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ORIGINAL ARTICLE

Urinary incontinence in female road runners from the Brazilian Federal District - occurrence and associated risk factors

Incontinência urinária em grupos de corredoras de rua no Distrito Federal - prevalência e fatores associados

A incontinência urinaria en grupos de corredoras de la calle en el Distrito Federal - prevalencia y factores associados

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Keywords
Urinary incontinence;
Urinary incontinence stress;
Female runners;
Prevalence.

ABSTRACT
Urinary incontinence (UI) is defined as the involuntary leakage of urine and stress urinary incontinence (SUI) is a common type of UI, characterized by the loss of urine during physical effort, including running. **Objective:** Analyze UI and associated factors in female road runners in the Brazilian Federal District (DF). **Method:** Cross-sectional descriptive study that investigated UI by applying an adapted questionnaire to female road runners in DF. **Results:** 94 runners, 3.2% of whom reported UI and 56.6% complained of SUI. Body mass index (BMI), birth weight of largest baby and episiotomy were factors associated of SUI. **Conclusion:** Although few women reported UI while running, the results suggest that SI needs to be addressed, especially when associated with risk factors.

Palavras-chave
Incontinência urinária;
Incontinência urinária de esforço;
Corredoras de rua;
Prevalência.

RESUMO
A incontinência urinária (IU) é definida como a perda involuntária de urina, e a incontinência urinária de esforço (IUE) é um tipo comum de perda urinária, caracterizada pela perda de urina durante esforço físico, como, corrida. **Objetivo:** Analisar a prevalência e fatores associados de IU em corredoras de rua do Distrito Federal (DF). **Método:** Estudo transversal descritivo, com aplicação de questionário adaptado, em mulheres, corredoras no DF. **Resultados:** De 94 corredoras, 3.2% apresentaram IU, sendo IUE, 56.6% mais comum entre 40 a 49 anos. Índice de massa corporal (IMC), peso do maior bebê e episiotomia foram fatores associados à IU. **Conclusão:** Embora poucas mulheres relatem IU, os resultados sugerem que a IU precisa ser abordada, ainda quando associada aos fatores de risco.

Palabras clave
Incontinencia urinaria;
Incontinencia urinaria de esfuerzo;
Corredoras de la calle;
Prevalencia.

RESUMEN
La incontinencia urinaria (IU) se define como la pérdida perdida involuntaria de orina, y la incontinencia urinaria de esfuerzo (IUE) es un tipo común de pérdida urinaria, caracterizada por la pérdida de orina durante el esfuerzo fisico, como correr. **Objetivo:** Analizar la prevalencia y sus factores asociados de IU en corredoras de la calle en el Distrito Federal (DF). **Método:** Estudio descriptivo de corte transversal, com aplicación de un cuestionario adaptado, en mujeres, en DF. **Resultados:** De 94 corredoras, 3.2% tenían UI, con IUE más común entre 40 y 49 años. Índice de masa corporal (IMC), partos de fetos grande y la episiotomía fueros factores associados con la IU. **Conclusión:** Aunque pocas mujeres informan IU, los resultados sugieren que es necesario abordar la IU, incluso cuando se associa com factores de riesgo.

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INTRODUCTION

According to the International Continence Society (ICS), urinary incontinence (UI) is defined as complaint involuntary loss of urine and stress incontinence (SUI) involuntary loss of urine on effort or physical exertion or on sneezing or coughing (Haylen et al., 2010). The prevalence of UI increases with advancing age. Symptoms of UI in women have been linked to several risk factors, age, obesity, parity, pregnancy, vaginal delivery, chronic obstructive pulmonary disease, gynecological surgeries, diet, smoking, comorbidities, and physical exercise (Pedersen et al., 2017; Nygaard and Shaw, 2016).

With the increase in the practice of sports and the awareness of the importance of physical activity, there has been a growth in pelvic floor dysfunction in practitioners of physical activity in both professional and amateur athletes. In a systematic review, when compared to about the other 17 sports, the prevalence ranged from 5% in low-impact activities to 80% in activities such as jumping on a trampoline. The amount of training also proved to be a factor in the development of UI in athletes. Teixeira et al. (2018) observed the presence of 36% UI in athletes, and when compared to sedentary women, athletes had a 177% higher risk of presenting UI (Mattos et al., 2018; Teixeira et al., 2018).

Urinary incontinence is a major public health problem and is associated with poor quality of life (QOL). High age and body mass index (BMI) associated with high-impact physical activity were positive associations with the reduction in quality of life in athletes with urinary symptoms. Meanwhile, higher values of maximum voluntary contraction of the pelvic floor muscles (PFM) and longer physical activity were associated with improved QOL and reduced urinary symptoms. In female athletes, UI leads to reduced performance, change of sport, and even avoid physical activity (Pizzol et al., 2021; Pires et al., 2020; Casey and Temme, 2017).

Regarding the current evidence, it is known that running is a sport with intense involuntary activation of PFM. However, the mechanism of activation of such muscles during physical activity is still uncertain. Besides, there are still some doubts about the practice of long-term physical exercise and strenuous exercise in the support and function of PFM. The intra-abdominal pressure and the pressure in the PFM vary depending on the type of sport and each woman. Also, it is not yet known what the limits of values that can cause dysfunctions or benefits for this musculature are (Bø and Nygaard, 2020; Moser et al., 2018; Shaw and Nygaard, 2017).

Running involves global muscle activation, including the pelvic floor (PFMs) and abdominal muscles, being the latter also indirectly related to PFM support (Leitner et al., 2017). In a cross-sectional study by Forner and collaborators, when comparing the symptoms in the PFMs in female runners with Crossfit practitioners, they observed that runners had a higher prevalence of pelvic organ prolapse and anal incontinence. SUI was present in both groups. However, it was not found a significant difference (37% in runners and 41% in Crossfit practitioners) female runners who have already had vaginal birth reported more symptoms in the PFMs (Forner et al., 2021).

Taking into account the high prevalence of UI in athletes and its negative impact on QOL, this study aims to investigate UI and associated factors in female road runners from the Federal District (DF) in Brazil.

METHODS

This is a cross-sectional descriptive study with female road runners from DF, recruited during road races. Inclusion criteria were being a woman, aged between 18 and 49 years, and member of a running club or group in the Federal District. Women with physical disabilities, professional athletes and those who had undergone gynecological surgeries, were pregnant or had been clinically diagnosed with UI were excluded.

Female runners who met the inclusion criteria were invited to participate, advised of the study objectives and methodology and provided written informed consent. Sociodemographic and clinical data were initially assessed, followed by a self-administered questionnaire designed by the researchers, containing 16 objective and 5 subjective questions. Adaptations of the question "Do you worry in case you smell?" from the King's Health Questionnaire (KHQ) (Fonseca et al., 2005) and a question on the type of UI from the International Consultation on Incontinence Questionnaire - Short Form" (ICIQ-SF) (Tamanini et al., 2004) were also included.

The study was approved by the Unieuro Research Ethics Committee (REC), under protocol number 2.210.208.

Data were analyzed using SPSS software, version 22.0. Descriptive statistics were used to characterize the sample according to mean, standard deviation and frequency. The chisquared test was used to analyze categorical data, the relationship between running and UI, and between age, BMI and running time. Significance was set at less than or equal to 0.05.

RESULTS

From October to November 2017, 190 runners from 16 running clubs in DF were contacted, but 45 declined to participate and 32 were older than 49 years. Of the 113 women remaining, 19 were excluded due to a clinical diagnosis of urinary incontinence (4), previous gynecological surgery (14) or pregnancy (1), for a final sample of 94 runners.

The predominant age range was 30 to 39 years (45.7%), with an average age of 34.63 ± 6.85 years. Sixty-two participants (66%) reported they had a college degree or diploma, and 60.6% were classified as normal weight based on BMI. With respect to their obstetric profile, 47.9% (45) had one or more children, 62.2% (28)

had undergone a Cesarean section and 26.7% (12) vaginal delivery, and 73.3% reported that the birth weight of their largest baby was less than 3.8 kg. Seventeen runners (58.8%) who had at least one vaginal delivery reported that episiotomy was performed.

In regard to weekly training time, 80.8% (76) reported < 7 hours a week and 19.2% (18) > 7 hours. Thirty-nine women had been running for less than 12 months and 39 between 12 months and 5 years (Table 1).

In terms of clinical characteristics, 72.30% (68) do not experience urinary urgency while running, 95.70% (90) are capable of holding urine in while running, 3.20% (3) leak urine when running and 16% (15) worry about the smell of urine after a run.

Although only 3 women said they leaked urine while running, positive answers were given in relation to the type of urine loss. For the question "When do you leak urine?", the most prevalent type was SI at 56.6% (17), assessed by the items "coughing/sneezing" and/or "during exercise". Responses to the item "before I get to the bathroom" suggest the presence of urge incontinence in 13.3% (4). An association was observed between items related to stress and urge incontinence in 10.0% (3); 13.3% (4) experienced leakage "after urinating, when I'm already dressed"; 3.3% (1) reported nocturnal enuresis (bedwetting) based on the item "when I'm sleeping"; "leaks for no obvious reason" represented 3.3% (1) and "leaks all the time" was not marked by any participants (Table 2).

Analysis of the relationship between possible risk factors and the self-reported type of UI in runners demonstrated that episiotomy was significantly related to SI (p=0.01). Birth weight of the largest baby showed a statistically significant relation (p=0.05) to SI, whereby all the runners with this complaint had delivered babies weighing more than 3.8 kg (3). Body mass index (BMI) exhibited a statistically significant association with UI (p<0.01), which was more prevalent in overweight (12) and obese runners (5). There was no statistically significant correlation between UI and age (p=0.27), parity (p=0.50) or type of delivery (p=0.50); however, urine leakage tended to rise with increased age. Although urine loss was not associated with weekly training time (p=0.78), it was related to how long participants had been involved in the sport (in years) (p=0.05), whereby the less time they had been involved in running, the greater the urine leakage. There was a direct correlation between "urinary urgency while running" and UI (p= 0.02) (Table 3).

Table 4 shows the results of analyses of the relationship between age, BMI, time involved in running and urinary urgency during running. Both BMI and urinary urgency when running were greater in women who had been involved in the sport for less time.

Participants' knowledge regarding physiotherapy to prevent or treat urine leakage was not related to UI (p=0.65), but 48.9% (46) were not aware of it, while 51.1% (48) knew about pelvic physical therapy.

There was no significant difference in urine leakage when a physical therapist was employed by the running club (p>0.09); UI was reported by 31.8% (14) of women from clubs with a physical therapist and 32.0% (16) in those without one.

Table 1. Sociodemographic characteristics of runners from DF.

Variable	n = 94	Percentage %
Age		
18 to 29 years	12	12.8%
30 to 39 years	43	45.7%
40 to 49 years	39	41.5%
Schooling Level		
High School Diploma	7	7.4%
Incomplete University	2	2.1%
Complete University	62	66%
Graduate degree (lato sensu)	15	16%
Graduate degree (stricto sensu)	8	8.5%
BMI		
Normal weight 18.5-24.99kg/cm²	57	60.6%
Overweight 25-29.99 kg/cm²	30	31.9%
Obese 30 kg/cm² or more	7	7.4%
Parity		
No children*	49	52.1%
1	18	19.10%
2	20	21.3%
3	7	7.4%
Type of delivery	n = 45	
Cesarean	28	62.2%
Vaginal	12	26.7%
Both	5	11.1%
Birth weight of largest baby	n = 45	
< 3.8 kg	33	73.3%
< 3.8 kg	12	26.7%
Episiotomy	n = 17	
No	7	41.2%
Yes	10	58.8%
Time involved in the sport		
Up to 1 year	39	41.49%
1 to 5 years	39	41.19%
5 to 10 years	12	12.77%
10 to 15 years	3	3.19%
Information not provided	1	1.06%
Weekly training time		
< 7 hours per week	76	80.8%
> 7 hours per week	18	19.2%

n: sample size; BMI: body mass index (kg/cm²).

DISCUSSION

This study aimed to investigate UI and associated factors in groups of road runners from the Brazilian Federal District and found that although 3% reported urine loss while running, 56.6% stated that the most common form of leakage is SI. Risk factors such as episiotomy, birth weight of the largest baby, and high BMI showed a positive association with the type of UI most reported by participants (SI). The prevalence of SUI in our study was quite high, which confirmed the findings of other authors. Abitteboul et al. (2015) analyzed 517 non-professional (amateur) runners, as in this study, through the application of a questionnaire in France and found a prevalence of 30.7% UI in any circumstance and 52.9% presented SUI only during the running. Another study compared the dysfunctions of PFMs in non-professional athletes, practitioners of various sports with non-athletes. It reported the occurrence of sexual symptoms and loss of flatus in both groups, but with no significant difference. But it concluded that amateur athletes are 3 times more likely to develop UI, SUI being the most common when performing high impact activities. In other impact sports SUI is also present. Amateur and professional volleyball players showed a rate of 55.6% and 50%, respectively. However, the amount of urine loss in grams was significantly higher in professional athletes (Abitteboul et al., 2015; Almeida et al., 2016).

The results here obtained corroborate to those reported in the literature, with SI prevalent in 56.6% of the sample studied, suggesting that running may be an important factor in the development of stress incontinence, although only 3% reported urine loss

Table 2. Clinical characteristics related to urinary symptoms while running.

Variable	n = 94	Percentage %
Urinary urgency while running		
No	68	72.30%
Yes	26	27.70%
Holding urine in while running		
No	4	4.30%
Yes	90	95.70%
Urine loss while running		
No	91	96.80%
Yes	3	3.20%
Concern about the smell of urine after running		
No	79	84%
Yes	15	16%
Types of UI		
Stress incontinence	17	56.6%
Urge incontinence	4	13.3%
Stress and urge incontinence	3	10.0%
Post-micturition dribble (PMD)	4	13.3%
Bedwetting	1	3.3%
No obvious reason	1	3.3%

n: sample size; UI: urinary incontinence.

Table 3. Relationship between road running and UI.

	Continent n(%)	Incontinent n(%)	p-value
Weekly training time			**p = 0.78**
< 7 hours per week	51 (67.1%)	25 (32.9%)	
> 7 hours per week	13 (72.2%)	5 (27.8%)	
Time involved in the sport			**p = 0.05**
Up to 1 year	24 (61.5%)	15 (38.5%)	
1-5 years	27 (69.2%)	12 (30.8%)	
5-10 years	9 (75%)	3 (25%)	
10-15 years	3 (100%)	0 (0.0%)	
Information not provided	1 (100%)	0 (0.0%)	
Urinary urgency while running			**p = 0.02**
No	51 (75%)	17 (25%)	
Yes	13 (50%)	13 (50%)	

Chi-squared test n%: percentage of the sample p≤0.05.

Table 4. Relationship between time involved in the sport and age, BMI and urinary urgency while running.

	Up to 1 year	1 and 5 years	5 to 10 years	10 to 15 years	Information not provided	p-value
	n (%)	n (%)	n (%)	n (%)	n (%)	
Age						**p = 0.12**
Group 1 (18 to 29 years)	6 (15.4%)	6 (15.4%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	
Group 2 (30 to 39 years)	21 (53.8%)	12 (30.8%)	8 (66.7%)	1 (33.3%)	1 (100%)	
Group 3 (40 to 49 years)	12 (30.8%)	21 (53.8%)	1 (33.3%)	2 (66.7%)	0 (0.0%)	
BMI						**p < 0.01**
Normal	17 (43.6%)	24 (61.5%)	12 (100%)	3 (100%)	1 (100%)	
Overweight	16 (41%)	14 (35.9%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	
Obese	6 (15.4%)	01 (2.6%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	
Urinary urgency while running						**p = 0.03**
No	24 (35.3%)	31 (45.6%)	9 (13.2%)	3 (4.4%)	1 (1.5%)	
Yes	15 (57.7%)	8 (30.8%)	3 (11.5%)	0 (0.0%)	0 (0.0%)	

Chi-squared test n%: percentage of the sample p≤0.05.

while running. This discrepancy may have occurred because participants were unaware of urine leakage or too embarrassed to report the problem. Other studies have demonstrated that physical activity can become a risk factor for urine leakage when not monitored by specialists and/or associated with other risk factors (Martins et al., 2017; Vasaghi-Gharamaleki and Ostad-Rahimi, 2015; Silva et al., 2017).

According to several authors, age is one of the main risk factors for urinary incontinence. In the present study, age was not related to UI, but its prevalence increased with age, affecting 41.5% of 40 to 49-year-old subjects and corroborating the results of previous studies, in which the condition was more prevalent from the age of 40 years onwards (Mesquita et al., 2015; Silva et al., 2017; Henkes et al., 2015). In older adults, the disorder is due to the decline in estrogen levels and reduced vascularization that occur with aging, causing atrophy in PFM (Cândido et al., 2017).

Our study found no association between the type of delivery and urine loss. Still, 58.8% of the women who had a vaginal delivery (12 women) had an episiotomy. 2017 Cochrane review reinforces that the use of routine episiotomy should no longer be performed, as it increases, does not prevent, but rather raises the risk of severe perineal trauma and other complications compared to non-episiotomy. In other systematic reviews, episiotomy and severe perineal trauma increased the chance of muscle avulsion of the levator ani and enlarged the chance of injury to the anal sphincter by 30%, seen through ultrasound images. When compared to the strength of PFMs in women who underwent cesarean section and the ones who had vaginal deliveries, there was no significant difference, demonstrating that the cesarean section was not a protective factor for the muscles. However, when compared to instrumental deliveries (forceps and episiotomy) with cesarean deliveries, the latter showed greater strength of PFMs. Also, women who had an episiotomy had more episodes of SUI three months after delivery when compared to women who had a vaginal delivery. These findings corroborate with our study, as the episiotomy rate was quite high, and nowadays, its damages to the PFM are widely known (Jiang et al., 2017; Lima et al., 2020; Driusso et al., 2020).

Besides the high rate of episiotomy as one of the causes of SUI in runners, 62.2% of women underwent cesarean delivery, as seen above. On the other hand, vaginal delivery compared to cesarean section did not show a significant difference in muscle strength, yet, it is still a quite controversial topic, as several studies demonstrate cesarean delivery as a factor associated with a lower rate of urinary incontinence and other PFM disorders. 52.1% of runners were nulliparous, corroborating to the findings of other authors in which the practice of a high-impact physical activity is a risk factor for developing SUI. Almousa et al. observed that SUI is one of the main dysfunctions that occur in nulliparous adolescents and middle-aged women, affecting between 1 and 42% of them. Among the risk factors, there are the BMI, the infant enuresis, and the high-impact physical activity (Blomquist et al., 2018; Keag et al., 2018; Novo et al., 2020; Almousa and van Loon, 2019)

In the present study, the birth weight of the largest baby was associated with SI, which was present in all the runners with UI who had delivered babies weighing more than 3.8 kg. This is in line with the findings of Nascimento et al. (2017) that found that changes in the womb during pregnancy combined with a large fetus influence the emergence of SI.

Another significant correlation observed here was the influence of maternal BMI on stress incontinence, which was more prevalent in overweight and obese runners. This corroborates with a systematic review with a meta-analysis conducted in 2018 that overweight women are 1/3 more likely to have UI since when they are obese, the risk for dysfunction doubles. It also reported that the clinical advice for overweight and obese women should not only be based on metabolic damage but also on the information that the muscles will be overloaded and, consequently, weakened over time, causing greater chances of UI (Lamerton et al., 2018).

According to Filoni et al. (2015) an average of 7.77 hours of training a week was a risk factor for urine leakage, and the greater the duration and frequency of training, the more prevalent UI in high-impact sports athletes. However, this association was not observed in the present study. Martins et al. (2017) demonstrated that both the type of sport and training load influence urine leakage and that SI was more frequent in women with large training loads related to strenuous exercise (Filoni et al., 2015; Martins et al., 2017).

In our subjects, weight loss may have occurred as their time involved in the sport increased, resulting in less urine leakage, but the cross-sectional design makes it impossible to confirm this; confirmation can only be achieved by long-term research. Longitudinal-experimental studies are needed to assess the effect of running on the mechanisms involved in maintaining urinary continence.

CONCLUSION

Although few women reported experiencing UI while running, the results suggest that SI is present and needs to be addressed, especially when associated with risk factors such as high BMI, a large infant and episiotomy. Less time involved in running was associated with UI. Longitudinal studies should be conducted to assess pelvic floor adaptation to time engaged in physical activity as well as running.

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CONFLICTS OF INTEREST

The authors declare that they have no conflict of interest.

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