BRAZILIAN OLYMPIC FEMALE ATHLETES' MULTIDISCIPLINARY CARE: AN OBSERVATIONAL STUDY

CUIDADO MULTIDISCIPLINAR DE ATLETAS OLÍMPICAS BRASILEIRAS: UM ESTUDO OBSERVACIONAL

ATENCIÓN MULTIDISCIPLINAR DE DEPORTISTAS OLÍMPICAS BRASILEÑAS: UN ESTUDIO OBSERVACIONAL

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ABSTRACT

Introduction: Female participation in sports had reached a milestone in 1972 when a constitutional amendment was implemented to ensure equal opportunities for men and women. Since then, the percentage of participants in competitive sports has grown. In 1992, an association was made between three disorders related to female athletes called the "Female Athlete Triad". After that, much has been studied about this and other particularities of female athletes. Objective: To identify the professionals who follow-up Brazilian female Olympic athletes and the association between a multidisciplinary approach and athletes' knowledge about gynecological issues related to the practice of sport, i.e., female athlete triad, urinary incontinence, and weight control concerns. Methods: This observational study was conducted in Rio de Janeiro, Brazil, in 2016, during the Olympic Games. It included 120 female members of the Brazilian teams. A self-applied questionnaire, validated and adapted from the pre-participation gynecological evaluation of female athletes, was used to evaluate their multidisciplinary follow-ups, weight control concerns, and knowledge about the Female Athlete Triad and urinary incontinence. Results: The athletes practiced 28 different sports. For 66%, it was their first participation in Olympic Games; 56% were unaware of the female athlete triad, 77% indicated weight concerns, and 52% were on a diet. The use of diuretics or laxatives or vomiting was reported by 11%; 67.5% were aware that sports are a risk factor for urinary incontinence, and 40% had already experienced urine loss. Decreased sportive performance was mentioned by 31%. Several athletes presented multidisciplinary follow-ups psychological (83%), nutritional (96%), and gynecological (83%). Conclusion: Brazilian Olympic athletes sought multidisciplinary follow-ups during the Olympic cycle; however, participants' knowledge of sports-related issues remains limited. An orientation program regarding the above conditions is needed for female athletes and the professionals working with them to improve health and performance. ***Evidence Level IV; Cross-sectional observational study.***

Keywords: Female Athlete Triad Syndrome; Gynecology; Urinary incontinence; Athletic Performance; Sports Medicine.

RESUMO

Introdução: A participação feminina no esporte atingiu um marco em 1972, quando uma emenda foi implementada para garantir oportunidades iguais para homens e mulheres. Desde então, a porcentagem de participantes competitivas cresceu. Em 1992, foi feita uma associação entre três distúrbios relacionados a mulheres atletas denominadas "Tríade da Mulher Atleta". Depois disso, muito tem sido estudado sobre essa e outras particularidades das atletas. Objetivo: Identificar os profissionais que acompanham atletas Olímpicas brasileiras e associar a abordagem multidisciplinar e o conhecimento das atletas sobre questões ginecológicas relacionadas à prática esportiva, ou seja, tríade da mulher atleta, incontinência urinária e controle de peso. Métodos: Este estudo observacional foi realizado no Rio de Janeiro, Brasil, em 2016, durante os Jogos Olímpicos. Incluiu 120 mulheres das seleções brasileiras. Um questionário autoaplicável, validado e adaptado utilizado para avaliação pré-participação ginecológica, foi utilizado para avaliar seus acompanhamentos multidisciplinares, preocupações com o controle de peso e conhecimento sobre a Tríade de Atleta Feminina e incontinência urinária. Resultados: Os atletas praticaram 28 esportes diferentes. Para 66%, era a primeira participação em uma Olimpíada, 56% desconheciam a tríade da mulher atleta, 77% referiram preocupação com o peso e 52% estavam fazendo dieta. O uso de diuréticos ou laxantes ou êmese foi relatado por 11%; 67,5% sabiam que o esporte é um fator de risco para incontinência urinária e 40% já haviam experimentado perda de urina. A diminuição do desempenho esportivo foi mencionada por 31%. Muitas atletas apresentaram acompanhamento multidisciplinar psicológico (83%), nutricional (96%) e ginecológico (83%). Conclusão: As atletas olímpicas brasileiras buscaram acompanhamento multidisciplinar durante o ciclo olímpico; no entanto, o conhecimento dos participantes sobre questões relacionadas ao esporte permanece limitado. Um programa de orientação sobre informações específicas sobre as condições acima é necessário para as atletas e profissionais que trabalham com essas para melhorar a saúde e desempenho. ***Nível de Evidência IV; Estudo observacional transversal.***

Descritores: *Síndrome da Tríade da Mulher Atleta; Ginecologia; Incontinência urinária; Desempenho Atlético; Medicina Esportiva.*

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RESUMEN

Introducción: La participación femenina en el deporte alcanzó un hito en 1972 cuando se implementó una enmienda para garantizar la igualdad de oportunidades para hombres y mujeres. Desde entonces, el porcentaje de participantes en deportes competitivos ha crecido. En 1992, se estableció una asociación entre tres trastornos relacionados con atletas femeninas denominada "Tríada de la mujer atleta". Posteriormente se ha estudiado mucho sobre esta y otras particularidades de las deportistas. Objetivo: Identificar a los profesionales que dan seguimiento a atletas olímpicas brasileñas y la asociación entre un enfoque multidisciplinario y el conocimiento de las atletas sobre los aspectos ginecológicos relacionados con la práctica del deporte: la tríada, la incontinencia urinaria y las preocupaciones sobre el peso. Métodos: Este estudio observacional se realizó en Rio de Janeiro, Brasil, 2016, durante los Juegos Olímpicos. Incluyó 120 mujeres integrantes de los equipos brasileños. Se utilizó un cuestionario auto aplicado, validado y adaptado de la evaluación ginecológica, para evaluar sus seguimientos multidisciplinarios, preocupaciones sobre control de peso y conocimiento sobre la Tríada y la incontinencia urinaria. Resultados: Los deportistas practicaron 28 deportes diferentes. Para el 66%, fue su primera participación en los Juegos Olímpicos, 56% desconocía la tríada, 77% indicó preocupaciones sobre el peso y 52% estaba a dieta. El uso de diuréticos, laxantes o emesis fue reportado en un 11%; 67,5% sabía que el deporte es un factor de riesgo de incontinencia urinaria y 40% ya había experimentado una pérdida de orina. Un 31% mencionó una disminución del rendimiento deportivo. Varias deportistas presentaron seguimientos multidisciplinarios psicológicos (83%), nutricionales (96%) y ginecológicos (83%). Conclusión: Las atletas olímpicas brasileñas buscaron seguimientos multidisciplinarios durante el ciclo olímpico, sin embargo, el conocimiento sigue siendo limitado. Se necesita un programa de orientación específico sobre las condiciones anteriores tanto para atletas como para profesionales involucrados con ellas para mejorar salud y rendimiento. ***Nivel de Evidencia IV; Estudio observacional transversal.***

Descriptores: *Síndrome de la Tríada de la Atleta Femenina; Ginecología; Incontinencia Urinaria; Rendimiento Atlético; Medicina Deportiva.*

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INTRODUCTION

Benefits related to sportive practice are numerous. Regular engagement in physical exercise causes important organic changes associated with the prevention and treatment of chronic diseases (diabetes, hypertension, and obesity).[1] Positive results are related to improvement in the contractibility and cardiac capacity, enhancement of endothelial function and glucose tolerance, improvement of insulin sensitivity, and decreased levels of glycated hemoglobin.[1] In contrast, excess exercise can negatively affect health, particularly in conjunction with an improper diet.[2,3]

Female participation in sports achieved a historical milestone in 1972 when a constitutional amendment, Title IX, was implemented to ensure equal opportunities for men and women regarding studies and incentives to sportive practice and preventing exclusion or discrimination for any of these activities.[4] Since then, the percentage of female members in competitive sports grew rapidly and is expected to continue in the future.

In 1992, the American College of Sports Medicine carried out a conference to discuss questions directly related to women. In particular, three distinct but interconnected disorders, amenorrhea, osteoporosis, and eating disorders, seemed to compromise a growing number of athletes. The association of these three disorders was called "Female Athlete Triad" (FAT).[5]

Currently, the concept of the Triad components has been extended, to improve early diagnoses. Therefore, eating disorders related to negative energy balance conditions, related or not to anorexia and bulimia, menstruation changes due to hypoestrogenism, oligomenorrhea, preceding amenorrhea, and bone mineral density loss demonstrating possible evolution to high-risk stress fractures, have gained attention among scholars of the subject.[6]

In many sports, weight and body composition are important variables for performance. For this reason, many athletes engage in unhealthy habits in an attempt to achieve this "ideal" body. The low energy availability chronically changes the endocrine system and alters, mainly, the female athlete metabolism, which is a risk to both health and sports performance.[7]

Urinary incontinence (UI) is also one of the most prevalent conditions among women.[8] Stress urinary incontinence is defined as involuntary urine loss due to stress, coughing, or sneezing.[9] When the loss is related specifically to sports practice, it is referred to as athletic urinary incontinence (AUI).[10]

Most elite athletes count on a multidisciplinary approach to help them achieve their sportive goals. Nevertheless, the professionals they rely upon may not be aware of specific female athletes' issues or may not be concerned about them during their regular appointments. This may lead to the continuance of the risks of which they all are unaware. Different professionals spend abundant time with the athletes; therefore, they could be a resource to disseminate information regarding specific health concerns, helping to improve athletes' health and, perhaps, sportive performance.

The prevention of these conditions involves greater dissemination of knowledge among professionals who work with athletes, i.e., coaches, parents, and the female athletes themselves, who often underestimate the inherent risks associated with intense physical exercise without capable multi-professional follow-up.[11] Tracking this information is very important for early diagnosis and, consequently, improved treatment.[12]

Currently, data in Brazil are greatly lacking. New protocols concerning female athletes health and care are warranted. The supporting staff should go beyond their regular practices and engage in prevention statements, to expand athletes' knowledge of these conditions and facilitate more positive outcomes.[13]

This study aimed to survey female Brazilian Olympic athletes prior to the Summer Olympic Games held in Rio de Janeiro, 2016 to identify the professionals who they sought for follow-up. In addition, it aimed to investigate the athletes' knowledge regarding gynecological issues related to sports practice: FAT, AUI, and weight control concerns, and, lastly, to relate the multidisciplinary approach to their knowledge.

METHODS

Study design

This was an observational study conducted between July and August 2016, among female athletes of the Brazilian Olympic Team in the Summer Olympic Games held in Rio de Janeiro 2016. Female athletes answered a self-applied questionnaire, validated and adapted from the pre-participation gynecological examination (online version) of female athletes.[14] This questionnaire evaluates demographic and socioeconomic data, sports history, multidisciplinary approach, and questions regarding health, such as the FAT, AUI, and weight control concerns. The study was approved by the Research Ethics Committee of the Federal University of São Paulo, Brazil (CAAE 1.615.280) and the Brazilian Olympic Committee support provided the athletes' contact information and permitted the survey.

Participants

Participants comprised a convenience sample of 120 Brazilian Olympic female athletes competing at the Summer Olympic Games, Rio de Janeiro, 2016. They were >16 years of age, agreed to participate by online informed consent, completed the questionnaire, and were included in the study.

Evaluation

The online questionnaire is a proposed adapted version of the pre-participation gynecological examination, a previously validated instrument.[14] It inquiries about demographic data, sportive modality, socioeconomic sports history, and multidisciplinary follow-up. It also addresses weight control concerns, the knowledge of the FAT, and the occurrence of AUI.

Data analysis

Data were stored in a Microsoft® Excel® 2016 software spreadsheet (Microsoft Corporation, Redmond, WA, USA). Statical analyses were performed using statistical software Stata/SE 15.1 Windows.

Data were described by absolute and relative frequency measurements, that is, number (n) and percentage (%), respectively, for categorical variables. Quantitative variables were described by means and standard deviations (SD). Chi-square or Fisher's exact test was conducted to examine associations between categorical variables.

A significance level of 5% was adopted for all statistical analyses, meaning that results with a p-value <5% (p <0,05) were considered statistically significant.

RESULTS

The participants were distributed across 28 sports modalities. The mean participant age was 27±5 years, and 66% were participating in their first Olympic Games (Table 1, 2).

Participants' knowledge of FAT was low, 56% were unaware of this syndrome. Nevertheless, 77% expressed concerns about weight, and 52% were currently dieting. There was no significant relationship between either age and weight concern (p=0,753) or between weight concern and FAT knowledge. (p=0,873).

The use of diuretics or laxatives or vomiting for weight loss was indicated by 11% of participants, and it was more prevalent among those who were on a diet (77%). Among these, 77% mentioned using these means to optimize the loss. Stress fractures can also be related to FAT and were indicated by 18% of participants (Table 3).

Regarding urinary incontinence, 67,5% were aware that involuntary urine loss could happen during sports practice and 40% had already experienced urine loss. There was no significant association between age and urine loss (p=0,422). Additionally, 31% of those who had experienced urine loss related it to negative impacts on sportive performance (Table 4).

Table 1. Demographic characteristics of the participants.

Variables	n=120
Age, mean (SD)	27,2 (5,4)
BMI, mean (SD)	22,5 (2,6)
Race/ethnicity n (%)	
White	66 (56,4)
Brown	28 (23,9)
Black	19 (16,3)
Indian	2 (1,7)
Asian	2 (1,7)
Schooling n (%)	
Elementary school	8 (6,7)
High school	77 (64,2)
College education	35 (29,1)
SD: Standard Deviation; BMI: Body Mass Index	

Table 2. Sport history of the participants

Variables	n=120
Age at which they began sports training, mean (SD)	13,3 (4,5)
Physical training (hours/week)	11 (8,6)
Sports training (hours/week)	26,3 (10,1)
Complete training (hours/week)	36,4 (14,3)
Source of income n (%)	
Sport	10 (8,3)
Sport and another source	104 (86,7)
No sport source of income	6 (5)
Olympic participation n (%)	
One participation	80 (66)
Two participations	23 (19,2)
Three participations	11 (9,1)
Four participations	4 (3,3)
Five participations	2 (1,7)

SD: Standard Deviation

Table 3. Related questions to FAT and eating disorders

Variables	n=120
Knowledge about FAT, n (%)	
Yes	53 (44,2)
No	67 (55,8)
Stress fracture history, n (%)	
Yes	22 (18,3)
No	98 (81,7)
Weight concern, n (%)	
Yes	92 (76,7)
No	28 (23,3)
On diet	
Yes	62 (51,7)
No	58 (48,3)
Use of laxative, diuretic or induction of vomiting, n (%)	
Yes	13 (10,8)
No	107 (89,2)

FAT: Female Athlete Triad

Furthermore, there was a significant association between knowledge of FAT and AUI (p<0,001). Those who knew about FAT were also aware of the AIU.

Many of the athletes presented psychological (83%), nutritional (96%), and gynecological (83%) follow-ups (Table 5). Most (83%) referred to annual visits to a gynecologist, even without a specific complaint.

Most had nutritional follow-up (89%) and prescriptions for supplements were made mainly by a nutritionist (70%). There was no significant relationship between age and nutritional follow up (p=0,394).

Table 4. Questions related to urinary incontinence.

Variables	n=120
Knowledge about urinary incontinence, n (%)	
Yes	81 (67,5)
No	39 (32,5)
Urine loss during physical exertion, n (%)	
Yes	48 (40)*
No	60 (72)
Reduction of sport performance due to urine loss, n (%)*	
Yes	15 (31,2)
No	33 (68,8)

*n=48 who refer to urine loss.

Table 5. Related questions use of food supplement multidisciplinary follow-up.

Variables	n=120
Use of food supplement, n (%)	
Yes	99 (82,5)
No	21 (17,5)
Nutritional follow-up, n (%)	
Yes	115 (95,8)
No	5 (4,2)
Psychological follow-up, n (%)	
Yes	100 (83,3)
No	20 (16,7)
Gynecological follow-up, n (%)	
Yes	99 (83,2)
No	21 (16,8)

The majority (91%) indicated a psychological follow-up as important to sports performance. There was a significant difference in weight concerns between those who did and who did not receive a psychological follow up (p=0,041). Among those who were concerned about weight control, 21% did not mention psychological care.

DISCUSSION

The study was conducted with 120 female Brazilian athletes, 66% of whom were participating in their first Olympic Games.

The FAT is a thoroughly investigated issue among female sport participants.[15] In a study performed among young and amateur Brazilian athletes, 89,9% were not aware of the FAT.[14] Although the Olympic athletes are more knowledgeable about this issue, most of them (56%) remain unaware of the risk to which they are exposed.

Stress fracture has different etiologies and may be a negative outcome of the FAT. The injury may be caused by hypoestrogenism resulting from menstruation disorders related to FAT. [16] It is one limitation of this study that we were unable to relate the stress fractures, mentioned by 18% of the athletes, to menstrual cycle irregularities, which was also reported by some participants (35%). Previous studies describe a lower incidence among female athletes (13%),[17] compared to what is shown above. In addition to the association with the FAT, these injuries may cause pain and prevent athletes from attending practices.[18]

As mentioned, the focus of FAT is eating disorders. Occasionally, restricted food intake is voluntarily and evolves to persistent diets related to weight fluctuation.[19] In this study, 77% of the athletes referred to weight as a concern and 52% were on a diet to lose weight. However, the use of diuretics or laxatives, or vomiting may be used to optimize the loss. In this study, 11% of participants had already used these resources, and this practice was more common among those who were currently dieting (77%).

Athletes who participate in endurance sports (i.e., running, cycling and swimming), sports that involve weight control (i.e., wrestling and judo), or those that involve aesthetic judgments (i.e., gymnastics, diving, and artistic swimming) are at greater risk for eating disorders or disordered eating.[20] However, our findings revealed no statistically significant differences between the three groups of sports above, which lead us to suggest that a thin body is a common focus among female sports or, an aspiration to achieve the socially accepted standard body image.

Regarding urinary incontinence, the majority of participants indicated knowledge about the AIU (67,5%) and 40% had experienced urinary loss during the sport practice. Previous literature indicates that the frequency of urine loss may range between 5-80% among female athletes.[14,21] It is highlighted that the high prevalence may be related to the fact that urine loss is frequently underestimated, and athletes, therefore, do not report their complaints to the medical team or their coach,[14] possibly due to shame, underestimation, or lack of awareness of the treatment possibilities through pelvic floor strengthening exercises.[22] AUI must be treated, as it can limit exercise, including sports practice, leading to the abandonment of the sport or altering sports practice.[23]

Urinary incontinence can also impact sports performance, as mentioned by 31% of them. It has a negative influence on quality of life and concentration.[24] Therefore, it is important to treat and importantly, incorporate prevention programs during practice sessions for all female athletes.[25]

The participants had access to gynecological, psychological, and nutritional follow-ups during most of the Olympic cycle. However, the current findings demonstrate that the athletes continue to ignore the FAT, to accept the decrease in sportive performance related to AUI and engage in inappropriate diets and methods for weight control. Most of the participants who were on unsupervised diets did not mention psychological follow-up. They should, therefore, be directed to this resource to protect their health by improving their understanding of and minimize exposure to the risks to their health and athletic abilities.

In addition to the multidisciplinary follow-ups mentioned above, which are considered essential for optimal care, an individually tailored approach is necessary, with the inclusion of all the teams involved with the athletes' health and performance, to identify possible risks to each athlete.[13]

The great value of this study is that, to the best of our knowledge, it is the first intended to primarily investigate gynecological issues, such as the knowledge of inherent health concerns among Brazilian female Olympic athletes. Additionally, although these athletes are assisted by a multidisciplinary staff, it appears that the professionals involved with their health assistance should be encouraged to identify and assist those with specific needs related to female athletes' health conditions.

It is our hope that these findings will empower multidisciplinary teams to promote education, improve collaborative efforts and establish reliable protocols tailored to the specific needs of female Olympic athletes.

One limitation of this study is that the questionnaire was completed remotely (online) by the athletes, which made clarification of ambiguities or further questioning of the athletes impossible.

CONCLUSIONS

The Brazilian Olympic athletes were presented with a multidisciplinary follow-up during the Olympic cycle. Our findings demonstrated, however, that the athlete's knowledge regarding sports-related issues is still limited. This indicates the need for a specific orientation program to provide relevant information to the female athlete regarding conditions to which they are exposed - weight concern, FAT, and AUI. The multidisciplinary team who works with them should also be empowered and encouraged to provide information and care on these specific issues and should work together to achieve this particular goal.

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REFERENCES

1. Pedersen BK, Saltin B. Exercise as medicine - evidence for prescribing exercise as therapy in 26 different chronic diseases. Scand J Med Sci Sports. 2015;25 Suppl 3:1-72.
2. Logue DM, Madigan SM, Melin A, Delahunt E, Heinen M, Mc Donnell S-J, et al. Low energy availability in athletes 2020: an updated narrative review of prevalence, risk, within-day energy balance, knowledge, and impact on sports performance. Nutrients. 2020;12(3):835.
3. Orio F, Muscogiuri G, Ascione A, Marciano F, Volpe A, La Sala G, et al. Effects of physical exercise on the female reproductive system. Minerva Endocrinol. 2013;38(3):305-19.
4. Warren MP, Goodman LR. Exercise-induced endocrine pathologies. J Endocrinol Invest. 2003;26(9):873-8.
5. Beals KA, Meyer NL. Female athlete triad update. Clin Sports Med. 2007;26(1):69-89.
6. Donaldson ML. The female athlete triad. A growing health concern. Orthop Nurs. 2003;22(5):322-4.
7. Torstveit MK, Sundgot-Borgen, J. Eating disorders in male and female athletes. In: Maughan RJ, editors. Sports nutrition: the encyclopaedia of sports medicine. Chichester, UK: Wiley-Blackwell; 2014. p. 513-25.
8. Aoki Y, Brown HW, Brubaker L, Cornu JN, Daly JO, Cartwright R. Urinary incontinence in women. Nat Rev Dis Primers. 2017;3:17042.
9. Heath A, Folan S, Ripa B. Stress urinary incontinence in female athletes. J Womens Health Phys Therap. 2014;38:104-9.
10. Araujo MP, Sartori MGF, Girão MJBC. Athletic Incontinence: proposal of a new term for a newwoman. Rev Bras Ginecol Obstet. 2017;39:441-2.
11. Waldrop J. Early identification and interventions for female athlete triad. J Pediatr Health Care. 2005;19(4):213-20.
12. Rumball JS, Lebrun CM. Preparticipation physical examination: selected issues for the female athlete. Clin J Sport Med. 2004;14:153-60.
13. Ackerman KE, Stellingwerff T, Elliott-Sale KJ, Baltzell A, Cain M, Goucher K, et al. #REDS (Relative Energy Deficiency in Sport): time for a revolution in sports culture and systems to improve athlete health and performance. Br J Sports Med. 2020;54(7):369-70.
14. Parmigiano TR, Zucchi EV, Araujo MP, Guindalini CSC, Castro RA, Di Bella ZIK, et al. Pre-participation gynecological evaluation of female athletes: a new proposal. Einstein (Sao Paulo). 2014;12(4):459-66.
15. Yeager KK, Agostini R, Nattiv A, Drinkwater B. The female athlete triad: disordered eating, amenorrhea, osteoporosis. Med Sci Sports Exerc. 1993;25:775-7.
16. Otis CL, Drinkwater B, Johnson M, Loucks A, Wilmore J. American College of Sports Medicine position stand. The Female Athlete Triad. Med Sci Sports Exerc. 1997;29(5):i-ix.
17. Ackerman KE, Cano Sokoloff N, DE Nardo Maffazioli G, Clarke HM, Lee H, Misra M. Fractures in relation to menstrual status and bone parameters in young athletes. Med Sci Sports Exerc .2015;47(8):1577-86.
18. Abbott A, Bird ML, Wild E, Brown SM, Stewart G, Mulcahey MK. Part I: epidemiology and risk factors for stress fractures in female athletes. Phys Sportsmed. 2020;48(1):17-24.
19. Klungland Torstveit M, Sundgot-Borgen J. Are under- and overweight female elite athletes thin and fat? a controlled study. Med Sci Sports Exerc. 2012;44(5):949-57.
20. Ackland TR, Lohman TG, Sundgot-Borgen J, Maughan RJ, Meyer NL, Stewart AD, et al. Current status of body composition assessment in sport: review and position statement on behalf of the ad hoc research working group on body composition health and performance, under the auspices of the I.O.C. Medical Commission. Sports Med. 2012;42(3):227-49.
21. Almousa S, Bandin Van Loon A. The prevalence of urinary incontinence in nulliparous female sportswomen: a systematic review. J Sports Sci. 2019;37(14):1663-72.
22. Carls C. The prevalence of stress urinary incontinence in high school and college-age female athletes in the midwest: implications for education and prevention. Urol Nurs. 2007;27(1):21-39.
23. Hägglund D, Wadensten B. Fear of humiliation inhibits women's care-seeking behaviour for long-term urinary incontinence. Scand J Caring Sci. 2007;21(3):305-12.
24. Jácome C, Oliveira D, Marques A, Sá-Couto P. Prevalence and impact of urinary incontinence among female athletes. Int J Gynaecol Obstet. 2011;114(1):60-3.
25. Woodley SJ, Boyle R, Cody JD, Mørkved S, Hay-Smith EJC. Pelvic floor muscle training for prevention and treatment of urinary and faecal incontinence in antenatal and postnatal women. Cochrane Database Syst Rev. 2017;12(12):CD007471.