

Urinary incontinence prevalence in the day-by-day life and during sports practice in volleyball athletes: a systematic review

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Abstract

Introduction. Urinary incontinence (UI) is perceived as a problem that affects older and multiparous women. However, recent studies report that involuntary loss of urine also affects athletes, young and nulliparous. There is controversy over the role of exercise in UI. Thus the purpose of the review is to describe and evaluate scientific evidence concerning the prevalence of UI in female volleyball athletes.

Methods. The review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). The selected databases were PubMed, LILACS, PEDro, Medline, Cochrane, and ScienceDirect. The searches were performed between December 2016 and January 2017. The descriptors and Boolean operators used in the search were as follows: 'urinary incontinence AND athletes AND volleyball.' After peer evaluation, 47 studies were identified, and 6 articles were selected for review. The methodological evaluation was based on Strengthening the Reporting of Observational Studies in Epidemiology (STROBE).

Results. The review identified the UI prevalence of 9–30% during sports practice and 17–18% in the day-by-day life. Practising physical exercise of high impact appears to be a causing factor of UI in women.

Conclusions. Practising volleyball in the female population can be an important UI risk factor. Owing to the high prevalence of UI, coaches and athletes must be aware of the importance of training the pelvic floor muscles simultaneously with the sports practice.

Key words: stress, urinary incontinence, muscles of the pelvic floor, sport

Introduction

Urinary incontinence (UI) is defined by the International Urogynecological Association (IUGA) and by the International Continence Society (ICS) as any involuntary loss of urine [1]. The prevalence of UI in women in general equals 7–37% [2]. Despite this dysfunction being clearly associated with multiparity, advanced age, menopause, Caucasian race and female sex [3–6], different studies relate UI with physical exercise, since exercise is associated with an increase of intraabdominal pressure, as well as a descendent displacement of the pelvic organs and, consequently, damage to the muscles that support this area [7–10]. Therefore, participants of physical exercise of high impact are the most prone to developing this dysfunction [11].

Amongst the exercises of high impact, volleyball is considered a recreational sport and the competitions are of large popularity around the world [12]. According to a research performed by the Ministry of Sports in Brazil in 2013, volleyball was the most practiced modality among women (20.50%) [12]. However, playing volleyball can be strongly related to an increase of intraabdominal pressure, and consequently become an important UI triggering factor [13]. Owing to UI symptoms, more than 20% of women abandon their sports practice. This leads to generating sedentary habits, which are precursors of other diseases, making

these women deprived of the benefits that are inherent to sports practice [14].

With this perspective, it becomes necessary to gather scientific evidence for symptoms of urinary loss during competition, while training, and in the day-to-day life of volleyball athletes. Therefore, the goal of this systematic review was to describe and evaluate scientific evidence on the prevalence of UI in volleyball athletes, to compare the urinary loss in volleyball athletes and non-athlete women, and verify the forms of UI evaluation in the competitive sport.

Subjects and methods

This review was recorded in the International Prospective Register of Systematic Reviews (PROSPERO) under the number CRD42017057569 and conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). The database selected were PubMed, LILACS, PEDro, Medline, Cochrane, and ScienceDirect. The search was performed in the period between December 2016 and January 2017. The Boolean descriptive and operative values utilized in the search were: 'urinary incontinence AND athletes AND volleyball.'

The systematic review involved studies that met the following criteria: (1) inclusion of professional volleyball athletes; (2) women participants aged at least 18 years; and (3) address-

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ing UI as an outcome. Case studies, series cases, historical articles, abstracts from events and books, as well as papers in languages different than English, Portuguese or Spanish were excluded.

Initially, two independent reviewers selected the studies on the basis of the titles, excluding those that clearly did not relate to the theme of this review. Later, abstracts of all the selected papers were analysed with the aim to identify those that met the inclusion criteria. The complete texts of the articles potentially relevant were saved for final evaluation. Possible disagreements during the selection process were resolved by means of a consensus between the reviewers.

For the purpose of data handling, a qualitative synthesis was made and the following information was extracted from the selected studies: (1) study type; (2) sample characteristics; (3) main outcomes; and (4) main results.

The methodological evaluation of the studies was performed in accordance with Strengthening the Reporting of Observational Studies in Epidemiology (STROBE). STROBE recommendations concern the title, abstract, introduction, methodology, results, and discussion of the scientific articles that deserve observational studies [15].

Results

In relation to the number of studies identified for this systematic review, as shown in Figure 1, after the database filter insertion, 47 titles were selected. Among these, 9 were doubled articles and therefore removed, which resulted in 38 titles for reading. After the paired reading, 13 studies were considered potentially relevant for abstract reading. With the abstract reading, 5 studies were excluded and 8 articles were left to be integrally read, from among which 5 were selected for analysis in the review.

The systematic review proved, as presented in Table 1, that the analysed studies exhibited different forms of evaluation of urinary loss and its prevalence.

UI prevalence in volleyball athletes in the studies eligible for the systematic review varied from 9% to 30%. The studies by Simeone et al. [16] and Nygaard et al. [14] verified the day-to-day prevalence of 17.2% and 18%, respectively. In turn, Nygaard et al. [14], Reis et al. [13], Thyssen et al. [19], and Borin et al. [17] observed the UI prevalence of 9%, 30%, 30%, and 19%, respectively, during sports practice.

In relation to the type of UI, in studies by Ferreira et al. [18], 32 volleyball athletes (100%) presented UI of effort; Reis et al. [13] and Borin et al. [17] observed effort-based

UI among 30% and 19% of the volleyball athletes, respectively. From the 5 addressed articles, Nygaard et al. [14], Borin et al. [17], Simone et al. [16], and Thyssen et al. [19] recruited women above 18 years of age, whereas the study by Reis et al. [13] involved also women aged below 18 years.

It is possible to observe that from among the papers analysed, only the study by Simeone et al. [16] utilized the International Consultation on Incontinence Questionnaire (short form) (ICIQ-SF), validated by Tamanini et al. [20], whilst the other studies applied self-report to identify urinary loss. Only the study by Reis et al. [13] employed objective methods to quantify the capacity of pelvic floor muscle contraction and muscle activation: functional assessment of the pelvic floor and electromyographic biofeedback (Fênix®), respectively.

With reference to the risk factors for UI associated with sports practice, Simeone et al. [16] identified an inverse relationship between the frequency of urinary loss and the time of practice in the modality (athletes with less than 1 year of practice reported higher loss quantity). In this study, which evaluated 7 sports modalities, 91 volleyball players had urinary loss episodes, and the urinary loss was experienced shortly before and immediately after a competition. In turn, Nygaard et al. [14] did not find any significant relation between the time of practice in the modality or position in the sport and urinary loss. Borin et al. [17] verified a positive correlation between urinary loss and the activities of physical preparation, such as abdominal exercises, effort training, jumps, the number of games in a year, and the duration of daily training.

As for the STROBE recommendations, it is evident that all the studies followed the recommendations partially, yet satisfactorily since more than half of the items were implemented (Table 2). Among the recommendations, items 9, 17, and 21 stood out as they were not present in any of the 5 articles included in the review. These were: describe any efforts to address potential sources of bias (9); report other analyses done (17); discuss the generalizability (external validity) of the study results (21).

Discussion

The results found in this review pointed at the prevalence of UI in volleyball athletes varying from 9% to 30% during sports practice and from 17% to 18% in the day-to-day life. Literature proves that sports practice of high impact is related to the occurrence of pelvic floor dysfunctions, such as UI [21–22]. Reis et al. [13] affirms that among the sports modalities of high impact, volleyball belongs to the ones that most intensively exert a direct influence on the pelvic floor of the athletes. On the other hand, volleyball athletes often present a lesser set of factors associated with urinary loss, among which are age, parity, and sedentary lifestyle [23].

According to Maia et al. [24], effort UI is the type of incontinence with highest prevalence among sports practitioners, having highest rates in sports of high impact. Accordingly, Silva et al. [7] affirm that the type of physical exercise practiced by young women, nulliparous and without additional UI risk factors, can be a triggering element because of the elevated intraabdominal pressure over the pelvic floor. Antunes et al. [25] obtained similar results, observing that 17 out of 18 women who reported urinary loss experienced this loss exclusively during exercise practice.

Among the conditions that lead to urinary loss during sports practice are jumps as they involve contact of feet and the ground that generates a maximum effort reaction,

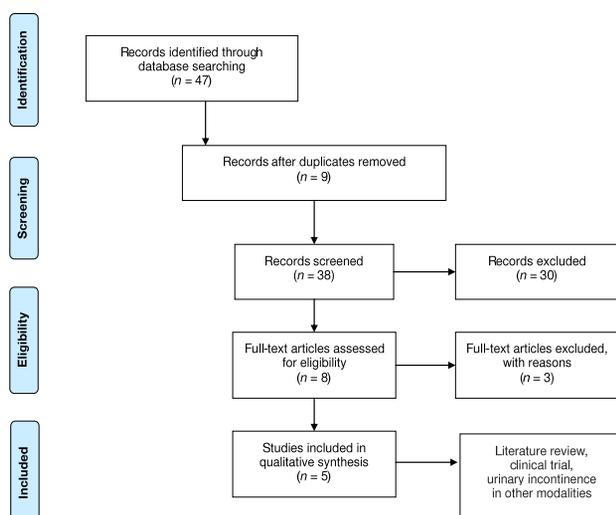


Figure 1. Flowchart of the systematic review

Table 1. Summary of the studies included in the review (n = 5)

Author, year [reference]	Type of study	Sample	Main outcomes	Main results
Nygaard et al., 1994 [14]	Cross-sectional	156 female athletes, 11 being volleyball players	UI prevalence, sport modality practiced, and duration of the activity	UI prevalence of 9% was found in volleyball athletes during sports practice and 18% on a day-to-day basis
Thyssen et al., 2002 [19]	Observational prospective	396 female athletes, 10 being volleyball players	Prevalence of urinary symptoms on a day-to-day basis and during sports practice	30% of the volleyball athletes reported the presence of urinary loss during sports practice in their day-to-day life
Simeone et al., 2010 [16]	Observational prospective	1000 female athletes, 196 being volleyball players	Daily urinary loss frequency with ICIQ-SF	17.2% of volleyball athletes reported urging incontinence in their day-to-day life
Reis et al., 2011 [13]	Quantitative of observational type, cross-sectional	20 female athletes, 10 being volleyball players	Pelvic floor muscle contraction capacity through AFA and electromyographic biofeedback (Fênix®)	AFA in volleyball athletes was estimated as 4, with an average value of 20 µV of muscle activation in the biofeedback evaluation; 30% of volleyball athletes reported urinary loss episodes during physical effort
Borin et al., 2013 [17]	Observational prospective	40 female athletes, 10 being volleyball players	Perineal intracavitary pressure through perineometer (Quark®), UI prevalence, practiced sport modality, and diurnal and nocturnal urinary frequency	Volleyball athletes presented the perineal intracavitary pressure of 4.36 ± 1.43 mm Hg; 19% of volleyball athletes reported urinary loss during sports practice

UI – urinary incontinence, ICIQ-SF – International Consultation on Incontinence Questionnaire (short form), AFA – functional assessment of the pelvic floor

Table 2. STROBE recommendations followed in the analysed studies (n = 5)

STROBE recommendations	Borin et al., 2013 [17]	Nygaard et al., 1994 [14]	Simeone et al., 2010 [16]	Reis et al., 2011 [13]	Thyssen et al., 2002 [19]
1	P	P	P	P	P
2	P	P	P	P	P
3	P	P	P	P	NP
4	P	P	P	P	P
5	NP	NP	NP	P	P
6	P	NP	P	P	P
7	P	P	NP	NP	NP
8	P	P	P	P	P
9	NP	NP	NP	NP	NP
10	P	NP	NP	NP	NP
11	P	P	P	P	P
12	P	NP	P	NP	NP
13	P	P	P	P	P
14	P	P	P	P	P
15	NP	P	P	P	P
16	NP	P	P	P	NP
17	NP	NP	NP	NP	NP
18	P	P	P	P	P
19	P	NP	NP	NP	NP
20	P	P	P	P	P
21	NP	NP	NP	NP	NP
22	NP	NP	P	NP	NP
Total	15/22	13/22	15/22	14/22	12/22

STROBE – Strengthening the Reporting of Observational Studies in Epidemiology, P – present, NP – not present

increasing body weight [26]. This impact can affect the mechanism of continence by altering the amount of effort transmitted to the pelvic floor; it can contribute to the incontinence in nulliparous young women and practitioners of sports demanding high impact [27]. In a recent study, Dias et al. [28] verified through high resolution magnetic resonance that during a jump, healthy and nulliparous young women exhibited considerable deformations of the pelvic floor, as the excessive posterior movements were counterbalanced by the vaginal wall.

The impact of female UI in sports does not limit itself to the physical aspects, but also negatively affects the sexual, domestic, and occupational spheres. Women with UI feel ashamed and embarrassed to engage in various activities; it should be noted that urinary loss during sports practice involves one third of women and constitutes a social problem [19, 29]. Therefore women adopt prevention strategies, such as the application of tampons during sports practice, lavatory use, and the reduction of liquid ingesting before exercises [18, 19].

In a study developed by Araújo et al. [30], urinary loss in athletes was compared between training and competitions, turning out to concern 60.9% athletes during training and 65.2% during competition. These data are in disagreement with the results obtained by Thyssen et al. [19] and Nygaard et al. [14], who reported that urinary loss in athletes during training was higher than in the competition periods.

In relation to the presence of urinary loss and the time of sports practice, Nygaard and Shaw [31], in a recent systematic review, identified a strong relation between these factors. The authors indicated that urinary loss was influenced not only by the type of exercise, but also by the volume of and time spent in practice. Reis et al. [13] found a relation between the time of training in years and the presence of UI; volleyball athletes developed symptoms of urinary loss after 9 years of training. In turn, Simeone et al. [16] identified an inverse relation between the frequency of urinary loss and the time of practice in the modality, being that athletes with less than 1 year of practice reported higher loss rates.

In this context, the practice of exercises that promote the simultaneous contraction of the perineum must be implemented in order to strengthen the muscles of the pelvic floor and consequently decrease urinary loss during sports practice [29]. With reference to the contraction capacity of the pelvic floor muscles, Reis et al. [13] proved that volleyball athletes, even if showing signs of UI, did not present a significant difference in relation to intravaginal pressure. This result is supported by the findings of a study by Araújo et al. [32], who evaluated the capacity for muscle contraction in the pelvic floor in runner athletes and gymnasts and did not verify the association of urinary loss with a low capacity of pelvic muscle contraction.

Borin et al. [17] compared the capacity of muscle contraction in the pelvic floor in four groups: handball athletes, basketball athletes, volleyball athletes, and non-athletes. The estimated perineum pressure (standard deviation) was 6.73 ± 1.91 mm Hg in non-athletes, 5.55 ± 1.43 mm Hg in handball players, 4.36 ± 1.43 mm Hg in volleyball players, and 3.65 ± 1.35 mm Hg in basketball players. With these results, the study suggests that non-athlete women have better contraction capacity when compared with athlete women.

One should remember that a large methodological variety of the studies analysed is evident: few of them utilized objective measures to quantify the urinary loss with higher precision. Despite that, the results of the review indicate that a significant prevalence of UI exists in athletes, although this

is still not greater than the presence of UI in women with other associated factors, such as age or multiparity.

Limitations

Among the limitations, the methodological quality of the studies needs to be mentioned. With regard to STROBE recommendations, it was observed that some items were not followed, which could impact on the relations and possible biases that the studies presented. Besides, there was lack of specificity in evaluating one modality only; this made the relation between details of some sports gestures and urinary loss irrelevant. Therefore, more research is needed to identify the prevalence of UI and the related factors in volleyball athletes more specifically. Such studies would enable developing strategies for prevention and treatment effective for the wellbeing and efficiency of volleyball players.

Conclusions

In this study, it was possible to observe that practising physical exercises of high impact constituted a causative factor of UI in women. In this context, playing volleyball can be an important UI risk factor in the female population, given that all the reviewed studies included incontinent volleyball athletes. Therefore, coaches and their athletes must be aware of the importance of training the pelvic floor muscles simultaneously with the sports practice.

The current literature lacks wider studies that would verify the UI and the functions of the pelvic floor muscles in volleyball athletes in order to develop specific prevention and treatment solutions for this population, although it is a modality widely practiced by women.

Conflict of interest statement

The authors state no conflict of interest.

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