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# Evaluating Family Physicians' Knowledge of Urinary Tract Infection in Southern Iran: Scale Development

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**Purpose:** Urinary tract infections (UTIs) often present with nonspecific symptoms in childhood and can result in serious complications. Therefore, it is imperative for the proper diagnosis, treatment, and follow-up of this affliction. We first designed a valid and reliable questionnaire. Subsequently, the study evaluated the knowledge of family physicians regarding pediatric UTI.
**Materials and Methods:** A questionnaire was designed to evaluate the family physicians' knowledge of pediatric UTIs. The face and content validity and reliability of the questionnaire were first evaluated in a pilot study. Subsequently, doctors were asked to complete the questionnaire and data-collecting form delivered at their workplace.
**Results:** The validity and reliability of the questionnaire were deemed acceptable after omitting two questions. Cronbach's alpha of the final questionnaire was 0.71. More than 75% of the participants answered each question correctly. Approximately 50% of the physicians were post-graduates. Age was determined to be negatively correlated, and the "number of years of graduation" was positively correlated with the total score of the questionnaire.
**Conclusions:** The designed questionnaire had acceptable validity and reliability. Moreover, family physicians' knowledge of pediatric UTIs was found to be favorable.

**Keywords:** Family physician; Urinary tract infections; Knowledge

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## INTRODUCTION

Pediatric urinary tract infection (UTI) is an important community health problem that causes a significant burden for healthcare providers [1]. The prevalence of UTIs in children varies based on age, sex, race, hygiene management, cultural beliefs, and circumcision. The rate of UTI is higher in the first year of life [1,2]. Overall, the childhood occurrence of this affliction is reported to be about 1-3% in girls and 1% in boys [3].

Due to its potential complications, childhood UTI needs an accurate and early diagnosis [3] to determine the appropriate treatment and prevent long-term complications such as renal scarring, hypertension, and end-stage renal disease [1].

In a 2015 study in North America, Schmidt and Copp [1] showed that UTIs impose substantial costs on the healthcare system and require early diagnosis and treatment to prevent secondary complications. Zorc et al. [4] conducted a study in the United States in 2005 to diagnose and treat pediatric

UTIs and concluded that UTIs could have long-term complications.

Due to the adverse effects that pyelonephritis can have on kidney functions, some patients with febrile UTI need follow-up imaging studies such as urinary tract ultrasound and VCUG (voiding cystourethrography) to prevent severe damage to the kidneys [3]. A study in Ethiopia reported that 31.7% of all children referred to a tertiary center presented with signs and symptoms of UTI, and 8.5% had a positive urine culture [5].

UTI is the second most common cause of empirical antibiotic therapy at primary and secondary care levels, and urine samples are the most commonly examined samples in microbiology laboratories worldwide [6]. Pediatric UTI presents with varying nonspecific symptoms, depending on the location involved in the urinary system. Renal parenchymal involvement, known as acute pyelonephritis, usually presents with symptoms like fever, abdominal or back pain, vomiting, and sometimes diarrhea; in acute cystitis associated with bladder involvement, symptoms include dysuria, frequency, and malodor urine without fever [3]. All symptoms are indications for referral to family physicians.

Based on these facts, the physicians' knowledge for providing proper treatment, especially at the primary care level, is of particular importance. The presence of nonspecific symptoms and young children presenting only with fever without any other associated symptoms [4] which could lead to serious complications, highlights the importance of timely diagnosis and appropriate treatment. Primary care is the key point of health provision worldwide; hence, the role of general practitioners is most significant [7].

Family physicians are the first in a line of health organizations who are responsible for the prevention and treatment of infections, referral of patients, and maintaining the health of the community [8]. To determine the signs and symptoms of important common diseases that a general practitioner should be aware of, Yamani et al. [2] conducted a cross-sectional study in 2015-2016, enrolling 642 general practitioners in Isfahan, Iran. They concluded that education of general practitioners should be prioritized based on the prevalence of the diseases and their importance [2]. UTI is one such common disease in children that requires meticulous attention.

A study in the United States, which examined the knowledge of primary care physicians regarding the diagnosis and treatment of pediatric UTI, reported a high level of knowledge of the physicians [9]. Another study showed that Minute Clinics provide better services for UTI treatment than emergency departments in the United States [10]. In a study in Iran, the level of knowledge and practice of general practitioners and pediatricians in relation to pediatric UTIs was compared. Levels of both factors were better amongst the pediatricians as compared to general practitioners [11].

Since UTI is within the scope of general practitioners and a large number of these patients are diagnosed and treated by family physicians before being referred to a specialist [5], it is necessary to assess the knowledge of these practitioners in terms of timely diagnosis, treatment, and referral.

The current study was therefore undertaken to evaluate the level of knowledge of family physicians regarding pediatric UTIs. The results of this study can be helpful in planning for continuous clinical education for physicians and improving the performance of family physicians as the first level of patient referral.

Based on studies conducted till date to assess the level of a family physicians' knowledge regarding pediatric UTI, there is no available appropriate questionnaire in Persian whose validity or reliability has been assessed. Thus, we also endeavored to design a questionnaire based on scientific sources, and evaluated its validity and reliability.

## MATERIALS AND METHODS

The project was reviewed and approved by the medical ethics committee at the Shiraz University of Medical Sciences (Ethics approval number: IR.sums.med.rec.1399.365).

This is a cross-sectional analytical study enrolling 300 family physicians working under the coverage of two main Healthcare Centers in Shiraz (Valfajr and Enghelab). The participants were selected by cluster sampling method from 2019 to 2020. Radom cluster sampling was the preferred method due to the impracticality to study the whole population subgroup. The sample size was calculated by considering the number of questionnaire items. By considering five samples for each item of the questionnaire, and given that there were 30 items in the scale, the preliminary sample size was calculated to be 150. Due to

cluster sampling, this number was multiplied by a design effect ratio of 1.4 and an additional 30% was added for missing data. Hence, the total sample size was calculated to be 300.

Based on the proportion of family physicians covered by the two main public healthcare centers, the number of participants was randomly selected from the clinics of family physicians. The inclusion criteria included general practitioners and the workplace to be located in Shiraz, and the exclusion criterion was an unwillingness to participate in the study. The questionnaire was first designed according to previously published pediatric textbooks and related articles [3,9,11] by two faculty members: a pediatrician and a family and community medicine specialist. The questionnaire contained fourteen questions (eleven multiple-choice questions and three multiple-answer questions) to evaluate the participants' knowledge about UTI. The questions encompassed demographic, occupational, and educational information of participants as an introduction (age, sex, university of graduation, their work experience, number of patients per day, availability of the internet at office, post-graduation education, and their knowledge about guidelines). The second part of the questionnaire contained the more relevant questions for assessing the knowledge of the participants. The first and second questions were about the risk factors of UTI. Symptoms of UTI and clinical differentiation of cystitis and pyelonephritis were asked in the third and fourth questions. The fifth and sixth questions covered methods of diagnosis and urine sampling. Interpretation of UTI on urinalysis and urine culture were evaluated in the following two questions, followed by three questions about indications of admission and treatment of UTI. The last three questions assessed the physicians' knowledge regarding follow-ups and indications of imaging in patients with UTI.

In order to determine the content validity, the prepared questionnaire was presented to nine faculty members of the Family Physician Department for appraisal and evaluation. Validity was assessed based on the content validity index (CVI; more than 0.79) and content validity ratio (CVR) according to the relevant values.

To measure the validity index, "relevance", "clarity", "simplicity" and "ambiguity" of each item was determined, based on a 4-point Likert spectrum. The relevance of each item was determined as: 1, "not relevant"; 2, "requires some correction"; 3, "relevant but requires minor corrections"; and 4, "completely relevant". The simplicity of the items was scored as: 1, "is not simple"; 2, "needs some corrections"; 3, "is simple but needs minor corrections"; and 4, "is quite simple". Clarity was scored as: 1, "is not clear"; 2, "requires some correction"; 3, "is clear but needs minor corrections"; and 4, "is quite clear". Ambiguity was specified as: 1, "ambiguous"; 2, "requires some corrections"; 3, "not ambiguous but requires minor revision"; and 4, "unambiguous".

The minimum acceptable value for the CVI index was considered to be 0.79; if the CVI index in an item was less than 0.79, the item was modified or replaced. To determine the CVR, experts were asked to examine each item based on a three-part spectrum: necessary, useful but not necessary, and unnecessary. The CVR was then calculated and interpreted according to the Lawshe table [12]. After confirming the CVR and CVI, the reliability of the questionnaire was evaluated in a pilot study enrolling 30 family physicians. At this stage, Cronbach's alpha was equal to 0.7, which was an acceptable value for the questionnaire. Final questionnaire is available as original and translated English version in Supplementary Materials. Once evaluated, the questionnaire and the data collecting form, which comprised demographic information and factors related to the physician's knowledge, were delivered to the doctor at their workplace according to the sampling method described earlier. Physicians were asked to complete the questionnaire in less than 35 minutes, and the questionnaires were collected the next day.

The data were entered into the SPSS software version 25 (IBM Co.). Descriptive statistics (mean, standard deviation, and graph) were used for data description. The content validity of the questionnaire was determined by calculating CVR and CVI, and its reliability was evaluated by Cronbach's alpha. Regression analysis was used for evaluating the effect of studied factors on the level of physicians' knowledge. The level of statistical significance is considered as 0.05.

## RESULTS

In this study, 270 out of 300 participants (90.0%) completed and returned the questionnaire, of which 150 (55.6%) were male and 120 (44.4%) were female subjects. The mean age of the participants was 42.5±7 years. Demographic infor-

**Table 1.** Demographic and occupational indicators of the participants and their level of awareness of guidelines

| Characteristics | Type | Value (n=270) |
|---|---|---|
| Sex | Male | 150 (55.6) |
| | Female | 120 (44.4) |
| Nationality | Iranian | 270 (100) |
| | Other | 0 (0) |
| University of study | Shiraz | 52 (19.3) |
| | Other | 218 (80.7) |
| Type of employment | Private | 161 (59.6) |
| | Public | 109 (40.4) |
| Role | Family physician | 270 (100) |
| | No family physician | 0 (0) |
| | Both | 0 (0) |
| Pediatric urinary tract infection education after graduation | Yes | 137 (50.7) |
| | No | 133 (49.3) |
| Internet access at work | Yes | 270 (100) |
| | No | 0 (0) |
| Aware of guidelines | Yes | 136 (50.4) |
| | No | 134 (49.6) |
| Study the guidelines | Yes | 102 (37.8) |
| | No | 168 (62.2) |
| Age (y) | | 42.5±7 |
| Graduated years | | 15±6.7 |
| Duration of activity as family doctor (y) | | 4.13±2 |
| Average number of patients (per day) | | 42.8±13.9 |

Values are presented as number (%) or mean±standard deviation.

mation of the participants is given in Table 1.

CVI and CVR were used to validate the questionnaires. After four stages of corrections by nine family physicians and pediatricians, the values of these indicators for all questions were more than 0.88 and 0.78, respectively.

Cronbach's alpha of the whole questionnaire was 0.68; after deletion of 2 questions (questions 1b and question 9), the Cronbach's alpha reached an acceptable level of 0.71. The deleted questions were:

1b. Is a previous history of urinary tract infection a risk factor for subsequent urinary tract infection in the child?

9. Which one is not the indication for hospitalization in children with urinary tract infections?

Fever ☐

Existence of vomiting or dehydration ☐

Infants less than one month ☐

Suspicion of urosepsis ☐

By assigning one point for each item in the total questionnaire of 28 item (after deleting the 2 mentioned questions), the average total score was 25.02±1.9. The lowest score obtained was 20 and the highest score was 28.

In the present study, all participating physicians had 100% internet access at the workplace. The rate of knowledge of guidelines in the field of pediatric urinary tract infections was 136 persons (50.4%) and the rate of study of guidelines was 102 persons (37.8%).

The analysis of questions presented in Table 2 revealed that over 75% answered all questions correctly, which is an acceptable knowledge of family physicians concerning pediatric UTIs.

Among the factors of age, sex, year of graduation, access to guidelines, being informed about the guidelines, access to the internet, cooperation with the family doctor plan, activity in the public or private sector, university of studying medicine, and education in the field of UTIs in children following graduation, only "age" had a significant negative effect and "number of years of graduation" had a significant positive effect on the total score of the questionnaire (regression analysis: p-value 0.01).

## DISCUSSION

This study evaluated the validity and reliability of the researcher-made questionnaire concerning pediatric UTIs. We subsequently evaluated the knowledge of general practitioners in this field, as it is an important infection in childhood that requires immediate attention and follow-up. Our findings determined acceptable validity and reliability of the prepared questionnaire. All questions scored above 75% accurate answers, thereby verifying a desirable knowledge of family physicians in Shiraz with respect to pediatric UTIs. Among the investigated factors, "age" had a significant negative effect, and "number of years of graduation" had a significant positive effect on the total score of the questionnaire.

This study was limited in determining the validity and reliability of the questionnaire in the field of UTIs. Only one previous study in Iran in 2012 had developed a questionnaire in this field for comparing the level of knowledge and practice of general practitioners and pediatricians [11]. The researcher-made questionnaire used in the 2012 study was reliable and valid, and their findings revealed that compared to general practitioners, pediatricians scored better in both knowledge and practice. The score obtained by general practitioners in the knowledge dimension was 2.7±1.2 of 5 points compared to 3.6±1.2

**Table 2.** Rate of correct answers to the questionnaire

| Q. No. | Questions | Numbers (%) | |
|---|---|---|---|
| | | Right answer | Wrong answer |
| 1a | The effect of constipation on urinary tract infection | 241 (89.3) | 29 (10.7) |
| 1b | The effect of previous urinary tract infection on urinary tract infection | 263 (97.4) | 7 (2.6) |
| 1c | The effect of a history of urinary tract infection in a first-degree family on urinary tract infection | 226 (83.7) | 44 (16.3) |
| 1d | The effect of wearing tight clothing on urinary tract infections | 218 (80.7) | 52 (19.3) |
| 1e | The effect of usage of antibiotic history on urinary tract infections | 238 (88.1) | 32 (11.9) |
| 2 | The method of prophylaxis of recurrent urinary tract infections in children without reflux with normal VCUG | 216 (80.0) | 54 (20.0) |
| 3a | Abdominal pain as a common symptom of urinary tract infection in children over 5 years | 262 (97.0) | 8 (3.0) |
| 3b | Dysuria as a sign of urinary tract infection in children over 5 years | 270 (100) | 0 (0) |
| 3c | Frequency as a sign of urinary tract infection in children over 5 years | 270 (100) | 0 (0) |
| 3d | Malodor urine as a sign of urinary tract infection in children over 5 years | 225 (83.3) | 45 (16.7) |
| 3e | Nausea and vomiting as signs of urinary tract infection in children over 5 years | 247 (91.5) | 23 (8.5) |
| 3f | Diarrhea as a sign of urinary tract infection in children over 5 years | 256 (94.8) | 14 (5.2) |
| 3g | Weight loss as a sign of urinary tract infection in children over 5 years | 240 (88.9) | 30 (11.1) |
| 3h | Restlessness as a sign of urinary tract infection in children over 5 years | 236 (87.4) | 34 (12.6) |
| 3i | Hematuria as a sign of urinary tract infection in children over 5 years | 239 (88.5) | 31 (11.5) |
| 4 | Auxiliary sign for differentiating pyelonephritis from cystitis | 270 (100) | 0 (0) |
| 5 | Method of collecting urine culture samples in 6-month-old infants | 207 (76.7) | 63 (23.3) |
| 6 | Method of definitive diagnosis and initiation of treatment of urinary tract infection in children | 212 (78.5) | 58 (21.5) |
| 7 | Findings in urinalysis in favor of urinary tract infection | 223 (82.6) | 47 (17.4) |
| 8 | Positive urine culture in urinary tract infection | 216 (80.0) | 54 (20.0) |
| 9 | Indication for hospitalization in children with urinary tract infections | 232 (85.9) | 38 (14.1) |
| 10a | Experimental treatment with Cotrimoxazole for pediatric cystitis | 246 (91.1) | 24 (8.9) |
| 10b | Experimental treatment with Nitrofurantoin for pediatric cystitis | 265 (98.1) | 5 (1.9) |
| 10c | Experimental treatment with Cefixime for pediatric cystitis | 270 (100) | 0 (0) |
| 10d | Experimental treatment with Metronidazole for pediatric cystitis | 266 (98.5) | 4 (1.5) |
| 10f | Experimental treatment with Azithromycin for pediatric cystitis | 269 (99.6) | 1 (0.4) |
| 11 | Suitable antibiotic for children with febrile urinary tract infections | 209 (77.4) | 61 (22.6) |
| 12 | Conditions for second urine culture after treatment of a child with urinary tract infection | 224 (83.0) | 46 (17.0) |
| 13 | Sonography of the kidneys and urinary tract in children with urinary tract infections | 254 (94.1) | 16 (5.9) |
| 14 | Performing VCUG in pediatric urinary tract infections | 241 (89.3) | 29 (10.7) |

VCUG: voiding cystourethrography.

by pediatricians [11]. Since this study was not up to date, we were unable to use the questionnaire in our research. Differences in the information of general practitioners could be attributed to the wider access of physicians to information sources and the internet in the present day workplaces, which has eased searches and the ability to obtain correct answers.

The study of Babazadeh et al. [13] evaluated the knowledge of general practitioners and concluded that most family physicians and managers had necessary and sufficient information and received the necessary training, which is in accordance with the results of the present study. However, in a study by Hoberman et al. [14], who investigated the prevalence of UTIs in children with fever, the investigators concluded that general practitioners were unable to accurately diagnose the signs and symptoms of UTIs. A 1996 study by Van der Voort et al. [15] enrolling 83 general practitioners also found that most pediatric UTIs were not well diagnosed, which contradicted the results of our study.

The studies by Janati et al. [16] and Karimi et al. [17] concluded that inadequate training of family physicians is one of the limitations of the family physician training plan by managers and healthcare experts, and the knowledge and skills of general practitioners were insufficient compared to expectations of the healthcare system. Thus, in addition to reviewing the training of general practitioners, it is necessary to increase the level of information and skills of physicians by conducting relevant workshops.

In our study, 137 participants (50.7%) had undertaken continuous education courses in pediatric UTIs after their graduation which, according to the results of the study and the desirability of physicians' knowledge in the field of children's UTIs, indicates the importance of continuous education after graduation. Our study also showed that the younger age of physicians (and, as a consequence, their

recent training as students) is associated with a higher level of knowledge about pediatric UTIs, which further confirms the importance of continuous education.

The study of Shiri et al. [18] reported that continuous education courses significantly improve the informed decision-making of general practitioners and are therefore important elements for updating their knowledge.

The study of Yamani et al. [2] and Shakournia et al. [19] examined the needs of continuous education of general practitioners and confirmed the importance of continuous education. The 2015 study of Zarif Sanaiey et al. [8] also concluded a need for continuous education for physicians after graduation, and further reported that education should be based on training needs.

In the current study, considering the positive relationship obtained between graduation years and the physicians' level of knowledge, as well as the number of doctors who received postgraduate training, we determined a satisfactory impartation of continuous education related to pediatric UTIs.

A 2004 study by Norman et al. [20] concluded that potential solutions to identify educational needs include:

- Periodic reviews using previously available records
- Reviewing the results of individual evaluation and comparing them with available guidelines
- Comparing the evaluation results of each person with other colleagues

Based on this study and other similar studies, periodic surveys should be conducted to assess the educational needs of general practitioners. One method of such a periodic survey is to assess the level of knowledge of physicians through standard acceptably valid and reliable questionnaires. The present study designed a questionnaire based on scientific sources and other studies to evaluate the level of knowledge of family physicians concerning pediatric UTIs (some of the most important childhood infections), and evaluated its validity and reliability. Our results showed that after deleting two questions, the validity and reliability of the questionnaire are acceptable, and it can be applied for future studies. However, due to future scientific advances and changes that may occur in the concepts, it is recommended that the questionnaire be reviewed and revised every few years.

One of the reasons that the use of guidelines in the treatment of pediatric UTI is as low as determined in our study, and also in the study of Lugtenberg et al. [21], is the difference in various guidelines or the lack of transparency in some of them. In 2001, Freeman and Sweeney [22] conducted a qualitative study on 19 general practitioners to investigate the reason why they were not using resources. They concluded six main reasons for the same:

- Personal and professional experiences of general practitioners
- Communication between doctor and patient
- Existing tensions between primary and secondary care
- Physicians' feelings about the patient and resources
- Legal problems
- The choice of words by the physician can affect patients and their decisions, and the implementation of treatment.

Therefore, based on the current study and the above cited researches, we conclude that continuous training of general practitioners is very important and necessary. Further studies are required to determine the issues concerning the implementation of continuous education of general practitioners. During the COVID epidemic and due to the effectiveness of e-learning, continuous training of general practitioners can be implemented through distance and online education.

One limitation of this study was the lack of cooperation of some participants in completing the questionnaires in the presence of the investigators. Although only 35 minutes were assigned to complete the questionnaire, it is possible that references were used to complete the survey.

## CONCLUSIONS

Based on the results obtained in this study, the designed questionnaire had acceptable validity and reliability. Moreover, it showed that family physicians' knowledge of pediatric UTIs was favorable. We recommend establishing clear guidelines for the diagnosis, treatment, and follow-up of pediatric UTIs at the primary health level, which should be designed according to up-to-date sources and climatic conditions of our country. These should be provided to general practitioners and families across the country. We further propose improving and holding training sessions and encouraging family physicians to update their knowledge. Moreover, detailed planning should be done to make the maximum use of continuous education for family physicians.

## CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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## AUTHOR CONTRIBUTIONS

H.H. contributed to the conception and design of the research, writing the proposal, data collection, data analysis, writing the article, and approving the final version. P.J. contributed to the conception and design of the research, design of the questionnaire, writing the proposal, data collection, writing the article, and approving the final version. R.S. contributed to writing the proposal, data collection, writing the article, and approving the final version. K.T. contributed to data collection, writing the article, and reviewing and editing the article. F.M. contributed to the conception and design of the research, writing the proposal, writing the article, and approving the final version.

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## SUPPLEMENTARY MATERIALS

Supplementary data can be found via https://doi.org/10.14777/uti.2023.18.1.24.

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