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Prevalence of urinary incontinence and associated factors in crossfit practitioners: A cross-section study in Brazil

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ABSTRACT

Objectives: The objective was to identify the prevalence of urinary incontinence and the associated factors in CrossFit practitioners.

Materials and Methods: A cross-sectional study with 235 CrossFit practitioners from Brazil. Urinary incontinence was investigated using an instrument created by the authors based on the 3IQ questionnaire. Data were analyzed using the chi-square test.

Results: The prevalence of urinary incontinence in CrossFit practitioners was 9.7%. However, it was observed that the female sex is associated with factors present in the practice of CrossFit.

Conclusion: The prevalence of urinary incontinence among CrossFit practitioners is low, yet it is essential to create strategies and actions that promote pelvic health and prevent urinary incontinence in CrossFit practitioners in Brazil. High-intensity interval training such as CrossFit promotes the improvement of physical fitness, but some movements can lead to urinary incontinence. The objective was to identify the prevalence of urinary incontinence and the associated factors in CrossFit practitioners. A cross-sectional study with 235 CrossFit practitioners from Brazil. Urinary incontinence was investigated using an instrument created by the authors based on the 3IQ questionnaire. Data were analyzed using the chi-square test. The prevalence of urinary incontinence in CrossFit practitioners was 9.7%. However, it was observed that the female sex is associated with factors present in the practice of CrossFit. The prevalence of urinary incontinence among CrossFit practitioners is low, yet it is essential to create strategies and actions that promote pelvic health and prevent urinary incontinence in CrossFit practitioners in Brazil.

Keywords: Exercise; pelvic floor; rehabilitation; sports; urinary stress incontinence

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INTRODUCTION

CrossFit is a high-intensity functional training model.[1] It is characterized by a sports modality with high energy and high-intensity interval training (HIIT)[2] and which aims to develop the physical fitness of practitioners and athletes especially in the components related to cardiovascular, respiratory, and muscle resistance, strength, flexibility, power, speed, coordination, balance, and precision.[1-3] This modality is composed of cyclical and acyclic movements, weightlifting exercises, as well as gymnastic exercises.[4]

This HIIT gained prominence for having motivational and challenging features, which is why it gets more and more practitioners.[5] This optimization occurs through the execution of functional exercises, in high intensity and constantly varied, such as the deadlift, shot put, bicycle, swim, run, squat, jump, overhead medicine ball, and jump ropes. Exercises are systematically organized through workout of the day (WOD).[6,7]

CrossFit practice requires the athlete to reach the limit of their physical conditioning. In cases where there is no correct and specific physical preparation, there may be injuries, and can be followed by pain, discomfort, and even the inability to continue training.[8] In some circumstances, depending on the chosen WOD, repetitive weightlifting besides other exercises that cause axial overload, can generate several musculoskeletal injuries. Some repetitive jumping exercises and maximum abdominal contraction, such as skipping rope and the burpee, which increase the support exercised by the pelvic floor and intra-abdominal pressure can lead to urinary incontinence (UI).[9,10]

According to the International Continence Society, UI is characterized by involuntary urine loss, being considered a multifactorial condition. It is a condition that affects women, men, and children, negatively impacting the quality of life of individuals.[11] The prevalence rates of UI vary from 0% to 80% in different sports and with higher prevalence in those involving HIIT.[12,13]

The pathophysiology of UI with high-impact exercises is possibly related to explosive in intra-abdominal pressure, which can lead to an elastic change and neuromuscular fatigue over time, thus causing an imbalance between the support offered by the pelvic floor and sudden pressure variations during exercise.[2] Some authors also report on the cause of UI, such as paralysis or weakness of the pelvic floor muscles.[13-15]

Individuals who have a diagnosis of UI, feel embarrassed by the odor and feeling of being dirty, due to the uncontrolled leakage of urine. Thus, the negative impact on the quality of life is very frequent.[16-18] Currently, there are few good quality studies that performed this type of association, making this investigation necessary. In this sense, the objective of the study was to identify the prevalence of UI and the associated factors in CrossFit practitioners in Brazil.

MATERIALS AND METHODS

This is a cross-sectional and observational research, carried out following the recommendations of strengthening the reporting of observational studies in epidemiology.[19]

The study was approved by the Ethics and Research Committee (CEP) of Universidade Cesumar, under opinion no: 2,919,167/2018. We fully attended the Resolution 466/2012 of the Ministry of Health of Brazil, as well as the Declaration of Helsinki. All participants signed the informed consent form.

Inclusion criteria were individuals of both sexes aged between 18 and 60 years, literate, without neurological and physical impairment and who practiced CrossFit residing in Brazil. Pregnant women and individuals with disabilities were excluded.

We evaluated socio-demographic data, health status, as well as characteristics of CrossFit practice. To assess the prevalence of UI and a HIIT such as CrossFit considering its practice at a recreational and high-performance level, information was collected through a structured questionnaire prepared by the authors, with questions involving UI were based on the 3IQ questionnaire, which is a useful and quick validated instrument for establishing the presence of UI and classifies the type of UI.[20,21]

Statistical Analysis

Descriptive analysis was performed with the results expressed in absolute and relative frequency. To assess any association between characteristics related to the practice of HIIT, CrossFit, and UI with the sex of the individuals, we used simple logistic regression, estimating the odds ratio, with interval 95% confidence.

Subsequently, using the methodology proposed by Hosmer and Lemeshow,[22] variables that showed at least a moderate association ($p<0.25$) were selected with the variable that indicates adherence to treatment by the chi-square test of association.[23]

RESULTS

A total of 235 CrossFit practitioners participated in the study in the city of Maringá-PR, most (55.7%) being female. Table 1 shows the frequencies of responses to the questions according to sex and the results of the association test. It could be observed, at 5% significance, that the number of hours of CrossFit practice

Table 1. Profile of Brazilian CrossFit practitioners (n=235)			
Variables	**Men**	**Women**	***p***
Time practicing			
Less than 6 months	27 (26.0%)	49 (37.4%)	0.063
6 months to 1 year	23 (22.1%)	21 (16.0%)	
More than 1 year	19 (18.3%)	32 (24.4%)	
More than 2 years	35 (33.7%)	29 (22.1%)	
Times a week			
4 times	23 (22.1%)	26 (19.8%)	0.312
5 times	46 (44.2%)	61 (46.6%)	
6 times	25 (24.0%)	22 (16.8%)	
Time per day			
30 to 60 minutes	58 (55.8%)	93 (71.0%)	0.018*
60 to 90 minutes	42 (40.4%)	31 (23.7%)	
Time of the day			
Evening	33 (31.7%)	41 (31.3%)	0.333
Night	57 (54.8%)	64 (48.9%)	
The practice of other sport			
No	62 (59.6%)	109 (83.2%)	0.0004*
Yes	42 (40.4%)	22 (16.8%)	
Concern to perform the exercises correctly			
No	1 (1.0%)	1 (0.8%)	0.999
Yes	103 (99.0%)	130 (99.2%)	
Priority			
Quality	97 (93.3%)	127 (96.9%)	0.222
Advancing without thinking about quality	7 (6.7%)	4 (3.1%)	
CrossFit athlete (competition level)			
No	79 (76.0%)	105 (80.2%)	0.524
Yes	25 (24.0%)	26 (19.8%)	
TOTAL	**104 (100%)**	**131 (100%)**	

*: *p*-value <0.05

(*p*=0.0182) was one of the variables that proved to be significantly associated with the sex of the individuals, with most women training from 30 to 60 minutes (71%) and 23.7% from 60 to 90 minutes, while 55.8% of men practice from 30 to 60 minutes and 40.4% from 60 to 90 minutes.

It is also observed that 40.4% of men practice another sport besides CrossFit, while only 16.8% only practice CrossFit, indicating an association of this factor with sex (*p*=0.004). On the other hand, when observing the leakage of urine factor (Table 2) before starting the CrossFit, a proportion of 12% of affirmative responses is observed among women, while no men reported this problem, thus characterizing an association between these variables (*p*=0.0014).

Similarly, when compared to women, a higher percentage of men did not experience the loss of urine doing CrossFit (95.2% *versus* 80.9%), while all males did not report having urine leakage practicing another sport and 5.3% of women said they had this problem. Thus, there is evidence of an association with sex in these two cases, with *p*-values equal to 0.0049 and 0.0185, respectively.

The other factors did not show a significant association between these variables and the respondents' sex, with no significant divergence between frequencies according to sex.

DISCUSSION

The prevalence of UI is low among CrossFit practitioners. In this study, the prevalence of UI in both sexes was 9.7% during HIIT (CrossFit); most people do not seek to be high-performance athletes and try to perform movements correctly. Based on the aspects, the hypothesis of this study has not been proven.

The pelvis is divided into the greater pelvis (abdominal cavity, also considered false pelvis) and lesser pelvis (pelvis cavity, also considered true pelvis). This structure has reduced mobility, except when it comes to pregnancy.

However, some particularities can be observed when we talk about male pelvis and female pelvis, namely: The female pelvis presents greater anterior inclination; opening of the male pelvis is characterized by the oval shape; opening of the female pelvis is characterized by its rounded shape; the male pelvic cavity is funneled, while the female pelvic cavity has a cylindrical shape; and the subpubic angle, where the ischial ramus and bilateral pubis join, show differences between males (60º) and females (90º).

In both sexes, most practice this activity for 30 to 60 minutes a day. In this sense, a significant difference was observed between the hours of its practice per week in the study, corroborating with some studies that also observed that the longest time was 30 to 60 minutes.[4,24,25]

For women, it was found that most practice only CrossFit as a regular exercise. On the other hand, when testing the relative frequency for the practice of other physical activity combined with HIIT such as CrossFit by men, it was observed that the results were higher than that of women (40.4%). This suggests that men are more willing to perform physical activities when compared to women. This can be justified because women are more involved with family issues and double the workday.

Despite the known benefits of physical exercises such as prevention of hypertension, diabetes, cardiovascular diseases, 60% of the population does not exercise regularly.[26] However, actually more women than man train less.[27]

Table 2. Relationship of urinary incontinence with the CrossFit practice (n=235)			
Variables	**Men**	**Women**	**p**
UI before starting CrossFit			
No	104 (100%)	119 (90.8%)	0.001*
Yes	0 (0.0%)	12 (9.2%)	
UI during CrossFit			
No	99 (95.2%)	106 (80.9%)	0.0049*
Yes	4 (3.8%)	19 (14.5%)	
UI during other physical activity			
No	104 (100%)	124 (94.7%)	0.019*
Yes	0 (0.0%)	7 (5.3%)	
Leakage of urine without physical activity and the feeling of urgency			
Evening	103 (99.0%)	131 (100%)	0.443
Night	1 (1.0%)	0 (0.0%)	
Ability to hold urine when you feel like it			
No	8 (7.7%)	5 (3.8%)	0.254
Yes	96 (92.3%)	126 (96.2%)	
TOTAL	**104 (100%)**	**131 (100%)**	

*: *p*-value <0.05; subtitle: UI: urinary incontinence, it was not possible to perform the test due to the low frequency observed. Source: research data

Concerning the leakage of urine, scientific evidence indicates that modalities such as rhythmic gymnastics,[12,13] athletics, weight training,[28] basketball, footbal,[29] volleyball,[30] cross-country skiing, running,[31] amateur soccer,[32] and sports with a sudden change of movement can stimulate or increase the prevalence of UI.

As for the CrossFit participants of this study, there was no significant difference in the prevalence of UI concerning the practice of HIIT. Gram and Bø[12] did not find any statistically significant risk factors to explain the chances of having UI in rhythmic gymnastics. However, they report that the prevalence of UI is generally high in female athletes.

Yang et al.[2] reported that almost half of women who practice CrossFit reported UI episodes during training, and when compared to nulliparous women who do aerobic exercising, women who practice CrossFit tend to have a higher incidence of UI, indicating that CrossFit exercises potentially demand more pelvic floor support.

In our study 14% of the participants reported UI. The effect of sport on the pelvic floor can promote muscle weakness, lack of proprioception, fatigue induced by strenuous activity in the pelvic floor muscles, and damage to collagen tissue due to increased intra-abdominal pressure because of excessive efforts involved in the practice of high impact sports.[33]

To preserve continence, the integrity of intrinsic and extrinsic factors in the filling phase is necessary, which will provide urethral closure, such as the levator ani muscles, the endopelvic fascia, and their fixations to the lateral walls of the pelvis and the urethra.[17]

Failure of the sphincter mechanism in the neuromuscular component can cause UI.[34] Some studies also report the lack of pre-contraction of the pelvic floor muscles,[35] the influence of the underlying genetic factors, such as a low pelvic floor position within the pelvis, alteration of the conjunctiva, and a delayed neurophysiological response to increases in intra-abdominal pressure, during high-impact activities[12,13] and hormonal changes as hypotheses that cause UI in CrossFit athletes due to increased intra-abdominal pressure while exercising.[34]

Gephart et al.[36] calculated the peak intra-abdominal pressure in women who practice CrossFit and reported that. within a HIIT routine, the maximum intra-abdominal pressure peaks, the duration of the increase in the peak intra-abdominal pressure, and the shape of the pressure curve changed greatly by exercise.

Furthermore, CrossFit is a program of functional exercises, carried out in high intensity and in the shortest possible time. Intensity is essential for the result butis also responsible for the prevalence of almost 30% of UI in women of our study population when practicing CrossFit.[37,38]

In another study,[39] the incidence of UI was observed in 72.3% of participants who practice physical activity in gyms, with 52% of these women having moderate UI. Moreover, Berghmans[40] reports that stress on the integrity of extrinsic factors causes pain, muscle tension, altered circulation, nerve compression

causing muscle shortening, which can trigger pelvic pain and musculoskeletal symptoms. It is worth noting that in the present study, adherence of both sexes to CrossFit was observed.

In our study the incidence of UI in practitioners of HIIT like CrossFit is relatively low. However, that is different in other studies. In this sense, preventive measures are suggested to reduce the incidence of UI during training and the creation of strategies and actions that promote health in the context of interdisciplinarity.

Currently, there is a potential great ally to promote the pelvic health of the population. CrossFit practitioners may use the Pelvis application[11], a fully interactive application with exercises to strengthen, relax, and coordinate the muscles of the pelvic floor for individuals of both sexes to do at any time of the day.

Some limitations were observed in this study, the first of which is the non-randomization of study participants, besides the lack of a urodynamic exam to measure bladder filling and emptying, assessing bladder storage capacity. However, the results of the present study have important clinical and practical implications, such as the need for CrossFit centers to carry out tests related to the participants' pelvic health, as well as encouraging the promotion of pelvic health through educational actions.

CONCLUSION

The prevalence of UI is low among CrossFit practitioners, however, it is important to create strategies and actions that promote pelvic health and prevent UI in CrossFit practitioners in Brazil.

ETHICS

Ethics Committee Approval: The study was approved by the Ethics and Research Committee (CEP) of Universidade Cesumar, under opinion no: 2,919,167/2018. We fully attended the Resolution 466/2012 of the Ministry of Health of Brazil, as well as the Declaration of Helsinki.

Informed Consent: All participants signed the informed consent form.

Peer-review: Externally peer-reviewed.

Contributions

Concept: K.C.C., E.R.Z., R.V.O., C.G.A.A., D.S.W.; Design: K.C.C., E.R.Z., R.V.O., C.G.A.A., D.S.W.; Data Collection or Processing: K.C.C., E.R.Z., R.V.O.; Analysis or Interpretation: K.C.C., E.R.Z., R.V.O., M.D.A., C.G.A.A., D.S.W., B.H.M.B., M.S., B.B.; Literature Search: K.C.C., E.R.Z., R.V.O., M.D.A., C.G.A.A., D.S.W., B.H.M.B., M.S., B.B.; Writing: K.C.C., E.R.Z., R.V.O., M.D.A., C.G.A.A., D.S.W., B.H.M.B., M.S., B.B.

DISCLOSURES

Conflict of Interest: No conflict of interest was declared by the authors.

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