Health Scope. 2025 August; 14(3): e160469 https://doi.org/10.5812/healthscope-160469

Published Online: 2025 June 11 **Research Article**

The Relationship Between Eating Habits and Pollakiuria in Pediatrics

Zahra Kiani-Golshoori [1], Seyed Mojtaba Hashemi [2], Parsa Yousefichaijan [1], Pegah Mohaghegh [3], Fatemeh Azizi-Soleiman [4, *]

[1] Amirkabir Hospital, Arak University of Medical Sciences, Arak, Iran
[2] Department of Pediatrics, Arak University of Medical Sciences, Arak, Iran
[3] Community and Preventive Medicine Specialist, Faculty of Medicine, Arak University of Medical Sciences, Arak, Iran
[4] Department of Nutrition, School of Health, Arak University of Medical Sciences, Arak, Iran

[*] ***Corresponding Author:*** Department of Nutrition, School of Health, Arak University of Medical Sciences, Arak, Iran. Email: fatemehazizi87@gmail.com

Received: 23 February, 2025; **Revised:** 7 May, 2025; **Accepted:** 25 May, 2025

Abstract

Background: Pollakiuria is a lower urinary tract symptom (LUTS) characterized by frequent daytime urination in children without an identifiable cause.

Objectives: The aim of this case-control study was to investigate the relationship between eating habits and the incidence of pollakiuria in children.

Methods: The demographic features of 64 children aged 5 - 7 years affected with pollakiuria were gathered using a questionnaire and compared with the data of 64 healthy controls. Dietary data of children were collected using a validated food frequency questionnaire (FFQ). Logistic regression was employed to calculate the odds ratio (OR) of pollakiuria related to the frequency of consumption of meat, dairy products, vegetables, caffeine, and salt.

Results: There were no differences between the two groups in terms of age, gender, and body mass index (BMI). Among various food categories, children with pollakiuria consumed salt ($P = 0.003$) and caffeine ($P < 0.001$) more frequently than healthy children. Regarding the relationship between pollakiuria development and the consumption of certain foods, a statistically significant relationship was found only for salt ($OR = 1.24$; $P = 0.002$) and caffeine ($OR = 1.038$; $P < 0.001$).

Conclusions: According to the findings of this study, restricting the use of salt and caffeine may be effective in reducing the risk of pollakiuria in children. It seems necessary to conduct more studies to assess the role of other dietary habits, as well as confounding factors such as blood pressure, fluid consumption, exposure to tobacco smoking, and physical activity, in the development of pollakiuria.

Keywords: Lower Urinary Tract Symptoms, Children, Food Habits

1. Background

Lower urinary tract symptoms (LUTS) refer to a general term encompassing a full spectrum of urinary problems, including urinary retention and voiding, as well as post-micturition symptoms. This condition profoundly affects some aspects of the quality of life of patients, including social and emotional wellness (1) Among various types of LUTS, pollakiuria and nocturnal enuresis have been noted as some of the most exasperating symptoms (2). Pollakiuria is a type of bladder dysfunction, which in toilet-trained children is defined as excessive daytime urination in the absence of polydipsia, diabetes mellitus, nephrogenic diabetes insipidus, daytime polyuria, urinary tract infections (UTI), or viral syndrome. During the daytime, there is a daily voiding frequency of at least once per hour, and the average volume of voided expected bladder capacity (EBC) is usually 15 - 20% (3). It has been suggested that urinary incontinence problems can be associated with lifestyle-related diseases, such as cardiovascular disease, diabetes mellitus, renal dysfunction, lower urinary tract obstruction, and primary sleep disorders (4-6). Therefore, most patients are advised to modify their daily behaviors, such as reducing the consumption of fluids, caffeinated products, and alcohol (7).

How to Cite: Kiani-Golshoori Z, Hashemi S M, Yousefichaijan P, Mohaghegh P, Azizi-Soleiman F. The Relationship Between Eating Habits and Pollakiuria in Pediatrics. Health Scope. 2025; 14 (3): e160469. https://doi.org/10.5812/healthscope-160469.

A case-control study of non-pregnant women aged ≥ 20 years found an association between urinary incontinence and the consumption of caffeinated, carbonated beverages, citrus fruits, and acidic foods in the period 2007 - 2020 (8). Xie et al.'s study demonstrated that a diet resembling the Mediterranean diet — characterized by a high intake of vegetables, fruits, legumes, and nuts, a moderate intake of fish, and a low intake of dairy products and meat — is linked to reduced urinary urgency and mixed urinary incontinence in women (9). Another population-based study on 2060 women also demonstrated that receiving more calories predicted a higher risk of urinary incontinence and its severity (10). Although urinary incontinence did not correlate with carbohydrate, protein, or fat intake, the saturated/unsaturated fat ratio was positively associated with incontinence. These observations suggest that modifying the diet, as a restrained intervention, can be useful to these patients.

Research evidence is scarce on the relationship between pollakiuria and diet. Moreover, existing data on the relationship between diet and LUTS have been mainly derived from observational studies. Owing to the fact that diet is an easily modifiable element and is often recommended by healthcare professionals as part of a LUTS management program, more high-quality evidence is needed to achieve a better and more comprehensive understanding of the impact of diet on pollakiuria.

2. Objectives

The aim of the present study was to investigate the relationship between the consumption of certain foods, salt, and caffeine and pediatric pollakiuria in comparison with a healthy control group.

3. Methods

3.1. Study Design, Population, and Location

The present research was a matched case-control study conducted on 5- to 7-year-old children referred to a pediatric medical center at Amirkabir Hospital, Arak City, from April 2022 to October 2022. The sample size was calculated using STATA version 11 with the following assumptions: $\alpha = 0.05$, power = 0.8, $P1 = 0.163$, and $P2 = 0.4$ (11). The diagnosis of pollakiuria in children was confirmed by a pediatric nephrologist based on the following definition: A significant urinary frequency of more than eight times a day, distraction that relieves symptoms, disappearance of symptoms during sleep, absence of dysuria or fever, and unremarkable routine urine tests and ultrasound results of the urinary tract (12). Exclusion criteria included the detection of other renal and urinary disorders, as well as urinary tract infections (UTIs). The hospital control group consisted of age- and sex-matched children (frequency matching) referred to the same hospital within the same period. The control group was randomly selected from children with no symptoms of pollakiuria. This study was approved by the Ethics Committee of Arak University of Medical Sciences (IR.ARAKMU.REC.1400.331).

3.2. Data Collection Methods

Written informed consent was obtained from the children's parents or guardians. A questionnaire was completed for each patient by a trained physician during outpatient visits to collect demographic data (age, sex, and history of urinary incontinence). With light clothing and without shoes, body weight was measured on a scale to the nearest 0.1 kg. Using a measuring tape, height was taken without shoes and recorded to the nearest 0.1 cm. The body mass index (BMI) was calculated by dividing weight (kg) by height squared. Subsequently, the BMI was converted to Z scores using Iranian reference data (13).

A valid and reliable 168-item food frequency questionnaire (FFQ) was then completed by one of the children's parents with the help of a resident physician. The reliability and validity of the FFQ have been established previously (14). This questionnaire was used to evaluate whether children consumed food items on a daily, weekly, monthly, or yearly basis. Only the consumption of meats, dairy products, vegetables, and caffeinated products was investigated. Parents were asked to specify how often their children consumed each food item over the past year, using the learned serving sizes as a reference. The data were then analyzed by Nutritionist IV software (N Squared Computing, California, USA). Salt intake was determined through an analysis of the FFQ and the average salt consumption of each individual, calculated by dividing the monthly family consumption by the number of family members.

3.3. Data Analysis Methods

Using SPSS software (Version 26; IBM, Chicago), data analysis was performed by applying central tendency and dispersion indices for data presentation. The χ^2 test was employed to compare categorical data, while the independent *t*-test was utilized for between-group comparisons of quantitative data with a normal distribution. Using conditional logistic regression, the odds ratio (OR) and 95% confidence intervals (CI) for pollakiuria were calculated regarding the frequency of

consumption of meat, dairy products, vegetables, caffeine, and salt.

4. Results

Sixty-four children with pollakiuria and 64 healthy matched controls were enrolled in the study. All variables exhibited a normal distribution. The comparison of gender, age, and BMI did not reveal any significant difference between the case and control groups (Table 1). Table 2 displays the average frequency of consumption of selected food items, including meat, dairy products, vegetables, caffeinated products, and salt, in each group of participants and their association with pollakiuria. Among these food categories, the consumption of only salt ($P = 0.003$) and caffeine ($P < 0.001$) was more frequent among children with pollakiuria than their control peers. Regarding the relationship between the consumption of food items and the development of pollakiuria (Table 2), the likelihood of this disorder was significantly associated with the consumption of salt (OR = 1.24; $P = 0.002$) and caffeine (OR = 1.038; $P < 0.001$).

5. Discussion

It is assumed that environmental factors, including diet, are linked with the development of LUTS in children. In this study, we investigated the potential relationship between consuming certain food items and the development of pediatric pollakiuria. Our findings disclosed that the frequent consumption of salt and caffeine could increase the risk of pollakiuria in children. Based on our knowledge, we found scarce articles that examined the relationship between diet and LUTS in children; therefore, the results are mostly compared with existing studies conducted in adults.

In a study by Matsuo et al. on 728 adult patients with LUTS in Japan, it was specified that the excessive consumption of salt on a daily basis adversely affected pollakiuria and nocturnal enuresis (15). In another study on 1545 men aged 30 - 79 years, sodium intake was directly associated with LUTS and the storage symptom score (16). Ozaki et al. reported that daily salt intake (≥ 10 g/day) in Japanese women was independently associated with urine urgency (17). Prolonged consumption of salt, via activating the renin-angiotensin system in the kidney, triggers cellular dehydration and increases osmotic pressure, leading to polyuria. Excessive sodium intake also elevates blood pressure and increases CNS activity (18) which accelerates oxidative stress and bladder hypersensitivity (19). A study by Tsuji et al. showed that a high daily salt intake significantly decreased the effectiveness of 1-desamino-8-D-arginine vasopressin therapy in children with nocturnal enuresis (20). The authors proposed that reducing salt intake should be regarded as a strategy to enhance treatment effectiveness.

In the present study, more caffeine consumption was observed to increase the odds of developing pollakiuria. Consuming caffeine before bedtime has been identified as a significant factor linked to nocturnal enuresis in Ethiopian children aged 5 to 14 years (21). In men with hyperactive bladder, caffeine consumption at a dose of 4.5 mg/kg was reported to be a diuretic, reducing the bladder fullness threshold while increasing the speed of urinary flow (22). A systematic review declared that lower caffeine intake was positively associated with the symptoms of urinary urgency, urinary incontinence, and enuresis, (23)which was attributed to the stimulatory effects of caffeine on the detrusor muscle (24). A randomized clinical trial in children aged 6 - 15 years, comparing a caffeine-restricted group (< 30 mg/day) to a control group (80 - 110 mg/day), showed a significant reduction in bed-wetting frequency after one month in the intervention group (25).

In our study, no association was observed between the risk of pollakiuria and the consumption of dairy products. In line with this notion, Tabara et al., in a cross-sectional study, negated a link between the regular consumption of dairy products and polyuria (26). In another study, Chen et al. reported a positive correlation between the frequency of consuming milk and dairy products and the IPSS (27). Altogether, more studies are needed to verify the relationship between pollakiuria and the intake of dairy products.

We found no relationship between the consumption of vegetables and pollakiuria. It has been shown that the relative risk of LUTS in men is significantly reduced by the daily consumption of fresh vegetables (28). In a prospective cohort study on 785 patients, more frequent consumption of vegetables was reported to be protective against nocturnal enuresis (29). The positive impact of consuming vegetables on urinary problems has also been proven in other studies (11, 30). It seems that the antioxidant phytochemical constituents of vegetables can have preventive or therapeutic effects on diseases associated with LUTS (31). However, this protective effect seems to be dependent on the regular consumption of vegetables. The absence of such a relationship in our study may be attributed to the low vegetable consumption among Iranian children (32). According to Ziaei's study, only 23% of students meet the recommended vegetable intake (≥ 3 times/day), which aligns with our findings (32).

Table 1. Baseline Characteristics of the Pollakiuria Group and the Control Group [a]

Variables	Pollakiuria Group	Control Group	P-Value [b]
Age (y)	6.09 ± 0.88	6.16 ± 0.86	0.686
Gender			0.879
Male	33 (51.6)	30 (46.9)	
Female	31 (48.4)	34 (53.1)	
Height (cm)	87.52 ± 6.94	87.95 ± 7.22	0.860
Weight (kg)	19.05 ± 1.60	18.91 ± 1.63	0.556
BMI Z-score	2.27 ± 0.71	2.69 ± 0.53	0.963

Abbreviation: BMI, Body Mass Index.

[a] Values are expressed as mean ± SD or No. (%).

[b] P-value by independent *t*-test or χ^2.

Table 2. Odds Ratios and 95% Confidence Intervals for Pollakiuria in Relation to Dietary Intake Habits in Children [a]

Variables	Pollakiuria Group	Control Group	P-Value [b]	OR (95% CI)	P-Value [c]
Meats (serving/d)	1.27 ± 0.31	1.19 ± 0.30	0.115	2.38 (1.46,4.53)	0.142
Dairy products (serving/d)	0.48 ± 0.19	0.52 ± 0.26	0.838	0.520 (0.10,1.48)	0.398
Vegetables (serving/d)	1.07 ± 0.36	0.95 ± 0.42	0.067	2.28 (1.77,4.35)	0.074
Caffeine (mg/d)	45.75 ± 25.42	26.61 ± 21.35	< 0.001	1.038 (1.02,1.06)	< 0.001
Salt (g/d)	5.29 ± 3.71	3.40 ± 2.28	0.003	1.24 (1.00,1.17)	0.002

Abbreviation: OR, odds ratio.

[a] Values are expressed as mean ± SD or No. (%).

[b] P-value by independent *t*-test.

[c] P-value by logistic regression, adjusted for body weight.

To the best of our knowledge, the present research was the first case-control study investigating the relationship between dietary factors and pediatric pollakiuria. However, our study has some limitations. Our results might have been affected by the small sample size and the errors pertaining to the FFQ. Additionally, due to the lack of comparable studies in children, there may be confounding factors that were not accounted for in our study.

5.1. Conclusions

Based on the findings of the present study, restricting the use of salt and caffeine may be effective in reducing the odds of pollakiuria in children. There is a need to conduct more studies to assess the impact of other dietary factors and adjust for the effects of confounding factors, such as blood pressure, fluid intake, and physical activity.

Acknowledgements

The present study was extracted from a thesis in general medicine, approved by the Arak University of Medical Sciences. We want to express our gratitude to everyone who took part in the study.

Footnotes

Authors' Contribution: Z. K. G. conceived and designed the evaluation and drafted the manuscript. P. M. participated in designing the evaluation, performed parts of the statistical analysis and helped to draft the manuscript. P. Y. C. re-evaluated the clinical data, revised the manuscript and performed the statistical analysis and revised the manuscript. S. M. H. collected the clinical data, interpreted them and revised the manuscript. F. A. S. re-analyzed the clinical and statistical data and revised the manuscript. All authors read and approved the final manuscript.

Conflict of Interests Statement: The authors declared no conflict of interests.

Data Availability: The dataset presented in the study is available on request from the corresponding author during submission or after publication.

Ethical Approval: This study was approved by the Ethics Committee of Arak University of Medical Sciences (IR.ARAKMU.REC.1400.331).

Funding/Support: The Arak University of Medical Sciences provided funding for the research (grant number: 6516).

Informed Consent: Written informed consent was obtained from the children's parents or guardians.

References

1. Yoshimura K. Correlates for nocturia: a review of epidemiological studies. *Int J Urol*. 2012;**19**(4):317-29. [PubMed ID: 22239551]. https://doi.org/10.1111/j.1442-2042.2011.02956.x.
2. Chang TL, Kuo HC. Nocturia, nocturnal polyuria, and nocturnal enuresis in adults: What we know and what we do not know. *Tzu Chi Med J*. 2024;**36**(4):370-6. [PubMed ID: 39421492]. [PubMed Central ID: PMC11483088]. https://doi.org/10.4103/tcmj.tcmj_53_24.
3. Austin PF, Bauer SB, Bower W, Chase J, Franco I, Hoebeke P, et al. The standardization of terminology of lower urinary tract function in children and adolescents: Update report from the standardization committee of the International Children's Continence Society. *Neurourol Urodyn*. 2016;**35**(4):471-81. [PubMed ID: 25772695]. https://doi.org/10.1002/nau.22751.
4. John G. Urinary incontinence and cardiovascular disease: a narrative review. *Int Urogynecol J*. 2020;**31**(5):857-63. [PubMed ID: 31350566]. https://doi.org/10.1007/s00192-019-04058-w.
5. Chen J, Liu Z, Yang L, Zhou J, Ma K, Peng Z, et al. Sleep-related disorders and lower urinary tract symptoms in middle-aged and elderly males: a cross-sectional study based on NHANES 2005-2008. *Sleep Breath*. 2024;**28**(1):359-70. [PubMed ID: 37775620]. https://doi.org/10.1007/s11325-023-02927-9.
6. Li S, Zou J, Wang Z, Wang M, Yuan Y, Lv H. Correlation Between Insulin Resistance and Urinary Incontinence in Female Patients with Type 2 Diabetes Mellitus. *Int Urogynecol J*. 2024;**35**(2):431-40. [PubMed ID: 38189852]. https://doi.org/10.1007/s00192-023-05715-x.
7. Gormley EA, Lightner DJ, Burgio KL, Chai TC, Clemens JQ, Culkin DJ, et al. Diagnosis and treatment of overactive bladder (non-neurogenic) in adults: AUA/SUFU guideline. *J Urol*. 2012;**188**(6 Suppl):2455-63. [PubMed ID: 23098785]. https://doi.org/10.1016/j.juro.2012.09.079.
8. Ha B, Yanek LR, Harrington BJ, Blomquist JL, Chen CCG, Patterson D, et al. Purported Bladder Irritant Intake in Women With Urgency Urinary Incontinence. *Urogynecology (Phila)*. 2025;**31**(4):352-60. [PubMed ID: 39841448]. https://doi.org/10.1097/SPV.0000000000001652.
9. Xie S, Li Z, Yao Q, Zhang Y, Ou Y. Adherence to Mediterranean diet and female urinary incontinence: Evidence from the NHANES database. *PLoS One*. 2024;**19**(10). e0311771. [PubMed ID: 39436928]. [PubMed Central ID: PMC11495614]. https://doi.org/10.1371/journal.pone.0311771.
10. Maserejian NN, Giovannucci EL, McVary KT, McGrother C, McKinlay JB. Dietary macronutrient and energy intake and urinary incontinence in women. *Am J Epidemiol*. 2010;**171**(10):1116-25. [PubMed ID: 20421220]. [PubMed Central ID: PMC2877472]. https://doi.org/10.1093/aje/kwq065.
11. Dallosso HM, McGrother CW, Matthews RJ, Donaldson MM, Leicestershire MSG. The association of diet and other lifestyle factors with overactive bladder and stress incontinence: a longitudinal study in women. *BJU Int*. 2003;**92**(1):69-77. [PubMed ID: 12823386]. https://doi.org/10.1046/j.1464-410x.2003.04271.x.
12. Neveus T, von Gontard A, Hoebeke P, Hjalmas K, Bauer S, Bower W, et al. The standardization of terminology of lower urinary tract function in children and adolescents: report from the Standardisation Committee of the International Children's Continence Society. *J Urol*. 2006;**176**(1):314-24. [PubMed ID: 16753432]. https://doi.org/10.1016/S0022-5347(06)00305-3.
13. Mansourian M, Marateb HR, Kelishadi R, Motlagh ME, Aminaee T, Taslimi M, et al. First growth curves based on the World Health Organization reference in a Nationally-Representative Sample of Pediatric Population in the Middle East and North Africa (MENA): the CASPIAN-III study. *BMC Pediatr*. 2012;**12**:149. [PubMed ID: 22985219]. [PubMed Central ID: PMC3471000]. https://doi.org/10.1186/1471-2431-12-149.
14. Esfahani FH, Asghari G, Mirmiran P, Azizi F. Reproducibility and relative validity of food group intake in a food frequency questionnaire developed for the Tehran Lipid and Glucose Study. *J Epidemiol*. 2010;**20**(2):150-8. [PubMed ID: 20154450]. [PubMed Central ID: PMC3900814]. https://doi.org/10.2188/jea.je20090083.
15. Matsuo T, Miyata Y, Sakai H. Daily salt intake is an independent risk factor for pollakiuria and nocturia. *Int J Urol*. 2017;**24**(5):384-9. [PubMed ID: 28295650]. https://doi.org/10.1111/iju.13321.
16. Maserejian NN, Giovannucci EL, McKinlay JB. Dietary macronutrients, cholesterol, and sodium and lower urinary tract symptoms in men. *Eur Urol*. 2009;**55**(5):1179-89. [PubMed ID: 18692303]. [PubMed Central ID: PMC2735823]. https://doi.org/10.1016/j.eururo.2008.07.058.
17. Ozaki Y, Okamoto T, Miura Y, Iida K, Uemura N, Sugimura Y, et al. Association between female urinary urgency and aponeurotic ptosis: Results from a community-based cross-sectional study in Japan. *Neurourol Urodyn*. 2021;**40**(6):1678-85. [PubMed ID: 34174106]. https://doi.org/10.1002/nau.24736.
18. Qian Q. Salt, water and nephron: Mechanisms of action and link to hypertension and chronic kidney disease. *Nephrology (Carlton)*. 2018;**23 Suppl 4**(Suppl Suppl 4):44-9. [PubMed ID: 30298656]. [PubMed Central ID: PMC6221012]. https://doi.org/10.1111/nep.13465.
19. Andersson KE, Nomiya M, Yamaguchi O. Chronic Pelvic Ischemia: Contribution to the Pathogenesis of Lower Urinary Tract Symptoms (LUTS): A New Target for Pharmacological Treatment? *Low Urin Tract Symptoms*. 2015;**7**(1):1-8. [PubMed ID: 26663644]. https://doi.org/10.1111/luts.12084.
20. Tsuji S, Yamaguchi T, Akagawa Y, Akagawa S, Kino J, Yamanouchi S, et al. High daily salt intake had a negative impact on how well nocturnal enuresis treatment worked on children aged 7-10 years. *Acta Paediatr*. 2020;**109**(1):193-7. [PubMed ID: 31254367]. https://doi.org/10.1111/apa.14922.
21. Assimamaw NT, Kebede AK, Bazezew Genetu K. Effects of sex, toilet training, stress, and caffeine on nocturnal enuresis among school children in Gondar Town, the metropolitan city of Ethiopia: a community-based study in 2023. *Front Pediatr*. 2024;**12**:1366430. [PubMed ID: 38915871]. [PubMed Central ID: PMC11194331]. https://doi.org/10.3389/fped.2024.1366430.
22. Lohsiriwat S, Hirunsai M, Chaiyaprasithi B. Effect of caffeine on bladder function in patients with overactive bladder symptoms. *Urol Ann*. 2011;**3**(1):14-8. [PubMed ID: 21346827]. [PubMed Central ID: PMC3036994]. https://doi.org/10.4103/0974-7796.75862.
23. Park J, Lee H, Kim Y, Norton C, Woodward S, Lee S. Effectiveness of Fluid and Caffeine Modifications on Symptoms in Adults With Overactive Bladder: A Systematic Review. *Int Neurourol J*. 2023;**27**(1):23-35. [PubMed ID: 37015722]. [PubMed Central ID: PMC10073005]. https://doi.org/10.5213/inj.2346014.007.

24. Kershen R, Mann-Gow T, Yared J, Stromberg I, Zvara P. Caffeine ingestion causes detrusor overactivity and afferent nerve excitation in mice. *J Urol*. 2012;**188**(5):1986-92. [PubMed ID: 22999550]. https://doi.org/10.1016/j.juro.2012.07.010.
25. Rezakhaniha S, Rezakhaniha B, Siroosbakht S. Limited caffeine consumption as first-line treatment in managing primary monosymptomatic enuresis in children: how effective is it? A randomised clinical trial. *BMJ Paediatr Open*. 2023;**7**(1). [PubMed ID: 37072339]. [PubMed Central ID: PMC10124248]. https://doi.org/10.1136/bmjpo-2023-001899.
26. Tabara Y, Matsumoto T, Murase K, Setoh K, Kawaguchi T, Nagashima S, et al. Lifestyle habits associated with nocturnal urination frequency: The Nagahama study. *Neurourol Urodyn*. 2019;**38**(8):2359-67. [PubMed ID: 31486144]. https://doi.org/10.1002/nau.24156.
27. Chen Y, Yu W, Zhou L, Wu S, Yang Y, Wang J, et al. Relationship among diet habit and lower urinary tract symptoms and sexual function in outpatient-based males with LUTS/BPH: a multiregional and cross-sectional study in China. *BMJ Open*. 2016;**6**(8). e010863. [PubMed ID: 27580828]. [PubMed Central ID: PMC5013377]. https://doi.org/10.1136/bmjopen-2015-010863.
28. Koskimaki J, Hakama M, Huhtala H, Tammela TL. Association of dietary elements and lower urinary tract symptoms. *Scand J Urol Nephrol*. 2000;**34**(1):46-50. [PubMed ID: 10757270]. https://doi.org/10.1080/003655900750016887.
29. Furukawa S, Sakai T, Niiya T, Miyaoka H, Miyake T, Yamamoto S, et al. Dietary intake habits and the prevalence of nocturia in Japanese patients with type 2 diabetes mellitus. *J Diabetes Investig*. 2018;**9**(2):279-85. [PubMed ID: 28667795]. [PubMed Central ID: PMC5835452]. https://doi.org/10.1111/jdi.12709.
30. Liu ZM, Wong CKM, Chan D, Tse LA, Yip B, Wong SY. Fruit and Vegetable Intake in Relation to Lower Urinary Tract Symptoms and Erectile Dysfunction Among Southern Chinese Elderly Men: A 4-Year Prospective Study of Mr OS Hong Kong. *Med (Baltimore)*. 2016;**95**(4). e2557. [PubMed ID: 26825896]. [PubMed Central ID: PMC5291566]. https://doi.org/10.1097/MD.0000000000002557.
31. Alwis US, Monaghan TF, Haddad R, Weiss JP, Roggeman S, Van Laecke E, et al. Dietary considerations in the evaluation and management of nocturia. *F1000Res*. 2020;**9**. [PubMed ID: 32185022]. [PubMed Central ID: PMC7059782]. https://doi.org/10.12688/f1000research.21466.1.
32. Ziaei R, Shahi H, Dastgiri S, Mohammadi R, Viitasara E. Fruit and vegetable intake and its correlates among high-school adolescents in Iran: a cross-sectional study. *J Public Health*. 2019;**28**(6):711-8. https://doi.org/10.1007/s10389-019-01084-2.