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ORIGINAL ARTICLE

Prevalence study of stress urinary incontinence in women who perform high-impact exercises

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Abstract
Introduction Stress urinary incontinence is a frequent complaint in medical offices and studies have shown that women who practice high impact sports develop its symptoms.
Objective To evaluate the prevalence of stress urinary incontinence in women who attend gyms and perform high impact exercises and correlate it with women who do not attend gyms.
Method Prospective comparative study in which 488 nulliparous women of normal weight were divided into a Study Group, composed of women who attended gyms, and a Comparative Group, composed of women who did not attend gyms. Three questionnaires were used for the evaluation of stress urinary incontinence and the results of the ICIQ-SF questionnaire were used to compare the groups.
Results There was a significant difference between groups on the ICIQ-SF. The average in the Study Group was 1.68 (+ 3.46) and in the Comparative Group the average was 1.02 (+ 2.69) (p=0.006).
Conclusion Women who attend gym and perform high impact exercises have a higher prevalence of urinary incontinence symptoms, independent of the exercise modality, than women who do not perform any high impact exercise.

Keywords Stress urinary incontinence · High impact exercises

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Introduction

Physical activity has been promoted to all ages because of the benefits to health and as a tool to compensate for a sedentary lifestyle, which can result in obesity, muscle weakness and postural problems. With this objective in mind, men and women search for exercise at gyms, without paying too much attention to the fact that during the execution of the activities, the superficial muscles as well as the internal muscles are engaged and could be damaged in the event that the exercises are not properly done.

The pelvic floor muscles (PFM) are part of the musculoskeletal system, more specifically the muscles around the sacroiliac articulation, which contribute to the stabilization of this region, as well as of the lumbar spine [1, 2]. Additionally, these muscles also have the function of keeping the viscera inside the abdominal cavity and contribute to sphincter functions. The PFM activity can be compromised if these muscles are damaged and their dysfunction is one of the factors involved in stress urinary incontinence (SUI).

Stress urinary incontinence is a significant complaint in medical offices and it is defined as the involuntary loss of urine during physical exertion (sports activities), sneezing or coughing [3]. It is responsible for approximately 50% of the urinary incontinence (UI) symptoms in women between 25 and 45 years old [4, 5]. This is a situation that causes embarrassment and discomfort, depriving women of social conviviality and can lead to the abandonment of physical activities as well as affecting sexual intercourse and the overall quality of life [6].

The mechanism of continence is the complex coordination of bladder, urethra, PFM and supporting ligaments. With increased abdominal pressures, the PFM contraction exerts a pull on the anterior vagina wall toward the pubic symphysis, leading to the occlusion of the urethra and preventing urine leakage [7].

This mechanism is called upon during physical exercises, when there is a variation in the intra-abdominal pressure.

Studies have shown a relationship between SUI symptoms and the performance of high-impact physical activities [8–11]. According to Jiang, direct damage to the pelvic floor, either the rupture of the pubocervical fascia or ruptures in the arch tendon insertion of the endopelvic fascia, may occur when high-impact physical activities are practiced, and can be responsible for SUI complaints [9]. Loss of urine can also occur from the fatigue of the PFM, arising from repetitive muscular contraction during high impact exercises, although there is not enough evidence to sustain this hypothesis [12, 13].

Some studies aimed also to evaluate the presence of SUI in elite athletes and dancers, as a result of their physical activities, and have shown a high level of SUI reports inside these groups [14–16]. In the cases where there was a comparison between athletes performing low- and high-impact exercises, the prevalence was higher in the second group. [14]

Although there is literature on the prevalence of SUI in athletes as well as on the correlation of higher incidence when performing high-impact exercises, it is important to understand how this affects female non-athletes, who represent the biggest part of society. A majority of women have a sedentary lifestyle and try to compensate for the lack of physical activity by going to gyms and practicing exercise often without guidance and without special precautions to protect and strengthen their PFM. Misguided exercises can be as important as risk factors such as pregnancy, childbirth, obesity and changes in physiological curves of the spine leading to postural changes and can modify the structure of the pelvic basin. Therefore, the body will seek a new balance, often with damage to bodily functions, as in the continence process [17].

These women comprise a group at risk of developing SUI and it is important to understand the level of incidence among this group and how it relates to the type of exercise performed (high impact or not) and compare it with the incidence among women who do not attend gyms and consequently do not perform high impact exercises.

Objective

To evaluate the prevalence of stress urinary incontinence in women who attend gyms and perform high impact exercises, and compare with women who do not attend gyms.

Materials and methods

A prospective comparative study was carried out in which 488 healthy, sexually active, and nulliparous women between 20 and 45 years of age were interviewed in the greater Campinas region and after written consent, were subdivided into two groups: a Study Group (SG), consisting of 244 women who attend gyms and a Comparative Group (CG), consisting of 244 women who do not go to gyms and do not perform any high-impact exercises. Excluded from the study were women with diabetes mellitus, chronic lung diseases, those who had undergone urinary incontinence surgery, or those with a urinary tract infection. Also excluded from the study were women with body mass index (BMI) exceeding 30, which was calculated by dividing the weight by the height to the power of two, with eight and height being self-reported values.

All women selected for the comparative group were interviewed outside of gyms, in places like: banks, universities, beauty centers, and residential buildings. These women pledged not to perform any high impact exercises and most of them also pledged not to perform any kind of exercises. The few who did perform exercise referred only to running, swimming, stretching or localized exercises (and therefore not high-impact exercise). As the criteria to classify the type of exercise, weight-bearing lower extremities exercise, including jumping and leaping in vertical and onward directions, were considered high-impact exercise. All other exercise was considered non-high impact.

Three questionnaires were used for the evaluation: the first for personal information; the second, the International Consultation on Incontinence Questionnaire Short-Form (ICIQ-SF) [18, 19], to evaluate the SUI symptoms; and the third, a specific questionnaire about the physical activity, with type and frequency of exercise and the relationship between urine loss and the activity. Women interviewed at the gyms received a specific questionnaire, requesting information on the type of activity performed.

The sample size was calculated by the Statistics Department of the Faculty of Medical Sciences of UNICAMP, with data from a pilot study performed in December 2008. This study featured 108 women of whom 57 used to attend gyms and 51 did not attend gyms and the evaluation was carried out based on the average score calculated from the ICIQ-SF. An average difference of 0.81 was found between the groups (calculated from the difference between the average of the group of women who used to attend gyms, 2.32, and the average of the group of women who did not attend gyms, 1.51), a standard deviation of 3.19 and a significance level of 5% (alpha or error type I) and a power of 80% (beta or error type 2 of 20%). Based on this calculation, the sample size required was 244 women for each group. [20]

This study was approved by the Research Ethics Committee (1093/2008).

Results

Demographic data are presented in Tables 1 and 2. Statistical analysis showed a significant difference between the groups

Table 1 Descriptive analysis of the women's characteristics in the Study Group (n=244) and the Comparative Group (n=244)

Characteristic	Study Group		Comparative Group		p
	Average	SD	Average	SD	
Age (years)	25.68	5.32	24.45	4.97	<0.001 (Mann–Whitney)
BMI	22.03	3.21	21.87	2.85	= 0.427 (Mann–Whitney)
ICIQ-SF	1.68	3.46	1.02	2.69	= 0.006 (Chi-squared)

with regard to age (p<0.001), but the difference in mean age was 1.23 years, which in practice is a small difference, and therefore it can be considered that this difference in years would not lead to any difference in results.

Regarding schooling there was no significant difference between groups (p=0.016). With regard to the race declared and BMI, there was no significant difference (p=0.344 and p=0.427 respectively). The BMI showed mean 22.03 (±3.21) in the Study Group and 21.87 (±2.85) in the Comparative Group.

There was a significant difference between groups (p=0.006) regarding the ICIQ-SF. The average score was 1.68 (± 3.46) in the Study Group and 1.02 (± 2.69) in the Comparative Group. When comparing the replies to the last question of the questionnaire, in which the loss of urine during effort and the situation of the loss was evaluated, 24.6% of women in the Study Group reported loss of urine, compared with 14.3% in the Comparative Group (p=0.006).

There was also a significant difference reported between the groups regarding the question in which the respondents were asked if loss of urine occurred during physical activity: 5.7% in the Study Group compared with 0.4% in the Comparative Group (p=0.001).

The Study Group also answered a specific questionnaire about physical activity and the results were that the average time spent performing physical activity was 39.65 months (+ 47.08) and the weekly frequency was 3.74 days (+1.36). In this group, 14.3% of women reported urine loss during the exercises and 57.4% reported emptying the bladder as prevention before starting the exercises. The type of exercise and the respective number of women performing them, as well as the respective proportions of reports of urine leakage, are shown in Table 3.

Analyzing the results for the time and weekly frequency of the exercise, there is no significant difference between women who reported never losing urine and those who have had at least one situation of loss. However, regarding the type of exercise, jumping was the cause of urine leakage in the highest number of women.

Table 2 Descriptive comparative analysis of the women's race and education in the Study Group (n=244) and the Comparative Group (n=244)

Characteristic		Study Group (%)	Comparative Group (%)	p (Chi-squared)
Declared race	White	86.1	82.0	= 0.344
	Black	1.6	3.3	
	Yellow	6.6	7.4	
	Others	4.1	3.3	
Education	High school	22.1	15.6	= 0.016
	University	77.9	84.4	

Comments

As also found in the literature, the women interviewed were quite young. The average age was 25.68 in the Study Group and 24.45 in the Control Group. In their studies, Nygaard et al. (1996) interviewed athletes between 18 and 20 years of age and Thyssen et al. (2002) interviewed athletes with an average age of 22.8 years [16, 21]. This is relevant information, since at this age, women have less chance of exhibiting the predisposing factors for UI. This study selected only young and healthy women, eliminating risk factors, known in the literature to be potential causes for the complaint of urine loss.

Table 3 Types of exercises, number of women practicing them within the Study Group and the incidence of urine leakage during exercise practice

Type of exercise	Number of women performing exercise	Number of women with urine leakage during the exercise	Percentage
Others[a]	32	11	34.4
Jump	80	20	25.0
Step	43	10	23.3
Running	87	17	19.5
Abdominal	87	14	16.1
Localized Exercises	73	11	15.1
Hydrogymnastic	7	1	14.3
Bodybuilding	164	23	14.0
Muscle stretching	68	9	13.2
Hiking	99	12	12.1
Bike	89	9	10.1
Swimming	14	1	7.1
Pilates	36	2	5.6

[a] In this group are included women who referred to exercise such as dancing, fights, volley ball, basket ball or tennis

A few studies were found that used a comparative group. Bo and Sundgot (2001) compared elite athletes with a pair age group and found equal prevalence for SUI and urgency urinary incontinence in both groups [22]. However, the prevalence of urine loss during physical activity was higher in elite athletes. This study showed a higher prevalence of urine loss in women who practice physical activity compared with those who do not practice or practice only low impact exercises. However, 14.8% of nulliparous women with an average age of 24.45 who did not perform high impact exercise reported urine loss. Considering the total number of women interviewed, 39.4% of them reported some sort of urine loss. One interesting finding demonstrated in this study was the higher number of young, healthy and nulliparous women who reported these symptoms.

Fischer and Berg (1999) correlated BMI with urinary incontinence and observed that this relationship only occurs at values of BMI greater than 30 [23]. Therefore, women in this condition were excluded from the study.

In this study, of the women who exercise, 14.3% reported loss of urine during the physical activity.

Nygaard et al. (1996) reported that about 54% of elite athletes had an episode of urine loss during physical activity and Thyssen et al. (2002) found that 44% of athletes and dancers lost urine during sport [16, 21]. In addition, Thyssen reported that the exercise that is usually associated with higher loss is "jumping." In relation to the time and frequency of practice and the type of exercise, no difference was found between the women who reported some loss and those who had no loss.

Another important factor reported by Thyssen et al. is the ritual of urinating before physical activity. In his study, 57.4% of women in the Study Group used to urinate before exercise. This could lead to two different conclusions, which could potentially influence the result of the prevalence of urine loss: that women do not lose urine because they have the habit of emptying the bladder before doing the exercise (they would lose urine if they don't) or they empty the bladder as a routine and nothing would happen otherwise.

The lack of information on the causes of incontinence, its prevention and treatment leads to two types of behavior: women assume that losing urine during exercise is a normal condition and accept it, thus worsening the situation (the PFM condition and consequently the UI symptoms) or the women completely give up practicing exercises, which has a large impact on the other aspects of their life.

This study showed that a higher prevalence of urinary incontinence symptoms was found in women who frequent the gym, independent of the type of physical activity performed. This study also showed that the SUI, which before was a condition attributed to older women, is also present in very young women. This needs to be taken into account and more attention and orientation needs to be dedicated to these younger women at the doctor's and physiotherapist´s offices, as well as in gyms and sports centers.

More studies are necessary to understand the factors that are present in women's routines that may be related to UI symptoms, e.g., postural imbalances, misguided exercises and professional activity. What, finally, can be leading such young women to present these symptoms of urine loss?

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Conflicts of interest None.

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