



Prevalence of The Lower Urinary Tract Symptoms among Female Competitive Ice Hockey Players

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Abstract: In countries where ice hockey is a popular sport, more and more women are starting to play it at a competitive level. Physical activity of women practicing sport can have a negative impact on the lower urinary tract. Symptoms of urinary incontinence mainly occur in sports in which jumping and/or running are an integral part. In contrast, the effect of competitive ice hockey on the lower urinary tract in women is unknown. The aim of the present study was therefore to estimate the prevalence of lower urinary tract symptoms (LUTS) among female competitive ice hockey players. Forty-nine women competitively playing ice hockey were studied. The control group comprised of 49 women competitively playing other team games (football, handball, volleyball and basketball). Lower urinary tract conditions among the female athletes were assessed using the Core Lower Urinary Tract Symptom Score (CLSS) questionnaire. In the study group of female hockey players, LUTS were less frequent (95% CI: 2.15-3.53 vs. 2.88-43) and less severe (95% CI of CLSS Score: 2.61-4.66 vs. 3.55-5.79) compared to the control group, but these differences were not statistically significant. Of the 10 symptoms of LUTS assessed, only incomplete bladder emptying ($p < 0.05$) and urethral pain ($p < 0.01$) were statistically significantly less frequent among female competitive hockey players. Urgency was the most common symptom in female hockey players (48.98%). Urethral pain was also characterized by a statistically significant lower degree of severity ($p < 0.01$) among female hockey players. Female competitive ice hockey does not lead to a higher prevalence of LUTS and does not result in a higher degree of severity compared to women playing other team games.

Keywords: competitive women's sport, team games, health condition of the urinary tract, CLSS questionnaire

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INTRODUCTION

Physical activity nowadays plays a very important role in the prevention of many diseases and also significantly improves quality of life [1-3]. However, there are reports in the literature on the subject indicating potentially negative effects of physical activity, especially of a sporting nature, on the lower urinary tract of women [4,5]. These reports indicate that with the increase of exercise intensity, the proportion of women experiencing urinary incontinence (UI) increases. Women who practice sport at least 8 hours per week are more likely to report the symptoms [6,7]. Comparison of UI incidents during sports training and during daily activity indicates that incidents of this type are much more frequent during sports activity [8]. On the other hand, however, the severity of UI symptoms does not constitute a clinical problem in women who practice sports recreationally, as only 2.8% of them undergo therapy for this reason [8]. The adverse effect of physical exercise on the condition of the lower urinary tract is observed especially in women who practice sports professionally, and this is manifested by severe UI incidents [9-13]. For female athletes participating in high-intensity sports, the most common type of UI is stress urinary incontinence (SUI) [14,15]. In the literature on the subject there are two opposing hypotheses about how forcible exercise affects the pelvic floor of female competitive athletes [5,7,16]. The first hypothesis suggests that female athletes have strong, strengthened pelvic floor muscles (PFM) because physical activity that increases intra-abdominal pressure (IAP) leads to a simultaneous contraction of the pelvic floor muscles [16]. This in turn causes a training effect that leads to beneficial morphological changes in the tissues – their hypertrophy or shortening could "lift" the pelvic floor and internal organs [7,16]. Theoretically, therefore, this would reduce the risk of pelvic floor dysfunction [14,17]. This hypothesis is supported by the results of studies that found increased levator ani thickness in competitive athletes [18]. The second hypothesis is that strenuous exercise may cause overloading, stretching and weakening of the pelvic floor muscles and neuromuscular fatigue [15,19-23]. This is due to the high training load during exercise and chronically increased abdominal pressure [24]. The fatigue theory is supported by the fact that urine leakage is more frequent later in the day and after a greater number of exercise repetitions [25].

The incidence of lower urinary tract symptoms (LUTS) is most often limited to the occurrence of UI in various sports played by women. The prevalence of incontinence ranges from 0% (golf) to 80% (trampolinists) and increases in high-intensity sports such as volleyball or gymnastics [23], and also in female athletes who have not previously given birth [26]. Other researchers estimate the prevalence of UI among regularly exercising women at 7-38%, depending on the sport [15,27,28]. Symptoms of UI mainly occur during sports in which the specific technique is based on frequent jumping and/or running [6,29,30]. Although there are also studies that indicate that some exercises, such as the popular squat, cause an increase in IAP and provoke urine leakage [31]. Ice hockey is a highly dynamic sport in which the contact between players is direct. The success of ice hockey players depends on their skating skills, which are determined by their ability to accelerate, sprint, change direction and stop quickly [32-34]. The key to optimal performance of these elements of technique is the ability of the athlete to produce high levels of strength and power in the lower body, and ice hockey training primarily targets strengthening this [33]. The effect of the training of female ice hockey players on the pelvic floor is unknown. A study on elite female rugby players (a sport where the dynamics during competition and training are very similar to ice hockey) found that during game elements such as direct contact tackling (often with a fall, similar to hockey), rapid acceleration (sprinting) or jumping, the highest rates of SUI were recorded: 67%, 62% and 54% respectively [35].

What connects ice hockey with other sports played at a competitive level is undoubtedly the dynamic of the game. However, the way of moving around the field is different. The varied running pace characteristic of handball, football and basketball may

potentially affect LUTS [36]. Another indicated risk factor of pelvic floor overload with a potential negative impact on LUTS is the landing phase after a jump [30,37], the cyclicity of which is a characteristic of volleyball and basketball. On the other hand, ice hockey is characterized by violent impacts with great impact not only against the opponent but often against the rink board where the player's body is subjected to a violent mechanical shock. Ice hockey is also a sport with a high injury risk. Injuries in ice hockey are direct (80%) and overload (20%) [38]. They are caused by high puck speed, aggressive use of hockey sticks, and collisions of opponents' bodies [36]. In the context of the present study, it is important to note that the main injuries of hockey players are groin and lower abdominal injuries [39,40]. In line with theories stating that the muscles surrounding the abdomen and pelvis can alter intra-abdominal pressure and have an indirect effect on the function of pelvic floor muscles (PFM) [41], it is plausible to hypothesize that, following injury to these areas (or simply overtraining), PFM function can also become deregulated in female competitive hockey players. Another potential factor that may affect LUTS is the difficult thermoregulation of the body associated with specific clothing containing multi-layered protectors, which, in combination with the intensity of physical effort, leads to intensive sweating.

Only Simeone et al. [42] included a group of female competitive ice hockey players in their study, concluding that dysuria was the biggest problem in this group. Other studies included field hockey among many different sports. In this group of female athletes, the prevalence of UI was estimated at 42% [43]. Selecka et al. [44] when analysing the prevalence of SUI, taking into account a slightly broader division of sports proposed by Mitchell et al. [45] which takes into consideration volitional factors in addition to environmental determinants, included hockey in the group of the so-called heuristic-collective sports with a hockey stick. In a study by these authors, the risk of SUI is low in this group of sports disciplines [44]. In the meta-analysis performed by Sorriquet-Hernández et al. [46], ice hockey was included in the group of sports with moderate effects on the pelvic floor, in which the incidence of SUI was estimated at 50%.

In the available literature on the subject, there are practically no studies on LUTS condition among female competitive ice hockey players. The above-presented fragmentary and ambiguous data, and the limited assessment of the occurrence of only one symptom, i.e. UI, do not allow for drawing conclusions about the influence of women's ice hockey on the condition of the lower urinary tract. Therefore, the aim of this study was to assess the prevalence of LUTS symptoms among female competitive ice hockey players compared to female athletes practicing other team sports.

MATERIALS AND METHODS

Design

This was an observational, cross-sectional study. The study was planned to be conducted in Poland in the Silesian and Lesser Poland voivodeships, which have the largest number (8) of sports clubs with women's ice hockey sections. Women practicing other team sports were recruited in the same voivodeships. These two voivodeships, which are home to approximately 20% of the country's population (approximately 8 million), have the largest number of sports clubs participating in central championship competitions with women's team sports sections. The survey was conducted between September 2019 and December 2021, among female players from teams belonging currently or in previous seasons to the Polish Women's Hockey League (PWHL) and football, handball, volleyball and basketball players taking part in professional competitions in Poland during 2020/21 season. Due to the Covid-19 pandemic during the restriction periods, the survey was also conducted online.

The present study was approved by the Bioethics Committee of the Jerzy Kukuczka Academy of Physical Education in Katowice (No. 6/2015). All research procedures were

conducted in accordance with the Helsinki Declaration of Human Rights of 1975, amended in 1983. All participants were informed about the aims and procedures of the study and gave their informed consent to the participation in the study.

Participants

The interviewed women were divided into 2 groups. The first group consisted of women practicing ice hockey competitively. The surveys were sent to players of 4 ice hockey clubs from the Silesian Voivodeship and 1 club from the Lesser Poland Voivodeship. A complete set of completed surveys was obtained from 49 ice hockey players, which constituted over 33.8% of the entire squad of players of these clubs ($n=145$). The second group consisted of women who were playing football (13 persons), handball (12 persons), volleyball (12 persons) and basketball (12 persons). The inclusion criteria for the study were women aged 18 and older and that participated in a competitive sport activity for at least a year. In both groups of women actively practicing team sports no other health criteria were applied apart from good health confirmed by a current examination allowing active participation in sport. This is due to the fact that according to the Polish law female athletes who are fully healthy are allowed to play professional sport at a high level. The characteristics of both groups are presented in Table 1.

Procedure

The study was conducted anonymously using questionnaires. Printed questionnaires in the form of a clipped set were distributed during training sessions; the same set was sent online to randomly selected women from the entire Poland. For the control group, female respondents were recruited by directing a set of questionnaires to individuals from each sport, starting with female footballers. Recruitment was completed when an equal number ($n=49$) of fully completed CLSS questionnaires was obtained compared to the ice hockey group.

The time needed to complete the questionnaires was not specified in the study. The questionnaire started with a short introduction discussing the aim of the research. At the beginning, the respondents were asked to answer questions about their biometric features, past surgical procedures, deliveries, stimulants, and diet. In addition, the women athletes also answered questions about their sporting career duration and training frequency (number of years of competitive ice hockey, number of training sessions per week and number of hours spent on training per week at the time of completing the questionnaire).

Table 1. Demographic data of the participants.

Characteristics	Hockey group mean (SD), range	Control group mean (SD) range	p
Age (years)	22.73 (5.4), 18-46	23.12 (3.8), 18-33	0.190 ^b
Weight (kg)	62.6 (8.7), 43-97	61.5 (7.1), 49-79.5	0.468 ^a
Height (cm)	167.88 (4.9), 158-176	169.9 (6.0), 157-187	0.065 ^a
BMI	22.19 (2.5), 16.38-32.41	21.29 (3.2), 17.72-27.55	0.061 ^a
Childbirth (n)	4	5	0.999 ^c
Sports career (years)	10.68 (3.4), 4-20	10.41 (4.4), 3-24	0.740 ^a
Training frequency (no./week)	4.38 (1.5), 3-10	4.29 (1.2), 3-7	0.747 ^a
Number of training hours (h/week)	8.1 (2.7), 4-15	8.1 (2.7), 3-15	0.944 ^a

^a t-test; ^b U Mann-Whitney test; ^c Chi²

Instruments

The occurrence of symptoms related to the functioning of the urinary bladder and lower urinary tract among female competitive ice hockey players was assessed using the CLSS (Core Lower Urinary Tract Symptom Score) questionnaire [47]. The CLSS questionnaire in the printed form covered one A4 page and took the form of a table, while in the online version it was in one of five sections where the respondents marked the answers. The CLSS questionnaire consisted of 11 questions. The first 2 questions related to frequency of urination during the day (question 1) and frequency of urination at night (question 2). The next 8 questions dealt with the frequency of other lower urinary tract symptoms: a sudden urge to urinate that is difficult to stop (question 3), urinary incontinence due to urgency (question 4), urinary incontinence during coughing, sneezing or physical exertion (question 5), urination in a slow stream (question 6), urination with effort (question 7), feeling of incomplete bladder emptying after urination (question 8), bladder pain (question 9) and urethral pain (question 10). All questions were assessed on a four-point scoring scale from 0 to 3 points. In question 1, the respondents could choose the following options: up to 7 micturations (0 points), 8-9 micturations (1 point), 10-14 micturations (2 points) and 15 or more micturations (3 points). In question 2, the possible options were: no night micturition (0 points), 1 micturition (1 point), 2-3 micturations (2 points), 4 or more micturations (3 points). In the remaining 8 questions the possible choices were: "no" (0 points), "rarely" (1 point), "sometimes" (2 points) and "often" (3 points). The overall score of the fully completed CLSS questionnaire gave results ranging from 0 to 30 points, where "0" meant the absence of any LUTS symptoms. The questionnaire was closed with question 11 concerning the subjective assessment of the degree of acceptance of the examined woman of the condition of her lower urinary tract. There were 7 possible answers to choose from: "I would be delighted" (0 points), "I would be glad" (1 point), "I would be satisfied" (2 points), "I would have mixed feelings" (3 points), "I would be mostly dissatisfied" (4 points), "I would be unhappy" (5 points) and "I would feel terrible" (6 points).

Statistical analysis

Statistical analysis of the results concerned the characteristics of the study participants (mean and standard deviation). The frequency of LUTS was presented both, numerically and in a percentage from, in the group of female ice hockey players and the control group consisting of women practicing other team sports. The number of LUTS symptoms and their intensity were presented using the arithmetic mean, standard deviation and 95% CI. Prior to intergroup comparisons, the distributions of numerical parameters were analyzed using the Kolmogorov-Smirnov test. In the situation when these distributions did not differ significantly from the normal distribution, the t test for independent samples was used, and in the case of significant differences from the normal distribution, the Mann-Whitney test was used [48,49]. The significance of differences in the number of LUTS symptoms was calculated using the Chi² test. The critical level of statistical significance was assumed to be $p < 0.05$.

RESULTS

Of the 49 female hockey players, 6 players (12.25%) did not indicate the presence of any of the lower urinary tract symptoms. The highest percentage of 12 female hockey players indicated the presence of only 1 symptom (24.49%). The maximum number of symptoms (10) included in the CLSS questionnaire was indicated by only 1 player (2.04%). In the control group, 8 players had no LUTS (16.33%), and of the remaining 41 women in this group, 10 players (20.41%) indicated most frequently the presence of 3 or 5 symptoms. Similarly to the group of female hockey players, only 1 person from this

group (2.04%) indicated the presence of a maximum of 10 LUTS. In the control group, there was a higher prevalence of LUTS, but this was not statistically confirmed (Table 2).

The level of intensity of lower urinary tract symptoms in both groups was at similar stage except from urethral pain. That symptom was statistically higher in the control group ($p < 0.001$). The overall CLSS score was higher in the control group, too but the differences recorded were not statistically significant (Table 3).

Figure 1 shows the percentage distribution of LUTS symptoms. Female hockey players most frequently indicated the presence of urgency symptom (48.98%), increased number of daily micturitions (40.82%), incomplete bladder emptying (38.77%) and slow urinary stream (36.74%) (fig. 1). Most often, however, these symptoms were infrequent, with a moderate severity of incomplete bladder emptying indicated by nine female hockey players (18.37%). Five players indicated a similar severity of slow urinary stream symptoms (10.2%).

In this group of subjects, the maximum severity of symptom rated at 3 points was only relevant for 3 subjects (6.12%) with daily micturitions occurring at least 15 times. Women from the control group most frequently reported symptoms of incomplete bladder emptying (59.18%), slow urinary stream (48.98%), increased number of daily micturitions (46.94%), and urgency (44.90%). Also among the female athletes in the control group, mild severity of the symptoms predominated, as only 2 athletes indicated a frequent (3 points) occurrence of incomplete bladder emptying (4.08%) and 2 - a maximum frequency of slow urinary stream symptom (4.08%). A total of 10 female hockey players indicated the presence of incontinence symptoms, of which 2 (4.08%) had urgency incontinence symptoms and 8 (16.33%) had stress incontinence symptoms.

Table 2. The number of symptoms and the level of acceptance (points) of the condition of the lower urinary tract in hockey and control groups.

Parameters	Hockey group mean (SD), 95% CI	Control group mean (SD), 95% CI	p
No. of Symptoms	2.84 (2.4), 2.15-3.53	3.59 (2.5), 2.88-4.3	0.128 ^a
The level of acceptance of the condition of CLSS	1.02 (1.2), 0.68-1.37	1.29 (1.4), 0.87-1.7	0.328 ^a

^a t-test

Table 3. Lower urinary tract symptoms intensity level and general CLSS score in hockey and control groups.

Symptom	Hockey group mean (SD), 95% CI	Control group mean (SD), 95% CI	p
Daytime frequency	0.65 (0.9), 0.39-0.92	0.65 (0.8), 0.43-0.88	1.000 ^c
Nocturia	0.39 (0.6), 0.21-0.56	0.47 (0.6), 0.3-0.64	0.498 ^a
Urgency	0.55 (0.6), 0.38-0.73	0.53 (0.7), 0.33-0.73	0.876 ^a
Urge incontinence	0.06 (0.3), -0.03-0.15	0.12 (0.4), 0.01-0.23	0.395 ^a
Stress incontinence	0.18 (0.4), 0.06-0.31	0.14 (0.5), 0.01-0.27	0.654 ^a
Slow stream	0.47 (0.7), 0.27-0.67	0.65 (0.8), 0.42-0.88	0.225 ^a
Straining	0.25 (0.5), 0.11-0.38	0.35 (0.7), 0.15-0.55	0.693 ^b
Incomplete emptying	0.57 (0.8), 0.34-0.8	0.8 (0.8), 0.56-1.03	0.169 ^a
Bladder pain	0.41 (0.7), 0.21-0.6	0.51 (0.8), 0.29-0.73	0.486 ^a
Urethral pain	0.14 (0.4), 0.03-0.26	0.45 (0.7), 0.25-0.65	0.0085 ^b
CLSS Score	3.63 (3.5), 2.61-4.66	4.67 (3.9), 3.55-5.79	0.171 ^a

^a t-test; ^b U Mann-Whitney test

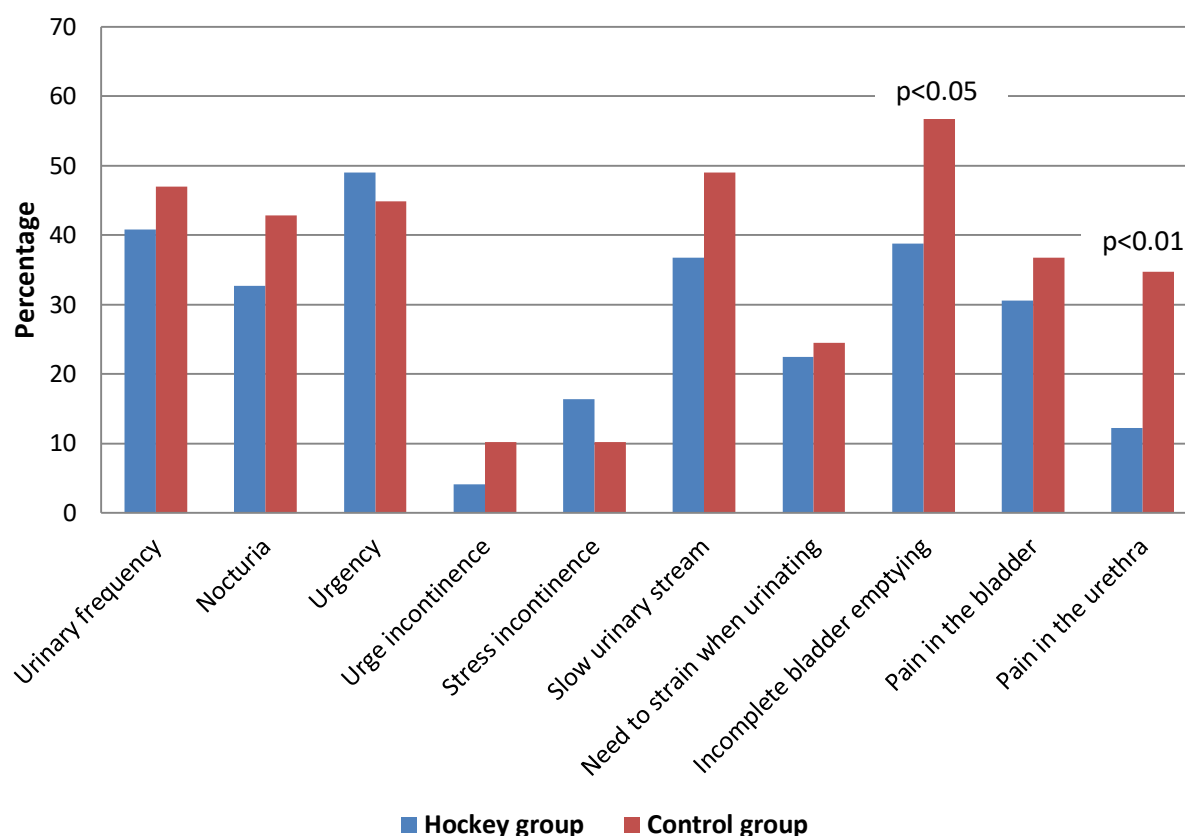


Figure 1. Occurrence of lower urinary tract symptoms according to the hockey and control groups.

These symptoms were rare, with only one athlete reporting occasional stress incontinence (2.04%). In the control group, also 10 women indicated the presence of incontinence symptoms, of which 5 (10.2%) had urgency incontinence symptoms and also 5 (10.2%) stress incontinence symptoms. Similarly to the female hockey players, these symptoms occurred sporadically, as only 1 woman indicated that she had symptoms of urgency incontinence sometimes, and a similar intensity of stress incontinence (sometimes) was indicated by 2 players (4.08%). The Chi test showed that the more frequent occurrence of symptoms of incomplete bladder emptying ($p=0.043$) and urethral pain ($p=0.0088$) in the control group was statistically significant.

DISCUSSION

Summarizing the results of the CLSS questionnaire, although fewer symptoms were found among female ice hockey players compared to women in the control group, these differences were not statistically significant (Table 2). Female ice hockey players in the vast majority of the cases, 87.8% of all female hockey players, expressed a positive opinion (delighted, pleased, mostly satisfied) on the current condition of their lower urinary tract. In the control group, the percentage of respondents similarly assessing the condition of their urinary tract was 81.63%. Negative well-being (6 points) related to the condition of the lower urinary tract was indicated by only 1 female competitive hockey player (2.04%) and 3 women (1 person - 4 points, and 2 persons - 6 points) from the control group. 95% CI of the level of acceptance of the condition of CLSS in the women ice hockey group was 0.68-1.37 and in the control group 0.87-1.7, and the differences found were not statistically significant (Table 2). Of the 10 symptoms assessed, only urethral pain was found to be more severe in women who played other team sports (Table 3).

Although the overall CLSS score was higher in the control group, the differences recorded were not statistically significant (Table 3).

In a review of the literature, few reports can be found on the prevalence of LUTS among female athletes, with most papers on lower urinary tract symptoms focusing primarily on incontinence symptoms. Only the study by Simeone et al. [42], assessing the prevalence of LUTS, included 19 female hockey players in a study population of 623 female athletes (279 competitive level and 39 professional). Unfortunately, the authors of this report performed a pooled analysis of the entire study population of women. LUTS in female hockey players are only mentioned twice. It was shown that these female hockey players most frequently had symptoms of dysuria just after the game (however, it was not stated in what percentage of the players these symptoms occurred) and that 8 players (42.1%) had symptoms of stress incontinence during training or the game. In the case of stress incontinence, the symptom consisted of a small urine loss once per week. In our study, eight female athletes also had symptoms of stress incontinence and, apart from one case, these symptoms were rare. However, given the significantly higher number of female athletes surveyed, this symptom occurred significantly less frequently (in 16.3%). Urinary problems described by Simeone et al. [42], defined very broadly as dysuria in our study included a broader group of symptoms, and in the cases of slow urinary stream and pain in the bladder, these symptoms were quite frequent (36.74% and 30.6%). Other reports that included female competitive ice hockey players analysed only the occurrence of incontinence symptoms [22,44,50,51]. The work of De Mattos Lourenco et al. [22] raises questions about the type of hockey practised. Although in their description of the methodology in terms of the type of activity, the authors differentiate between female field hockey and ice hockey players, categorising field hockey as medium-impact activity and ice hockey as high-impact activity, in the part of the report describing the results obtained, only female players in the medium-impact activity group were included, meaning that the incidence of incontinence in female ice hockey players was not analysed at all. Similar doubts are associated with the report by Rodríguez-López et al. [50]. Although a 43.5 percent incidence of UI in a group of 23 female ice hockey players appears in the results, it is completely unclear which sport is involved (field hockey?, ice hockey?) and whether the enigmatic term 'hockey' refers to women or men. As the research was carried out in and around the Spanish capital of Madrid, it can only be guessed that it is unlikely that the results were related to ice hockey players. Only two papers analysing the incidence of UI among female professional athletes explicitly mention ice hockey [44,51]. Selecka et al. [44] divided competitive sports by environmental determinants and volitional factors. Ice hockey, together with floorball, was included in the group of heuristic-collective sports with a hockey stick (group size n=51). These authors showed that there was no significant risk of SUI in this group of female athletes, as the coefficient for the relative development of SUI in female athletes in this group was only 0.63 (OR), where in the group of mobilisation-functional sports (cycling and running) the risk was more than double (OR=1.96) [44]. In a study by Whitney et al. [50], among 23 female ice hockey players, UI symptoms occurred in 13%. In our study, symptoms of stress urinary incontinence occurred in eight female ice hockey players (16.3%) and symptoms of urge incontinence in two female players (4.1%). Although a different measurement tool (CLSS) was used in our study, the results of our study regarding the prevalence of UI are largely consistent with the studies of the authors mentioned above.

In our study, female ice hockey players most frequently reported a problem with urgency (48.98%), increased daily micturition (40.82%), incomplete bladder emptying (38.77%), and slow urinary stream (36.74%). Women playing other team games were the most likely to report similar symptoms, but these were recorded in a slightly higher proportion of participants (incomplete bladder emptying - 59.18%, slow urinary stream - 48.98%, increased number of daily micturitions - 46.94% and urgency - 44.90%). In both study groups, these symptoms tended to be infrequent. In the case of incomplete bladder emptying, the more frequent occurrence of this symptom by 20.41% among female

volleyball, basketball, handball and football players was statistically significant. Urethral pain was also statistically significantly more frequent in the control group (34.69% vs. 12.25%) and the intensity of this symptom was also statistically significant in this study group. It is possible that the occurrence of these symptoms is related to each other. Incomplete bladder emptying and associated urinary retention is associated with urine thickening, which may lead to urethral irritation and result in urethral pain. It is also not known in what proportion urethral pain was the result of past inflammation of the urethra which may also be related to the nature of sporting combat (shared changing and sanitary rooms, heavy sweating and, in the case of football, weather conditions, etc.). It is interesting to note the rarer occurrence of the symptom of incomplete bladder emptying in female hockey players compared to players in other team sports. Perhaps this is related to the specific nature of the game of ice hockey. Frequent substitutions are a feature of the sport. With the exception of the goalkeepers, players are on the ice for several tens of seconds at a time. In case of an emergency, a female hockey player can go to the toilet without consequences for her and the team. A female footballer, for example, does not have this option. In addition, a period in ice hockey lasts according to the regulation 20 minutes (effectively about 25-30 minutes), whereas one half in football lasts at least 45 minutes. In other words, the symptom of incomplete bladder emptying can be linked to the development of a conscious reflex to withhold urine for a long period of time.

In our previous studies on the occurrence of LUTS symptoms in women professionally practicing road and cross-country cycling, we used a similar methodology using the CLSS questionnaire [52]. Compared to competitive cyclists, LUTS were less frequent (95% CI: 2.15-3.53 vs. 3.12-4.2) and less severe (95% CI of CLSS Score: 2.61-4.66 vs. 3.99-5.61) in female ice hockey players. Of the 10 symptoms assessed, only 3 cases showed a higher level of intensity in female hockey players (urgency, slow stream and straining). The biggest difference was in the level of intensity of stress incontinence symptoms, which was higher in competitive female cyclists (95% CI: 0.06-0.31 vs. 0.61-1.03) [52].

The CLSS questionnaire that we used in this study has a simple structure, is clear and contains specific questions that allow us to assess the frequency of LUTS. Like any psychometric tool of this type, it is burdened with a significant degree of subjectivity in the assessment of one's own health condition. In this matter, two mechanisms of approach to self-assessment of one's health condition are likely: either it is underestimated with a tendency to deny to oneself the occurrence of obvious worrying symptoms, or it is overestimated, and any even minimal discomfort grows into a significant health problem. It seems that in the case of young women practicing sports, we may be dealing with the first mechanism. This may be supported by the results of studies conducted among amateur and professional volleyball players [53]. Among these women, both surveys and the pad test were conducted. These studies revealed a greater consistency of survey results among professional volleyball players than among amateurs [53]. In other studies, comparing the subjective assessment of UI occurrence with the pad test performed during sports activity, a rather interesting discrepancy in results was obtained. In the survey study 52% of women indicated the occurrence of UI symptoms, while in the pad test such symptoms were found in 43.7% of female athletes [54]. On the other hand, another result obtained in these studies speaks in favor of downplaying the occurrence of LUTS symptoms. It revealed that in 24% of women practicing sports professionally, who in the survey studies indicated no UI symptoms, in the pad test during sports activity the urine leakage was found [52]. The results of both studies indicate the presence of a certain discrepancy between the subjective feeling of UI symptoms and their actual degree of intensity. However, it should also be noted that the range of symptoms assessed in the case of these studies was undoubtedly larger, and in the case of many of them, objective methods of their assessment have not been developed thus far. Nevertheless, the fact that there is some discrepancy between the subjective and objective assessment suggests caution in drawing far-reaching conclusions regarding the occurrence of LUTS symptoms

in female competitive ice hockey players. In future studies, in the context of female competitive ice hockey, it would also be worthwhile to include assessment and other pelvic floor-related functions. However, on the basis of this study, it can be concluded that playing competitive ice hockey by women is not at risk of more frequent and more severe lower urinary tract symptoms compared to women playing other team sports.

CONCLUSIONS

In the studied group of women professionally practicing ice hockey, no greater number of LUTS symptoms was observed compared to women practicing other team sports. Ice hockey players most frequently reported symptoms of urgency (48.98%), increased number of daily micturitions (40.82%) and a feeling of incomplete emptying of the bladder (38.77%). In vast majority of cases, these symptoms occur rarely. The degree of severity of LUTS symptoms in the studied group of hockey players did not differ significantly from the degree of their severity in the group of other sportswomen studied.

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