

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

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Urinary incontinence (UI) is seen 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, as the purpose of the review is to describe and evaluate as scientific evidence about a prevalence of urinary incontinence in female volleyball athletes. This review was conducted according to items of Preferential Reports for Systematic Analysis and Meta-analysis (PRISMA). As selected databases were Pubmed, Lilacs, PEDro, Medline, Cochrane and Science Direct. How searches occurred from December 2016 to January 2017. Descriptors and Boolean operators use in the search for: “Urinary incontinence and athletes and volleyball.” After peer evaluation, 47 studies were identified and the most recent. 6 articles were selected for review of this review. The methodological evaluation was based on the Strengthening of the Report of Observational Studies in Epidemiology. (STROBE). The results found in the review identified the prevalence of urinary incontinence from 9% to 30% during sports practice and from 17% to 18% without day-day of volleyball athletes. This study was published in the report form of high-impact exercise exercises aimed at increasing intra-abdominal pressure through Strong muscle contractions.

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 women in general who have UI is predominant in 7% to 37% of women². Despite this dysfunction being clearly associated with multiparity, advanced age, menopause, caucasian and the female sex [3–6], different studies relate the UI with physical exercise, since exercise is associated with the increase of intraabdominal pressure as well as a descendent displacement of the pelvic organs and, consequently, damage to the muscles that comprehend this área [7–10]. Therefore, the practicants of these exercises of high impact are the most prone to developing this dysfunction [11].

Amongst the exercises of high impact, the volleyball is considered a recreative sport and of competition with large popularity around the world [12]. According to research made by the ministry of sports, in 2013, volleyball was the most practiced modality between women (20,50%). However, the practice of this modality can be strongly related to the exaggerated increase of intraabdominal pressure, and consequently becomes an important triggering factor to urinary incontinence [13]. Due to UI symptoms, more than 20% of women abandon their sport practice, the desistance or lack of that practice generate sedentary habits, which are precursors to the promotion of other diseases, making these women restrict to the benefits that are inherent to the practice [14].

From this perspective, it becomes necessary to gather the scientific evidences that identify the occurrence of symptoms of urinary loss during competition, while training and on day-to-day of volleyball athletes. Therefore, the goal of this systematic review is to describe and and evaluate the scientific evidences on the prevalence of urinary incontinence in volleyball athletes, comparing the urinary loss in volleyball athletes to non-athlete women and verify the forms of evaluation of UI in the competitive sport.

Methods

This review was registered in the *International Prospective Register of Systematic Reviews* (PROSPERO), sob nº CRD42017057569 and conducted according to the Preferred Reporting

Items for *Systematic Reviews and Meta-Analyses* (PRISMA recommendations). The database selected were Pubmed, Lilacs, PEDro, Medline, Cochrane and Science Direct. The search occurred in the period comprehending December 2016 to January 2017. The boolean descriptive and operative utilized in the search were: “Urinary Incontinence AND Athletes AND Volleyball”.

For this systematic review were included the studies that attended the following criteria: (1) studies that included professional volleyball athletes, (2) women participant, of equal or above age 18 and (3) of outcome directed to urinary incontinence. Case studies were excluded, series cases, historical articles, abstracts from events and books, as well as studies which dialects were not english, portuguese and spanish.

Initially, two independent reviewers selected the studies based on the titles, excluding those that clearly did not relate to the theme of this review. Later, all the selected titles had their abstracts analyzed in order to identify those that attended the inclusion criteria. The complete texts of the articles potentially relevant were saved for final evaluation. Possible disagreement during the selection process were resolved by means of a consensus between the reviewers.

For data treatment, 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 made according to the *Strengthening the Reporting of Observational Studies in Epidemiology* (STROBE). The items that amount to STROBE refer to the recommendations that should be present in the titles, abstract, introduction, methodology, results and discussion of scientific articles that deserve observational studies [15].

Results

In relation to the number of studies identified for this systematic review, it can be observed on Graphic 1 that, after the database filter insertion, 47 titles were selected. Amongst these titles, 9 were double articles and therefore removed, resulting 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, resulting in 8 articles to be integrally read, from which, 5 articles were selected for analysis in this review.

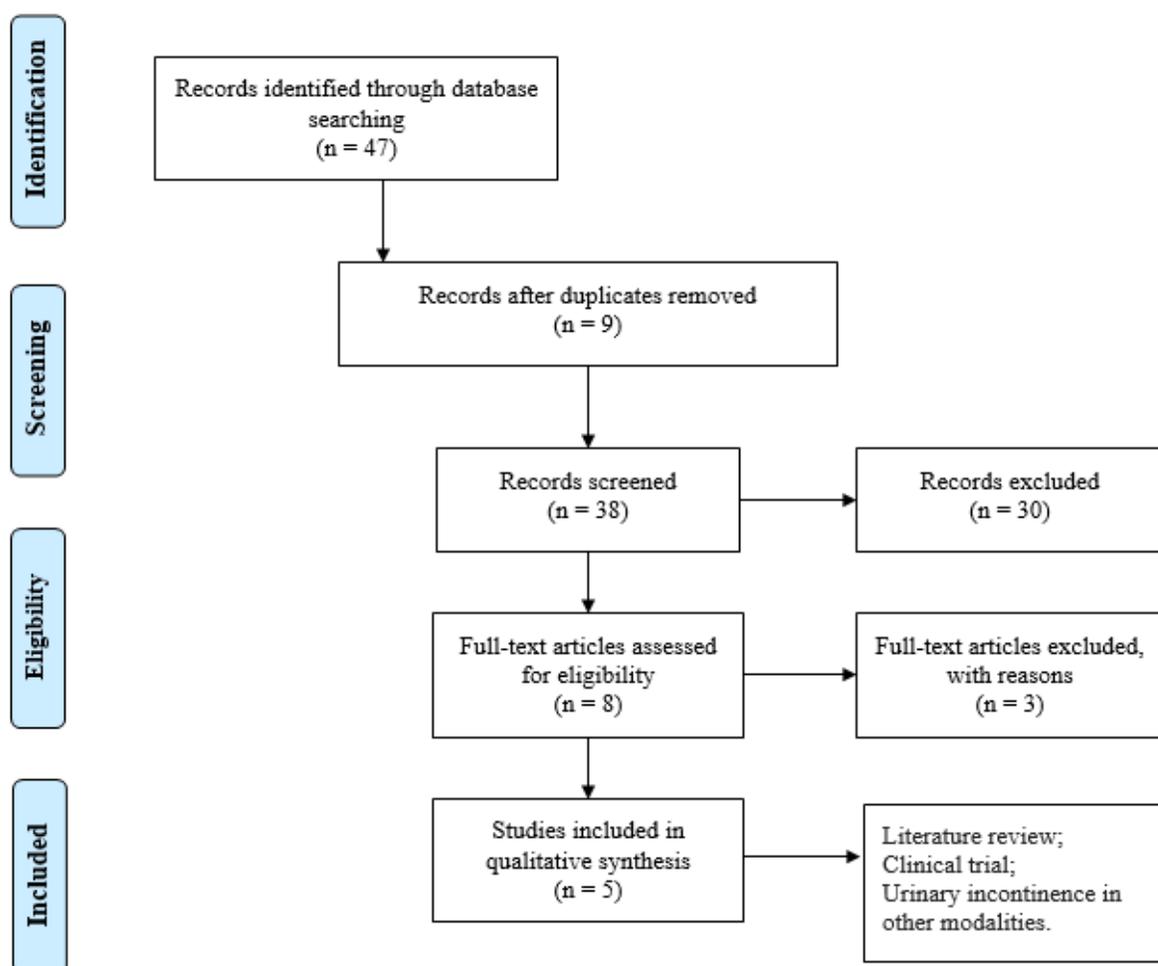


Figure 1. Flowchart of the studies included in the systematic review

Insofar as the results analyzed in the systematic review, it was observed in Table 1, that the research presented different forms of evaluation on urinary loss and its prevalence.

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

Author, year	Type of study	Sample	Main Outcomes	Main Results
Nygaard et al, 1994.	Cross sectional	156 female athletes, 11 being volleyball athletes.	UI Prevalence, sport modality practiced and duration of the activity.	A prevalence of 9% of urinary incontinence was found in volleyball athletes during sport

				practice and 18% on a day-to-day basis.
Thyssen et al, 2002.	Observational Prospective Study	396 female athletes between, 10 being volleyball athletes.	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 on their day-to-day.
Simeone et al, 2010.	Observational Prospective Study	1000 female athletes, 196 being volleyball athletes.	Daily urinary loss frequency with ICIQ-SF	17,2% of volleyball athletes reported urge incontinence on their day-to-day.
REIS et al, 2011 (Brasil)	Quantitative of observational type, cross sectional	20 female athletes, 10 being volleyball players.	Pelvic floor muscle contraction capacity through AFA and electromyographic biofeedback (Fênix®).	Volleyball athletes had an AFA with estimate 4, an average value of 20µv of muscle activation through evaluation with biofeedback. 30% of volleyball athletes reported some urinary loss episode by physical effort.
BORIN et al, 2013 (Brasil)	Observational prospective study	40 female athletes, 10 being volleyball athletes.	Perineal Intracavitary pressure through Perineometer (Quark®). UI prevalence, practiced sport modality and diurnal and nocturnal urinary frequency.	The volleyball athletes had a perineal intracavitary pressure of 4.36 + - 1.43mmHg. 19% of volleyball athletes reported urinary loss during sport practice.

Subtitle: ICIQ: International Consultation on Incontinence Questionnaire. AFA: functional assessment of the pelvic floor.

Urinary Incontinence Prevalence in volleyball athletes in eligible studies for this systematic review varied from 9% to 30% being that the studies by Simeone et al. [16] and Nygaard et al. [14] verified a prevalence on the day-to-day of 17,2% and 18% respectively. Despite that, in studies by Nygaard et al. [14], Reis et al. [13] and Borin et al. [17] verified a prevalence of 9%, 30% and 19% respectively, during sports practice.

In relation to the type of urinary incontinence, in studies by Ferreira et al. [18], the 32 volleyball athletes (100%) presented urinary incontinence of effort, given these similarities to the studies by Reis et al. [13] and Borin et al. [17] where 30% and 19%, respectively, of the volleyball athletes showed urinary incontinence effort based. From the 6 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 studies by Reis et al. [13] also recruited women below 18 years of age.

It is possible to observe from the results obtained, that only the studies 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 utilized self report to identify urinary loss. Despite that, only the studies by Reis et al. [13] utilized objective methods to quantify the capacity for contraction and pressure presents in the MAPs through electromyographic feedback (Fênix®).

In relation to the risk factors for UI associated to sports practice, studies by Simeone et al [16], identified an inverse relationship between the frequency of urinary loss and the time of practice in the modality, where athletes with less than 1 year of practice reported higher loss quantity. In this study, that evaluated 7 sport modalities, 91 volleyball players had urinary loss episodes, such as the urinary loss was experienced shortly beforehand and immediately after a competition. Counteractively, studies by Nygaard et al. [14] did not find significant relation between the time of practice in the modality or position in the sport to the urinary loss. Despite that, studies by Borin et al. [17] verified a positive correlation between urinary loss and the activities of physical preparation such as abdominals, effort training, jump, the number of games a year and the time of daily training.

Table 2. Recommendations *STROBE* (n = 5)

Recomendações STROBE	Borin et al., 2013	Nygaard et al., 1994	Simeone et al., 2010	Reis et al., 2011	Thyssen et al., 2002
1	P	P	P	P	P
2	P	P	P	P	P
3	P	P	P	P	
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

Subtitle: Present (P) Not Present (NP)

According to the STROBE recommendations, it is evident that all the studies attended the recommendations in partial manner, yet satisfactorily since more than half of the items were contemplated. Amongst the recommendations, the items 9, 17, 21 stood out as they were not contemplated in a clear manner by neither of the 5 articles included in this review. They are: (9) Specify all the methods adopted to avoid potential controversial sources; (17) Describe other analysis that have been made; (21) Discuss the generalization (external expiration) of the results.

Discussion

The results found in this review appointed that the prevalence of urinary incontinence in volleyball athletes varies from 9% to 30% during the sport practice and from 17% to 18% on day-to-day life. Literature shows that sports practice of high impact is related to the occurrence of dysfunctions of the pelvic floor, such as urinary incontinence [21–22]. Reis et al¹³ affirms that within the sport modalities of high impact, the volleyball is the one of the sports most propense to influence in a direct manner the pelvic floor of the athletes. However, volleyball athletes often show a lesser set of factors associated to urinary loss, amongst them is age, parity and sedentarismo [23].

According to Maia et al. [24], the UIE is the type of incontinence with highest prevalence between sports practicants, having highest rates in sports of high impact. In this way, studies by Silva et al⁷ affirms that the type of physical exercise practiced by young women, nulliparous and without additional UI risk factor, can be a triggering factor due to occurrence of elevated intraabdominal pressure over the pelvic floor. Antunes, Manso and Andrade [25] obtained results similar in their studies, observing that 17 out of 18 women that reported urinary loss showed this loss exclusively during exercise practice.

Amongst the conditions that explain the urinary loss during sports practice are the jumps that involve the contact of feet to the ground that generate a maximum effort reaction increasing body weight [26]. This impact can affect the mechanism of continence by altering the amount of effort transmitted to the pelvic floor, in that it can contribute to the incontinence between nulliparous young women and practicants of sports that demand high impact [27]. Dias et al. [28], In a recent study, verified, through magnetic resonance high resolution, that healthy and nulliparous young women during a jump showed important deformations of the pelvic floor, between them the excessive posterior movements are counterbalanced by the vaginal wall.

The impact caused by incontinence in sports does not limit itself to physical aspects of women only, but also affects negatively in the sexual, domestic and occupational spheres. Women with urinary incontinence feel ashamed and embarrassed to engage in activities, being that the urinary loss during sports practice is considered y one third of women a social problem [29,19]. Due to this situation, women adopt prevention strategies, such as the use of tampons during sports practice, lavatory use and the reduction of liquid ingesting before sports practice [18–19].

In a study developed by Araújo et al. [30] urinary loss in athletes was compared between training and competitions, in this manner urinary loss in athletes occurs in 60,9% during training

and 65,2% during competition. This data is in disagreement with results obtained in studies by Thyssen et al. [19] and Nygaard et al. [14] in which they report that urinary loss in athletes during training is higher when compared to periods of competition.

In relation to the presence of urinary loss and the time of sports practice, BØ, et al. [31], in a recent systematic review, identified a strong relation between these aspects. The authors appoint that not only the type of exercise influences in urinary loss, but also the volume and the time spent in practice. Reis et al. [13] found a relation between the time of training in years and the presence of urinary incontinence, in which volleyball athletes showed an estimate of 9 years to initiate the symptoms of urinary loss. Counteractively the study by Simeone et al. [16], identified an inverse relation to 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 manner, the practice of exercises that promote the simultaneous contraction of the perineum must be stimulated, in order to strengthen the muscles of the pelvic floor and consequently decrease urinary loss during sports practice[29]. In relation to the capacity of contraction of the muscles of the pelvic floor, studies by Reis et al[13], identified that volleyball athletes, even if showing signs of UI, did not obtain significant difference in relation to intravaginal pressure, this result agrees collaborates with results found 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 low capacity of pelvic muscle contraction.

Studies by Borin et al. [17] compared the capacity of muscle contraction in the pelvic floor in four situations: handball athletes, basketball athletes, volleyball athletes and non-athletes. As results, the estimate perineum pressure (standard de-location) for non-athletes was found at 6,73 (1,91) mm Hg. Estimate perineum pressure for handball players at 5,55 (1,43) mm Hg; for volleyball players at 4,36 (1,43) mm Hg; and for basketball players at 3,65 (1,35) mm Hg. With these results, the study suggests that non-athlete women have better contraction capacity when compared to athlete women.

In this manner, a large methodological variety in the studies analyzed is evident, being that few of these results utilized objective measures to quantify the urinary loss with higher precision. Despite that, the results of this review indicate that a significant prevalence of urinary incontinence exists in athletes, however this is still not greater than the presence of urinary incontinence in women that show other associated factors, such as age and multiparity.

In this study, it was possible to observe that the practice of physical exercises of high impact appears to be a causing factor to UI in women, in this context the practice of volleyball in the female population can be an important risk factor, given that all the studies reviewed included incontinent volleyball athletes. Additionally, in general this great prevalence of urinary incontinence creates a necessity for the awareness of the coach and their athletes on the importance of training the muscles of the pelvic floor in alliance with the sport practice.

The current literature lacks in wider studies that verify the urinary incontinence and the functions of the muscles of the pelvic floor in volleyball athletes, in order to generate a specific preventive and healing treatment for this population, given that it is a modality widely practiced by the female demographic.

Limitations

Amongst the studies limitations, the methodological quality of the studies is appointed. By means of STROBE recommendations, it was observed that some items were not contemplated, causing the methods to be obstructed insofar as the relations and biases that the studies can present. Besides that, it was possible to identify the lack of specificity in evaluating one modality only, which makes the relation between particularities of the sports gestures inviable with urinary loss. Therefore, it is suggested studies that identify the prevalence of UI and the related factors to sports practice, in the volleyball modality more specifically. In this manner, it will be possible to create strategies and preventive treatment techniques that are effective for the well being and efficiency of the volleyball athletes.

References

1. Bø K, Frawley HC, Haylen BT, Abramov Y, Almeida FG, Berghmans B et al. An International Urogynecological Association (IUGA)/ International Continence Society (ICS) joint report on the terminology for the conservative and nonpharmacological management of female pelvic floor dysfunction. *Int Urogynecol J*, 2016, 28 (2), 191–213.
2. Ardila OR. Caracterización clínica de la incontinencia urinaria y factores asociados em usuarias de la Unidad de la Mujer del Centro de Salud Familiar Ultraestación” en la ciudad de Chillán, Chile. *Rev. méd. Chile*, 2015, 143(2), 203–212.

3. Scarpa KP, Herrmann V, Palma PCR, Riccetto CLZ4, Morais SS. Sintomas urinários irritativos após parto vaginal ou cesárea. *Rev Assoc Med Bras*, 2009, 55(4), 416–20.
4. Langoni CS, Knorst MR, Lovatel GA, Leite VO, Resende TL. Incontinência urinária em idosas de Porto Alegre: sua prevalência e sua relação com a função muscular do assoalho pélvico. *Fisioter. Pesqui*, 2014, 21(1), 74–80.
5. Figueiredo, E.M. et al. Perfil sociodemográfico e clínico de usuárias de Serviço de Fisioterapia Uroginecológica da rede pública. *Revis Bras Fisioter*, 2008, 12(2), 136–42.
6. Santos, ES, Caetano AS, Tavares MCGC, Lopes MHBM. Incontinência urinária entre estudantes de educação física. *Rev Esc Enferm USP*, 2009, 43(2), 307–312.
7. Silva LH, Serezuella KC, Bordini A, Citadini JM. Relação da incontinência urinária de esforço com a prática de atividade física em mulheres nulíparas. *Salusvita*, 2005, 24(2), 195–206.
8. Almeida MBA; Monteiro MVC, Barra AA; Figueiredo EM, Velloso FSB, Silva AL, et al. Disfunções de assoalho pélvico em atletas. *Femina*, 2011, 39(8), 395–402.
9. Almeida MB, Barra AA, Saltiel F, Silva-Filho AL, Fonseca AM, Figueiredo EM. Urinary incontinence and other pelvic floor dysfunctions in female athletes in Brazil: A cross-sectional study. *Scand J Med Sci Sports*. 2016, 26(9), 1109–16.
10. Patrizzi LJ, Viana DA, Silva LMA, Pegorari MS. Incontinência urinária em mulheres jovens praticantes de exercício físico. *Rev Bras Ci e Mov*, 2014, 22(3), 105–110.
11. Jean-Baptiste J, Hermieu JF. Fuites urinaires et sport chez la femme. *Prog Urol*, 2010, 20(7), 483–490.
12. Associação Portuguesa de Voleibol 2015-2016: aprovados no 34º congresso FIVB 2014. Disponível em: http://www.fpvoleibol.pt/regras_indoor/Regras_Voleibol_2015-2016.pdf. Acesso em: 26 maio. 2017.
13. Reis AO, Câmara CNS, Santos SG, Dias TS. Estudo comparativo da capacidade de contração do assoalho pélvico em atletas de voleibol e basquetebol. *Rev Bras Med Esporte*, 2011, 17(2), 97–101, 2011.
14. Nygaard I, Thompson FL, Svengalis SL, Albright JP. Urinary Incontinence in Elite Nulliparous Athletes. *Obstet Gynecol*. 1994, 84(2), 183–7.

15. Malta M, Cardoso LO, Bastos FI, Magnanini MMF, Silva CMFP. Iniciativa STROBE: subsídios para a comunicação de estudos observacionais. *Rev. Saúde Pública*, 2010, 44(3).
16. Simeone C, Moroni A, Pettenò A, Antonelli A, Zani D, Orizio C, Cosciani Cunico S. Occurrence rates and predictors of lower urinary tract symptoms and incontinence in female athletes. , 2010, 77(2), 139–46.
17. Borin LC, Nunes FR, Guirro EC. Assessment of pelvic floor muscle pressure in female athletes. *PM R*. 2013, 5(3), 189–93.
18. Ferreira S Margarida Ferreira M, Carvalhais A, Santos PC, Rocha P, Brochado G. Reeducation of pelvic floor muscles in volleyball athletes. *Rev. Assoc. Med. Bras*. 2014, 60(5), 428–433.
19. Thyssen HH, Clewin L, Olesen S, Lose G. Urinary incontinence in elite female athletes and dancers. *Int Urogynecol J Pelvic Floor Dysfunct*. 2002,13(1), 15–7.
20. Tamanini JT, Lebrão ML, Duarte YA, Santos JL, Laurenti R. Analysis of the prevalence of and factors associated with urinary incontinence among elderly people in the Municipality of São Paulo, Brazil: SABE Study (Health, Wellbeing and Aging). *Cad Saude Publica*. 2009, 25(8), 1756–62.
21. Poswiata A, Socha T, Opara J. Prevalence of Stress Urinary Incontinence in Elite Female Endurance Athletes. *J Hum Kinet*, 2014, 9(44), 91–96.
22. Goldstick O, Constantini N. Urinary incontinence in physically active women and female athletes. *Br J Sports Med*, 2014, 48(4), 296–8.
23. Marinho AR, Leal BB, Flister JS, Bernardes NO, Rett MT. Incontinência urinária feminina e fatores de risco. *Rev Fisioter Bras*, 2006, 7(4), 301–5.
24. Maia, M; Roza, T; Mascarenhas T. O pavimento pélvico da mulher atleta – perspectiva uruginecológica. *Acta Obstet Ginecol Port*, 2015, 9(1), 56–64.
25. Antunes, MB, Manso VMC, Andrade NVS. Análise dos sinais da incontinência urinária de esforço em mulheres de 25 a 50 anos praticantes de atividade física em academias. *Ensaio e Ciência: Ciências Biológicas, Agrárias e da Saúde*, 2011, 15(1), 83–95.
26. Zucchi EVM, Sartori MGF, Girão MJBC, Bacarat EC, Lima GR. Impacto da atividade esportiva no assoalho pélvico. *Femina*. 2003, 31(4), 333–5.

27. BØ, K. Urinary incontinence, pelvic floor, dysfunction, exercise and sport. *Sports Med.* 2004, 34(7), 451–64.
28. Dias N, Peng Y, Khavari R, Nakib NA, Sweet RM, Timm GW, et al. Pelvic floor dynamics during high-impact athletic activities: A computational modeling study. *Clin Biomech (Bristol, Avon).* 2017, 41, 20–27.
29. Caetano A, Tavares MCGC, Lopes MHBM. Incontinência urinária e a prática de atividades físicas. *Rev Bras Med Esporte*, 2007, 4(13), 270–274.
30. Araújo MP, Oliveira E, Zucchi EM, Trevisani VFM, Girão MJBC, Sartori MGF. Relação entre incontinência urinária em mulheres atletas corredoras de longa distância e distúrbio alimentar. *Rev. Assoc. Med. Bras*, 2008, 54(2), 146–149.
31. Nygaard IE, Shaw JM. Physical activity and the pelvic floor. *Am J Obstet Gynecol.* 2016, 214(2), 164–71.
32. Araújo MP, Parmigiano TRP, Negra LGD Torelli L (Fisioterapeuta) Camila Garcia de Carvalho CG, Wo L et al. Avaliação do assoalho pélvico de atletas: Existe relação com a incontinência urinária?. *Rev Bras Med Esporte*, 2015, 21(6), 442–446.