdominal pressure. Resistance training, jumping, running, high-impact aerobic activity, and strenuous conditioning exercises may therefore place additional demand on the pelvic floor, especially in women with pre-existing risk factors such as increased body mass index, advancing age, parity-related pelvic floor changes, or reduced pelvic floor muscle strength (5).

Previous research has shown that physically active women and female athletes may report urinary leakage during high-impact or strenuous activity, suggesting that exercise-related pelvic floor loading may be clinically relevant even in otherwise healthy women (6). At the same time, obesity remains an important modifiable risk factor for stress urinary incontinence because increased body mass contributes to chronically elevated intra-abdominal and intravesical pressures, which may strain urethral and pelvic floor support mechanisms (7). This is particularly important in gym-attending populations, where women may attend fitness centers for weight management yet may simultaneously experience symptoms that discourage exercise participation. Despite this clinical relevance, urinary leakage during exercise remains underreported because many women perceive it as embarrassing, normalize it as a consequence of exertion, or avoid discussing pelvic floor symptoms with trainers or healthcare professionals.

Although the relationship between high-impact physical activity and urinary incontinence has been explored in athletic populations, less is known about how self-perceived exercise intensity relates to stress urinary incontinence symptoms among women attending community gyms. Rate of perceived exertion provides a practical, patient-reported estimate of exercise intensity and may reflect how women experience the physical demand of their usual gym activity. However, perceived exertion may not correspond directly to pelvic floor loading because women performing light or moderate activity may still experience leakage if other risk factors such as age or obesity are present (8). Therefore, examining stress urinary incontinence symptoms in relation to perceived exertion, age group, and body mass index may help identify clinically relevant patterns among gym-attending women and guide preventive pelvic floor education in fitness settings.

Therefore, this study aimed to determine the frequency of stress urinary incontinence symptoms among women attending gyms and to examine their association with rate of perceived exertion, age group, and body mass index. The study specifically addressed whether women reporting higher perceived exercise intensity were more likely to report stress urinary incontinence symptoms and whether age and body mass index were associated with urinary leakage patterns in this population.

MATERIAL AND METHODS

This cross-sectional observational study was conducted over one year, from September 2023 to September 2024, after approval from the research committee of the University of Sialkot. Data were collected from female gym attendees in Sialkot, Daska, and Gujranwala, Pakistan, including Oxygen Muscle Factory Gym, Ladies Fitness Gym, Sameer Fitness Gym, Chawinda Gym, V-Shaped Gym Sialkot, Fitness Zone Gym, Power House Gym, Trainer Arm Gym, CrossFit Gym, Citi Fitness Gym, and Champion

Fitness Center. The cross-sectional design was selected because the study aimed to estimate the frequency of urinary incontinence symptoms and assess their association with perceived exertion, age group, and body mass index at a single point in time among women attending community fitness settings.

The sample size was calculated using the RaoSoft sample size calculator with a 95% confidence level, 5% margin of error, and an estimated prevalence of 30%, resulting in a required sample of 323 participants (9). Eligible participants were women aged 25–45 years who attended gyms or community-based exercise classes at least three days per week, irrespective of marital status. Women with diabetes mellitus, chronic lung disease, current urinary tract infection, or a history of urinary incontinence surgery were excluded to reduce the influence of medical conditions or prior surgical intervention on urinary symptoms. Participants meeting the eligibility criteria were recruited from the selected gyms, and informed consent was obtained before data collection. Participation was voluntary, and confidentiality of personal and health-related information was maintained throughout the study.

Data were collected using a structured questionnaire administered manually and through online forms. The questionnaire recorded demographic and clinical information, including age, marital status, gym location, body mass index, exercise frequency, and relevant medical history. Age was categorized into two groups, 25–35 years and 36–45 years. Body mass index was classified into underweight, healthy weight, overweight, obese, and severely obese categories. These variables were recorded because age and body mass index are recognized factors that may influence pelvic floor function and stress urinary incontinence symptoms.

Urinary incontinence symptoms were assessed using the Urinary Incontinence Questionnaire, an eight-item categorical screening tool with response options recorded as “Never,” “Sometimes,” and “Often.” The first four items assessed stress urinary incontinence-related symptoms, including leakage during coughing or sneezing, laughing, squatting or lifting, and walking quickly, jogging, jumping, or exercise. Responses of “Sometimes” or “Often” on these stress-related items were interpreted as indicating the presence of the corresponding stress urinary incontinence symptom. Exercise-related stress urinary incontinence was described using the item assessing urine leakage during walking quickly, jogging, jumping, or exercise. The remaining four items assessed urgency-related urinary symptoms, including leakage while undressing to use the toilet, leakage before reaching the toilet, sudden strong urge to urinate, and incomplete bladder emptying symptoms (10,11).

Rate of perceived exertion was assessed using the Borg 10-point Rating of Perceived Exertion scale, a self-reported numerical scale ranging from 1 to 10. Lower scores represented very light activity, while higher scores represented vigorous, very hard, or maximal exertion. For analysis, perceived exertion was categorized as very light activity, light activity, moderate activity, vigorous activity, and very hard activity. Participants were instructed to select the exertion category that best represented the usual intensity of their gym-based exercise sessions. This measure was used because it provides a practical estimate of perceived exercise intensity in community and clinical exercise settings (12).

To improve data consistency, all questionnaire responses were coded using predefined categorical response options before analysis. Eligibility criteria were applied before questionnaire completion to minimize selection of participants with medical conditions that could independently influence urinary symptoms. Collection from multiple gyms across three cities was used to improve representation of women attending different community fitness settings. Age group, body mass index, marital status, and perceived exertion were recorded as clinically relevant variables for evaluating potential differences in urinary incontinence symptom patterns.

Data were analyzed using IBM SPSS Statistics version 27.0. Descriptive statistics were used to summarize participant characteristics, urinary incontinence symptoms, and rate of perceived exertion. Frequencies and percentages were calculated for categorical variables, including age group, marital status, gym

location, body mass index category, RPE category, and questionnaire responses. Mean and standard deviation were calculated for continuous variables, including age and body mass index. Associations between urinary incontinence questionnaire responses and rate of perceived exertion, age group, and body mass index category were examined using chi-square tests and cross-tabulations. The level of statistical significance was set at $p < 0.05$, with a 95% confidence interval and 5% acceptable margin of error.

RESULTS

A total of 323 women attending gyms were included in the analysis. The participants were almost equally distributed across the two age groups, with 162 women aged 25–35 years and 161 women aged 36–45 years. The mean age was 33.88 ± 6.48 years, and the mean body mass index was 30.49 ± 6.09 kg/m². Most participants were married, and more than half were classified as obese. Gym attendance was most frequently reported from Sialkot, followed by Gujranwala and Daska.

Table 1. Demographic and Clinical Characteristics of Women Attending Gyms

Variable	Category	n (%)
Age group	25–35 years	162 (50.2)
Age group	36–45 years	161 (49.8)
Marital status	Married	225 (69.7)
Marital status	Unmarried	98 (30.3)
Gym location	Sialkot	136 (42.1)
Gym location	Gujranwala	108 (33.4)
Gym location	Daska	79 (24.5)
BMI category	Underweight	7 (2.2)
BMI category	Healthy BMI	53 (16.4)
BMI category	Overweight	74 (22.9)
BMI category	Obese	169 (52.3)
BMI category	Severely obese	20 (6.2)

The sample showed a balanced age distribution, with 50.2% of participants in the 25–35-year group and 49.8% in the 36–45-year group. Most women were married, accounting for 69.7% of the sample. More than half of the participants were obese, while 22.9% were overweight and 6.2% were severely obese, indicating that excess body weight was common in this gym-attending population.

Table 2. Rate of Perceived Exertion Among Women Attending Gyms

Rate of Perceived Exertion	n (%)
Very light activity	10 (3.1)
Light activity	136 (42.1)
Moderate activity	113 (35.0)
Vigorous activity	48 (14.9)
Very hard activity	16 (5.0)

Most participants reported light or moderate perceived exertion during gym activity. Light activity was reported by 136 women, representing 42.1% of the sample, while moderate activity was reported by 113 women, representing 35.0%. Vigorous activity and very hard activity were reported by 14.9% and 5.0% of participants, respectively.

Table 3. Urinary Incontinence Questionnaire Responses Among Women Attending Gyms

Questionnaire Item	Never n (%)	Often n (%)	Sometimes n (%)
UIQ1	250 (77.4)	22 (6.8)	51 (15.8)
UIQ2	270 (83.6)	16 (5.0)	37 (11.5)
UIQ3	257 (79.6)	17 (5.3)	49 (15.2)
UIQ4	240 (74.3)	29 (9.0)	54 (16.7)
UIQ5	222 (68.7)	29 (9.0)	72 (22.3)
UIQ6	239 (74.0)	28 (8.7)	56 (17.3)
UIQ7	143 (44.3)	60 (18.6)	120 (37.2)
UIQ8	151 (46.7)	64 (19.8)	108 (33.4)

UIQ1–UIQ4 assessed stress urinary incontinence-related symptoms. Among these items, the highest symptom frequency was observed for UIQ4, where 83 participants reported symptoms either sometimes or often, corresponding to 25.7% of the total sample. Symptoms were also reported by 73 participants on UIQ1, 53 participants on UIQ2, and 66 participants on UIQ3. Urgency-related symptoms were more frequent on UIQ7 and UIQ8, with 180 and 172 participants reporting symptoms sometimes or often, respectively.

Table 4. Association Between Rate of Perceived Exertion and Urinary Incontinence Questionnaire Responses

Questionnaire Item	Response	Very Light n	Light n	Moderate n	Vigorous n	Very Hard n	Total n	p-value
UIQ1	Never	8	113	84	36	9	250	0.381
UIQ1	Often	1	8	7	4	2	22	
UIQ1	Sometimes	1	15	22	8	5	51	
UIQ2	Never	8	115	99	38	10	270	0.088
UIQ2	Often	2	6	4	2	2	16	
UIQ2	Sometimes	0	15	10	8	4	37	
UIQ3	Never	9	112	86	37	13	257	0.079
UIQ3	Often	0	5	4	7	1	17	
UIQ3	Sometimes	1	19	23	4	2	49	
UIQ4	Never	9	109	75	35	12	240	0.224
UIQ4	Often	0	12	10	5	2	29	
UIQ4	Sometimes	1	15	28	8	2	54	
UIQ5	Never	8	104	69	30	11	222	0.301
UIQ5	Often	1	10	12	4	2	29	
UIQ5	Sometimes	1	22	32	14	3	72	
UIQ6	Never	7	107	75	37	13	239	0.348
UIQ6	Often	2	11	11	4	0	28	
UIQ6	Sometimes	1	18	27	7	3	56	
UIQ7	Never	3	62	42	26	10	143	0.436
UIQ7	Often	3	26	22	7	2	60	
UIQ7	Sometimes	4	48	49	15	4	120	
UIQ8	Never	4	63	51	23	10	151	0.804
UIQ8	Often	1	30	22	10	1	64	
UIQ8	Sometimes	5	43	40	15	5	108	

Chi-square analysis showed no statistically significant association between rate of perceived exertion and any urinary incontinence questionnaire item. Among the stress urinary incontinence-related items, the lowest p-values were observed for UIQ3 and UIQ2, with p-values of 0.079 and 0.088, respectively; however, neither reached the prespecified significance threshold of $p < 0.05$. For exercise-related leakage assessed by UIQ4, the association with rate of perceived exertion was also not statistically significant.

Table 5. Summary of Reported Associations Between Participant Factors and Urinary Incontinence Questionnaire Responses

Factor	UIQ1 p-value	UIQ2 p-value	UIQ3 p-value	UIQ4 p-value	UIQ5 p-value	UIQ6 p-value	UIQ7 p-value	UIQ8 p-value
Rate of perceived exertion	0.381	0.088	0.079	0.224	0.301	0.348	0.436	0.804
Age group	0.012	0.866	0.002	0.002	0.015	0.050	0.001	0.321
BMI group	NR	NR	0.010	0.007	NR	NR	NR	NR

Age group showed statistically significant associations with UIQ1, UIQ3, UIQ4, UIQ5, UIQ6, and UIQ7. No statistically significant association was reported between age group and UIQ2 or UIQ8. BMI group showed statistically significant associations with UIQ3 and UIQ4, while significant associations were not reported for the remaining urinary incontinence questionnaire items. Rate of perceived exertion did not show a statistically significant association with any urinary incontinence questionnaire item.

Overall, exercise-related stress urinary incontinence symptoms were reported by 83 of 323 participants, corresponding to 25.7% of the sample on UIQ4. The findings indicate that stress urinary incontinence-related symptoms were present among gym-attending women, particularly for exercise-related leakage, but perceived exertion was not significantly associated with urinary incontinence responses. Age group and body mass index showed significant associations with selected stress urinary incontinence-related

items, suggesting that participant characteristics may be more closely related to symptom reporting than perceived exercise intensity in this sample.

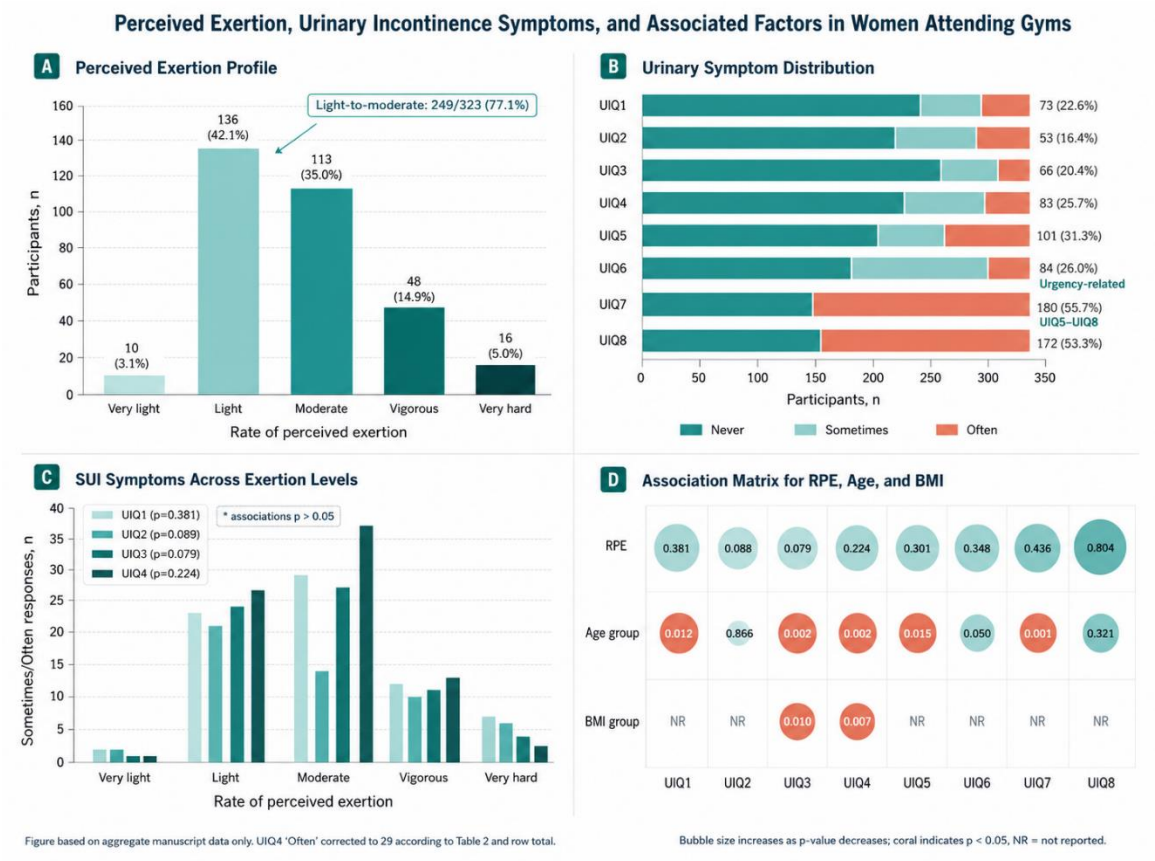

Figure 1 Perceived exertion, urinary incontinence symptom distribution, and associated factors among women attending gyms. The figure summarizes the distribution of perceived exercise intensity, urinary incontinence questionnaire responses, stress urinary incontinence-related symptoms across exertion levels, and reported association p-values for rate of perceived exertion, age group, and body mass index. Most participants reported light-to-moderate perceived exertion, while exercise-related leakage on UIQ4 was reported sometimes or often by 83 of 323 women. Rate of perceived exertion was not significantly associated with any urinary incontinence item, whereas age group and BMI group showed significant associations with selected questionnaire responses.

DISCUSSION

This cross-sectional study evaluated urinary incontinence symptoms among 323 women attending gyms and examined their relationship with rate of perceived exertion, age group, and body mass index. The findings showed that exercise-related stress urinary incontinence symptoms, assessed through UIQ4, were reported sometimes or often by 83 participants, representing 25.7% of the total sample. Other stress urinary incontinence-related symptoms were also present, including leakage during coughing or sneezing, laughing, and squatting or lifting. These findings indicate that urinary leakage during activities that increase intra-abdominal pressure is a relevant concern among gym-attending women. However, the results should be interpreted as symptom frequencies based on individual questionnaire items rather than as a single composite diagnostic prevalence, because participant-level overlap across UIQ1–UIQ4 was not available.

The proportion of women reporting exercise-related leakage in the present study is clinically important because gym-based activity is generally promoted for physical fitness, weight management, and cardiometabolic health. However, symptoms of urine leakage during exercise may discourage participation, reduce confidence during physical activity, and lead women to avoid certain movements such as jumping, lifting, jogging, or high-impact training. Previous evidence has shown that stress urinary incontinence may be common among recreationally active women attending gyms or exercise

classes, with higher prevalence reported in some physically active populations than in the present study (10). Differences in prevalence across studies may be explained by variations in age range, parity, type of exercise, impact level, diagnostic criteria, and whether stress urinary incontinence was defined by any leakage episode, questionnaire-based classification, or clinically confirmed diagnosis. In the present study, the frequency of UIQ4 symptoms was also close to previous work reporting stress urinary incontinence among women performing high-impact exercise, although direct comparison is limited by differences in study populations and measurement approaches (13,14).

The rate of perceived exertion was not significantly associated with any urinary incontinence questionnaire item in this sample. Among stress urinary incontinence-related items, UIQ3 and UIQ2 showed the lowest p-values, but neither reached statistical significance. This suggests that perceived exercise intensity alone may not adequately explain urinary leakage symptoms among gym-attending women. One possible explanation is that most participants reported light or moderate exertion, with 77.1% falling within these two categories, while relatively fewer women reported vigorous or very hard activity. Therefore, the sample may not have included a sufficient proportion of women exposed to high-intensity or high-impact exercise to demonstrate a clear association between perceived exertion and stress urinary incontinence symptoms. Another explanation is that RPE reflects subjective whole-body effort and may not directly capture pelvic floor loading, movement impact, lifting technique, intra-abdominal pressure generation, or exercise type, all of which may be more directly related to stress urinary leakage than perceived exertion alone.

The absence of a statistically significant association between RPE and urinary incontinence should not be interpreted as evidence that exercise characteristics are irrelevant to pelvic floor symptoms. Previous studies have suggested that high-impact exercise may increase the risk of stress urinary incontinence, particularly when activities involve repeated jumping, running, landing, or abrupt increases in intra-abdominal pressure (15). The present study assessed perceived exertion but did not classify exercise modality, training load, resistance level, jumping exposure, running volume, or pelvic floor muscle training history. As a result, the findings suggest that self-reported exertion intensity, as measured here, was not associated with urinary incontinence responses, while more specific exercise-related variables may still be important in future research.

Age group showed significant associations with several urinary incontinence questionnaire items, including UIQ1, UIQ3, UIQ4, UIQ5, UIQ6, and UIQ7. These findings support the interpretation that urinary leakage symptoms may become more frequent or clinically relevant with increasing age, even within a relatively young-to-middle-aged sample of 25–45 years. Age-related changes in connective tissue properties, pelvic floor muscle function, hormonal status, childbirth history, and cumulative mechanical stress may contribute to reduced continence support over time. Previous research also supports the association between increasing age and urinary incontinence symptoms, although the magnitude and pattern of association vary across populations, clinical settings, and age groups (16). In the present study, the significant age-related findings highlight the need for pelvic floor screening and preventive education among women attending gyms, particularly those in the older subgroup.

Body mass index was significantly associated with UIQ3 and UIQ4, indicating that BMI was related to leakage during squatting or lifting and during walking quickly, jogging, jumping, or exercise. This finding is consistent with the known role of excess body weight in increasing chronic intra-abdominal pressure and mechanical strain on pelvic floor and urethral support structures. Previous studies have reported positive associations between obesity-related indices and stress urinary incontinence among women, supporting the clinical relevance of weight status in urinary leakage symptoms (17,18). In this study, more than half of the participants were obese, and an additional proportion were overweight or severely obese, suggesting that body weight may be an important factor when assessing urinary incontinence symptoms among women attending fitness centers. However, because the study was cross-sectional, the findings cannot establish whether higher BMI contributed to urinary symptoms, whether

urinary symptoms influenced exercise behavior, or whether both were influenced by other factors such as parity, pelvic floor muscle function, or exercise type.

The findings also showed high frequencies of urgency-related symptoms, particularly UIQ7 and UIQ8, where more than half of the participants reported symptoms sometimes or often. Although the primary focus of this study was stress urinary incontinence, the presence of urgency-related symptoms suggests that gym-attending women may experience mixed urinary symptom patterns. This is clinically relevant because women who report leakage during exercise may also have urgency, incomplete emptying sensation, or overactive bladder-related complaints. Future studies should therefore distinguish stress, urgency, and mixed urinary incontinence using validated diagnostic scoring systems and, where feasible, clinical assessment.

This study has several strengths. It included a relatively large sample of gym-attending women from multiple fitness centers across Sialkot, Daska, and Gujranwala, which improves coverage of community-based exercise settings. The use of structured questionnaire responses allowed standardized symptom recording, and the inclusion of RPE, age group, and BMI provided clinically relevant variables for examining urinary incontinence patterns. However, several limitations should be considered. The cross-sectional design prevents causal inference. Urinary incontinence symptoms and perceived exertion were self-reported, which may introduce recall bias, reporting bias, or underreporting due to embarrassment. The study did not report parity, mode of delivery, menopausal status, pelvic floor muscle strength, exercise type, training duration, resistance load, high-impact exposure, or history of pelvic floor training, all of which could influence stress urinary incontinence. In addition, the analysis was based on chi-square testing and did not include multivariable adjustment; therefore, potential confounding by age, BMI, marital status, parity, or exercise characteristics could not be addressed. Some association tables for age and BMI were not fully presented, limiting interpretation of direction and magnitude.

Future research should use a clearly defined composite stress urinary incontinence outcome, such as “sometimes or often” on any stress-related questionnaire item, and should report participant-level overlap across symptoms. Studies should also collect exercise-specific variables, including high-impact activity, resistance training load, jumping exposure, running frequency, training duration, and pelvic floor muscle training practices. Multivariable regression models would allow adjustment for age, BMI, parity, marital status, childbirth history, and exercise type. Longitudinal designs may further clarify whether changes in weight, exercise intensity, training type, or pelvic floor intervention influence the development or improvement of urinary incontinence symptoms.

CONCLUSION

Stress urinary incontinence-related symptoms were present among women attending gyms, with exercise-related leakage reported sometimes or often by 25.7% of participants on UIQ4. Rate of perceived exertion was not significantly associated with urinary incontinence questionnaire responses, suggesting that perceived exercise intensity alone may not explain urinary leakage symptoms in this sample. In contrast, age group and body mass index were significantly associated with selected urinary incontinence symptoms, particularly stress-related leakage during squatting, lifting, walking quickly, jogging, jumping, or exercise. These findings support the need for pelvic floor health screening, weight-related risk assessment, and preventive education for women attending fitness centers, while future studies should use composite urinary incontinence outcomes and adjusted analyses to clarify independent predictors.

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