Prevalence and occurrence of stress urinary incontinence in elite women athletes

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Objective: *1) To assess the prevalence of stress urinary incontinence (SUI) and urge urinary incontinence (UTI) in elite women athletes versus the general female population, and 2) to analyze the conditions of occurrence of urine loss in search of etiological clues in elite athletes.* ***Decision:*** *An anonymous self-questionnaire was collected transversally from women aged 18 to 35 years. The exposed group was composed of elite female athletes; the non-exposed group was made up of women in the same age range accepting to answer the questionnaire.* ***Results:*** *A total of 157 answers from elite athletes and 426 from control subjects were available for analysis. Urinary incontinence prevalence was 28% for athletes and 9.8% for control subjects ($p = .001$). There was no significant difference in the relative prevalence of SUI between the athletes and control subjects. Athletes reported urine loss more frequently during the second part of the training session ($p < 0.0003$), and the second part of competition ($p < 0.05$). Urinary incontinence prevalence was 9.87% in physically-active control subjects versus 9.84% in sedentary control subjects (NS). Even a small quantity of urine loss was felt to be embarrassing. Most incontinent women did not dare to speak of their condition to anybody. Conclusions: There is a very high prevalence of urinary incontinence in women athletes. Detailed studies of the patho-physiology of this problem are necessary to formulate preventive recommendations.*

Key Words: prevalence study, urine loss, elite sportswomen, general population

Introduction

Urinary incontinence has been defined by the International Continence Society (ICS) as "the complaint of any involuntary leakage of urine".[1] Reports of the prevalence of urinary incontinence vary considerably from 10% to 58% in the general female population.[2] Stress urinary incontinence (SUI), the most common subtype of urinary incontinence in young women, is defined as the involuntary loss of urine during physical exertion increasing abdominal pressure.[1,3] SUI may occur during physical activity and daily events such as coughing, sneezing, or laughing. Urge urinary incontinence (UUI) is defined as the involuntary loss of urine associated with a sudden, strong desire to void.[1] UUI occurs especially in association with cold exposure, hand washing, loud noises, and anxiety. The coexistence of both SUI and UUI represents mixed incontinence.[1]

Although some studies have focused on a genetic

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cause of urinary incontinence,[4] other factors are involved. Delivery and constipation are described as the principal risk factors, but some studies have also examined the association of urinary incontinence with age and menopause.[5,6] Among other etiological factors of urinary incontinence, sports have been identified as a risk factor.[4-6]

Prevalence studies of urinary incontinence in physically-active women have yielded very different results. In rural general practice, Jolleys[7] found that 41% of young physically-fit women reported urinary leakage Bo et al[8] and Nygaard et al[9] respectively observed that 26% and 42% of elite athletes reported urine loss at least once during their daily activities. In another study, Bo et al investigated the prevalence of urinary incontinence in elite athletes and age-matched controls. They found 41% prevalence in elite athletes versus 39% in controls, without significant differences despite rigorous methodology.[10] On the other hand, the psychological distress associated with urinary incontinence is serious.[11] Nygaard et al[12] noted that 20% of women who were incontinent during a particular exercise stopped participating in it.

We hypothesized that methodological difficulties as well as a lack of information about the actual prevalence of urinary incontinence in sportswomen compared to the general population are the main obstacles in the prevention of this problem.

The aim of our study was, therefore, to:

1) assess urinary incontinence prevalence in elite athletes versus the general female population,
2) analyze the conditions of occurrence of urine loss in search of etiological clues of urinary incontinence in elite athletes.

Material and methods

We undertook an epidemiological athlete/non-athlete study, with one condition collected transversely by anonymous self-questionnaire. Only elite athletes, a status that may influence the condition, i.e. urinary incontinence, were included in the athlete group.

The study population was comprised of women aged 18 to 35 years. The athlete group of elite sportswomen practiced their activities at the highest national level, involving high intensity and sustained training. Some athletes were enlisted by the Minister of Youth and Sports and selected for a national team. All 53 sports clubs practicing at the national level in the region of Nîmes, France, were asked to participate. The non-athlete group was recruited randomly. Physicians from the Occupational Medicine Networks of Nîmes and Beziers, France presented the questionnaire to all female subjects in the required age range. Some subjects were recruited with the cooperation of the Beziers Nursing School. Within the non-athlete group, women participating in a physical activity at least once a week were considered as physically active; others were considered as sedentary. Anonymity was guaranteed to all study participants.

The self-questionnaire was the same for both groups. We used a validated questionnaire (effect size = 1.12 – unpublished data) developed for our hospital clinics. The first part, a general description of the aim of the study, was followed by questions regarding medical, obstetrical, gynecological histories and physical activities, including type of sports activities and duration of physical training per week. Finally, the participants were asked about urinary incontinence. Questions were related to symptoms of stress or urge incontinence, and the occurrence of urine loss during coughing, sneezing, laughing or sudden changes of position, cold exposure, hand washing, loud noises, anxiety or physical activity (i.e. in the first or second part of the physical exercise session). Urge incontinence was investigated along with the date of appearance, quantity, frequency, triggering factors, and resulting discomfort. The subjects were asked to rate their urinary incontinence as slight or marked, and its frequency of occurrence as daily, weekly, or monthly. Subsequent embarrassment was evaluated on a visual analogical scale. Subjects were also asked if they wore protection.

Women reporting urinary incontinence corresponding to the definition given by the ICS were considered as incontinent. Women with a history of pelvic surgery were excluded. The required number of subjects, calculated as recommended by Breslow and Day[13] was 171 elite athletes and 513 control subjects. Ethics Committee approval is not required in France for studies based on a strictly anonymous questionnaire.

The results are expressed hereunder as means ± 1 SD. Statistical analysis was performed using SAS V8.1 software (SAS Institute Inc. Cary, NC). Quantitative variables between groups were compared by Student's test for independent series, or by the Kruskal-Wallis test, depending on the observed distribution. Qualitative variables were compared by the c2 test or Fisher's exact test, depending on the observed distribution. The time of occurrence of urinary incontinence during physical exercise in the exposed group was established by comparing qualitative variables for matched series, i.e. the McNemar test. The results were considered significant at $P < .05$.

TABLE 1. **Percentage of subjects presenting stress urinary incontinence (SUI), urge urinary incontinence (UUI) and mixed incontinence (MUI)**

	SUI* %	UUI* %	MUI* %
Incontinent athletes n = 44	41.9	34.9	23.2
Incontinent non athletes n = 42	48.7	33.4	17.9
Physically-active n = 30	53.6	32.1	14.3
Sedentary n = 12	36.4	36.4	27.2

*no statistical difference found between groups within each type of incontinence

Results

Twenty-eight of the 53 sports clubs accepted to participate in the study. Within these clubs, 55.6% of athletes answered the questionnaire. We obtained a total of 157 completed questionnaires from elite athletes, and 426 (out of 602, 70%) from control subjects.

Age was 23.37 ± 4.52 years in the athletes group, and 25.06 ± 4.6 years in the non-athlete group ($p = 0.001$). Urinary incontinence prevalence was 28% (44 subjects) in the athletes group, and 9.8% (42 subjects) in the non-athlete group ($p = 0.3$).

Table 1 reports the prevalence of each incontinence type in both groups. SUI was the most common type reported by the subjects. There was no significant difference between the athletes and non-athlete groups regarding the relative prevalence of SUI and UUI.

In the non-athletes group, 304 (71.4%) were active women with an average duration of physical activity of 2.1 ± 1.3 hours per week. In athletes, the total duration of physical training was 9.25 ± 2.6 hours per week.

The prevalence of urinary incontinence in the non-athlete exposed group was 9.84% (n = 12) in sedentary women, and 9.87% (n = 30) in physically-active women (NS). The difference in prevalence between physically-active women and elite athletes was statistically significant ($p = 0.001$). Table 1 shows the type of urinary incontinence in incontinent athletes and non-athlete subjects. No significant difference was found between these subgroups. In the exposed group, there was a significant association between urinary leakage and progress of the physical session: urinary leakage appeared more frequently during the second part of the training session ($p < 0.0003$) and the second part of competition ($p < 0.05$), Table 2.

The highest rate of urinary incontinence was found in athletic activities and volley-ball, Figure 1. Comparison of the rate of incontinence between different sports activities did not yield significant results considering the small number of subjects in some subgroups.

Parity looked to be a risk factor for incontinence in non-athletes only (35,7% after one or more uncomplicated pregnancy versus 8% in nulliparous women $p < 0.0001$). In athletes in contrary prevalence of incontinence was 28.5% in nulliparous versus 2.3% in women having had one or more pregnancy. The small number of subject in the latest group may explain this paradox.

Most incontinent women reported only a few episodes of urine loss per month, Figure 2. Among

TABLE 2. **Occurrence of urine leakage in athletes presenting SUI during exercise**

Urine leakage in the first part of training	**Urine leakage in the second part of training**	**n = 15**
Yes	Yes	2 (13.3%)
Yes	No	0 (0%)
No	Yes	13 (86.7%)*
Urine leakage in the first part of competition	**Urine leakage in the second part of competition**	**n = 17**
Yes	Yes	4 (23.6%)
Yes	No	3 (17.6%)
No	Yes	10 (58.8%)*

*significant difference between the discordant data: yes-no versus no-yes

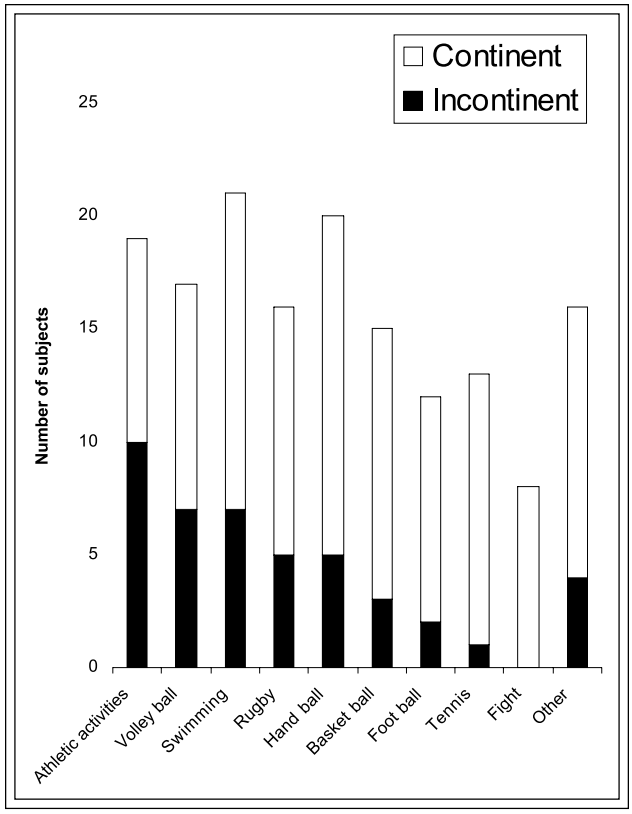

Figure 1. Urinary incontinence distribution according to sports activity in exposed subjects.

incontinent women, 2.41% of athletes and 4.82% of controls wore protection. Among athletes as well as control subjects, very few incontinent women admitted that they had discussed the matter with another party, Table 3.

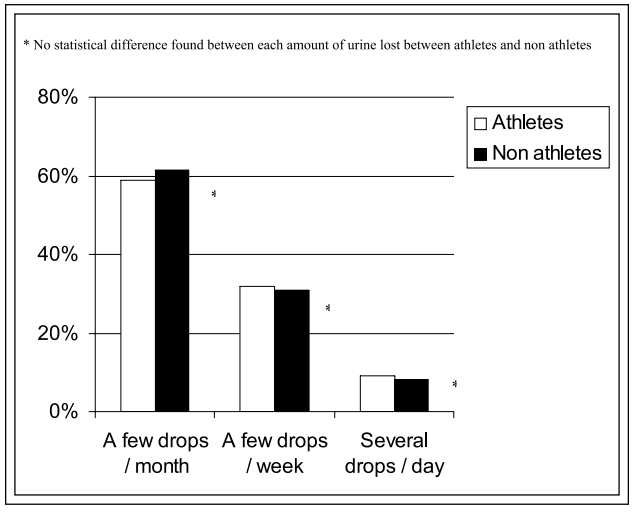

Figure 2. Quantity of urine losses

TABLE 3. **Persons to who subjects spoke about their incontinence problem**

	Athletes n = 44 n (%)	**Non-athletes n = 42 n (%)**	**P value**
Trainer	0 (0)		
Sport doctor	1 (2.2)		
Family doctor	1 (2.2)	10 (24)	0.001
Family	5 (11.3)	4 (10)	ns
Never spoke to anybody about it	37 (84%)	28 (66)	0.01

Discussion

Our study demonstrated a higher prevalence of urinary incontinence in young female elite athletes than in the controls. The exposed group was slightly younger than the non-exposed group, but the very small age difference cannot explain this result. The number of questionnaires collected was close to the calculated number. Missing questionnaires could have belonged to incontinent women who preferred not to answer as well as to continent women who were not motivated enough to participate in this study. Mallet and Bump[2] claim that incontinent women are more inclined to participate in such studies. Our investigation confirms that the prevalence of urinary incontinence is significantly higher in elite athletes (28%) than in the general population (9.8%), but lower than reported in the literature.[7,9] These discrepancies may be explained by the larger number of subjects we included, and the more restrictive definition of incontinence we used, as we considered only subjects with ongoing urinary incontinence.

Our study design was similar to the Bo and Borgen study.[10] Both studies used questionnaires to investigate the prevalence of urinary incontinence in elite athletes and age-matched controls; however the questionnaires used in that study are different from ours. Bo and Borgen[10] included a greater number of subjects involving all sports clubs in Norway, whereas our study was limited to the southern part of France around Nîmes, i.e. an area with homogeneous climatic conditions. In contrast to our results, Bo and Borgen found no difference in the prevalence of urinary incontinence between elite athletes (41%) and controls (39%). When referring, as we did, to the more restrictive ICS definition of urinary incontinence, prevalence fell respectively to

15% in their athletic group and 16.4% in the controls. Differences in body mass index and pregnancy rate were present the control groups of these two studies. Furthermore, many differences in climate, life-style, and nutrition between Norway and the south of France may have contributed to this discrepancy. In our study, we divided the non-athlete group into physically-active and sedentary women, and found no significant difference of urinary incontinence prevalence. Physical activity at an amateur, non-competitive level does not seem to constitute a risk factor for urinary incontinence. Therefore, only a high level of sports activity seems to result in greater urinary incontinence prevalence. Information regarding the type and intensity of physical activity in the control group cannot be found in the Bo and Bergen report.[10] In the athletes group, delivery could not explain the high prevalence of urinary incontinence, since few incontinent, athletes had children. Moreover, urinary incontinence prevalence remained significantly higher in elite athletes than in the general population when women with one or more previous pregnancy were excluded.

In this epidemiological study without clinical examination, the quantification of urine loss was subjective, but showed no significant difference between athletes and controls: most incontinent subjects presented "light" or "moderate" urinary leakage, and very few reported severe incontinence requiring them to wear protection.

Wyman et al,[11] found that patient perception of the psychological impact of urinary incontinence did not correlate with the objective severity of symptoms. Despite distress associated with urinary incontinence, very few incontinent women discussed their condition with someone else.[14] According to Wyman,[15] the majority of incontinent women do not seek help for their problem. This is especially true in elite athletes. One of the explanations offered by these authors is a lack of information, which leads to the acceptance of symptoms as being normal, and to the fear that surgery is the only treatment available. Most incontinent athletes are not aware that a 6-month training of pelvic floor muscles may be an efficient treatment of urinary incontinence.[16] Furthermore it is also interesting to notice that according to Nygaard et al,[9,17] strenuous exercises and sports don't predispose women to a markedly higher rate of incontinence in they get older in comparison to more sedentary women.

The small number of subjects in each sports group did not allow us to identify "high impact activities", as described by Nygaard,[12] as a risk factor for urinary incontinence. For these authors, track and field, gymnastics, basketball, and tennis seemed more likely to cause urinary incontinence. The acknowledged mechanisms of urinary incontinence in athletes involve a sudden increase in abdominal pressure that may lead to a transitory imbalance of continence mechanisms.

Athletes reported stress urinary loss more frequently at the end of practice sessions. One explanation may be that undergoing strong and repetitive abdominal pressure weakens the pelvic floor muscles that are no longer able to support the bladder and closing of the urethra. Progressively increased bladder volume may also be involved, but only in long-lasting sessions. However, urge incontinence was also frequently reported by athletes. Anxiety before competition may be a factor, but further clinical studies are necessary to investigate the risk factors and etiology of urinary incontinence in elite athletes.

Conclusion

Urinary incontinence is indeed a serious problem in women athletes. The demonstration of its higher prevalence in elite athletes than in the general population is mandatory to increase awareness among elite and professional sportswomen, their physicians and their managers, opening the way to further studies of its exact mechanisms and efficient prevention. Even if some elite athletes value competition results more than quality of life, they must understand that prevention is possible, thus improving their psychological condition for better results. □

References

1. Abrams P, Cardozo L, Fall M, Griffith D, Rosier P, Ulmsten U, Van Kerrebroeck P, Victor A, Wein A. Lower urinary tract function: standardization of terminology *Neurourol Urody* 2002;21:167-178.
2. Mallet V, Bump R. The epidemiology of female pelvic floor dysfunction. *Curr Opin Obstet Gynecol* 1994;6:308-312.
3. Fall M, Frankenberg S, Frisen M et al. 456,000 Swedes may have incontinence. Only one out of four seeks help for the problem. *Laekartid* 1985;82:2054-2056.
4. Mushkat Y, Bukovsky I, Langer R. Female stress incontinence - does it have familial prevalence? *Am J Obste Gynecol* 1996;174:617-619.

5. Chiarelli P, Brown W, McElduff P. Leaking urine: prevalence and associated factors in Australian women. *Neurourol Urodyn* 1999;18:567-577.
6. Sherburn M, Guthrie JR, Dudley EC et al. Is incontinence associated with menopause? *Obstet Gynecol* 2001;98:628-633.
7. Jolleys J. Reported prevalence of urinary incontinence in women in a general practice. *Brit Gen J* 1988;296:1300-1302.
8. Bo K, Maehlum S, Oseid S et al. Prevalence of stress urinary incontinence among physically active and sedentary female students. *Scand J Sports Sci* 1989;11:113-116.
9. Nygaard I, Thompson F, Svengalis S et al. Urinary incontinence in elite nulliparous athletes. *Obstet Gynecol* 1994;84:183-187.
10. Bo K, Borgen JS. Prevalence of stress and urge urinary incontinence in elite athletes and controls. *Med Sci Sports Exerc* 2001;33:1797-1802.
11. Wyman J, Harkins S, Choi S et al. Psychosocial impact of urinary incontinence in women. *Obstet Gynecol* 1987;70:378-380.
12. Nygaard I, Delancey JO, Arnsdorf L et al. Exercise and incontinence. *Obstet Gynecol* 1990;75:848-851.
13. Breslow NE, Day NE. Statistical methods in cancer research. Vol II: The design and analysis of cohort studies. I.A.R.C. Workshop May 1983. *IARC Sci Publ* 1987;82:1-406
14. Norton PA, MacDonald LD, Sedgwick PM et al. Distress and delay associated with urinary incontinence, frequency, and urgency in women. *BMJ* 1988;297:1187-1189.
15. Wyman J. The psychiatric and emotional impact of female pelvic floor dysfunction. *Curr Opin Obstet Gynecol* 1994;6:336-339.
16. Bo K, Hagen RH, Kvarstein B et al. Pelvic floor muscle exercise for the treatment of stress urinary incontinence: III. Effects of two different degrees of pelvic floor muscle exercises. *Neurourol Urodyn* 1990;9:489-502.
17. Nygaard IE. Does prolonged high-impact activity contribute to later urinary incontinence? A retrospective cohort study of female Olympians. *Obstet Gynecol* 1997;90:718-722.