MEDICAL UNIVERSITY
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PROSPERITAS VESTRA FINIS NOSTRA!

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"CLINICAL PRESENTATION AND PREVENTION OF THE RISK OF DEVELOPING URINARY TRACT INFECTIONS IN CHILDHOOD"

ABSTRACT

of a dissertation

for awarding the educational and scientific degree "doctor"

Specialty: General Medicine

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The dissertation contains 195 typewritten pages and is illustrated with 47 tables, 24 figures. The list of cited literature includes 314 titles, of which 22 are in Cyrillic and 292 are in Latin. The dissertation work has been discussed and referred for public defense by the Departmental Council of the Department of General Medicine at the Medical University "Professor Dr. Paraskev Stoyanov" - Varna.

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The public defense of the dissertation work will be held on 14.02.2023 at …. hour in ……city of Varna at an open meeting of the Scientific Jury and in an electronic environment with the WEBEX system.

The defense materials are published on the website of the Medical University "Professor Dr. Paraskev Stoyanov" - Varna and are available at the Department of General Medicine at the Medical University - Varna.

Note: The numbers of the tables and figures in the auto-reference do not correspond to those in the dissertation.

CONTENTS

I. INTRODUCTION

Childhood urinary tract infections (UTI) are a common problem in Primary Medical Care (PMC).

The diagnosis and control of UTI at first glance seem to be an easy task, but in practice, the most controversial clinical questions in PMC remain to be resolved.

The most common difficulties faced by the doctor on the front line are:

Difficulties in identifying UTI, due to the lack of a typical clinical picture, especially in infants and in early childhood.

- Errors can happen when taking urine for examination and interpreting the result of the examination of urine and uroculture.
- There is not enough time allocated for children's consultations. Currently, the organization of the health system does not allow qualitative examinations, and the mixing of healthy and infectious patients in the waiting room of the GP puts healthy children at risk and suggests quantitative examinations at the expense of quality.
- There is a lack of awareness and knowledge of parents about UTI in childhood.
- There is a lack of an algorithm in case of suspected UTI, diagnosis, treatment and prevention of the disease in PMC.

All these features contribute to contradictions and difficulties in timely diagnosis and treatment.

If only the clinical picture in infants and small children is taken into account, it is difficult, if not impossible, to distinguish pyelonephritis from cystitis, therefore, in practice, pyelonephritis (PN) and cystitis in them is summarized as UTI.

Urinalysis and urinalysis are required to prove UTI. The gold standard for the diagnosis of UTI is the presence of significant bacteriuria > 10^5 ml.

After a first UTI, a significant proportion of children develop recurrent infections.

Importantly for clinical practice, influencing children with UTI focuses not only on their early diagnosis and treatment, but also on early prevention of these diseases. The elimination of predisposing factors is the basis for reducing the frequency of relapses and complications.

Disease severity depends on microbial virulence and host susceptibility. Accurate and timely diagnosis in childhood followed by timely and appropriate treatment is

important to prevent chronic diseases and their consequences in adulthood (eg. hypertension, proteinuria and chronic kidney disease).

Administering antibiotic treatment on another occasion without conducting urinalysis masks the picture of UTI. Treatment of children with recurrent UTI with repeated courses of antibiotics or long-term prophylactic antibiotics puts patients at risk for infections with multidrug-resistant organisms. In addition, recurrent UTI are also associated with the risk of renal failure and parenchymal damage with long-term health consequences.

Parents have an essential role in the prevention of diseases, including UTI. One of the main problems is the lack of adequate awareness of parents about UTI, which is no less important and sometimes leads to difficulties and delays in diagnosis and treatment.

Their awareness of the infection itself, what it is, which organs it affects, what are the risk factors, the consequences of missed or incorrect treatment, training to collect sterile urine and last but not least - trust in GP’s are essential in early diagnosis, prevention , complications or chronicity in adulthood.

The reason for conducting the study that led to the writing of the present work is that in our country there is a lack of similar research that would make a clinical presentation, identify risk factors and look for the reasons for the difficulties in the diagnostic and treatment process of UTI in general practice.

The study provides statistical support for the opinion that the knowledge, attitudes and practices of parents taking daily care of their children, as well as the practices and knowledge of GP’s with regard to childhood UTI conducting a pediatric consultation, have a significant role in the prevention of UTI.

II. GOAL, TASKS AND WORKING HYPOTHESES

II.1. PURPOSE

The aim of the present work is to study the features of the clinical picture and course of UTI, as well as to identify the factors that make timely diagnosis difficult, with a view to improving the possibilities of risk prevention for their occurence in childhood.

II.2. TASKS

II.2.1. To analyze data on the features of the clinical picture and the course of UTI in childhood, obtained from medical records.

II.2.2. To identify the most common risk factors for the development of UTI in childhood.

II.2.3. To analyze therapeutic measures for UTI in childhood.

II.2.4. To determine the GP's approach to UTIs in childhood.

II.2.5. To investigate parents' knowledge, attitudes and practical skills about UTI in children.

II.2.6. To study the sources of information and the need to develop and present informational materials to parents related to UTI in childhood in our country.

II.2.7. To develop a behavior algorithm for UTI in childhood to help GPs.

II. 3. WORKING HYPOTHESES

II.3.1. There are conflicting practices regarding the prevention and treatment of UTI in childhood.

II.3.2. Taking a clean sample for urine testing is a major challenge in general practice and a frequent reason for delaying the diagnosis of UTI, respectively in many cases the treatment is inadequate.

II.3.3. Parents' knowledge about UTI is insufficient or absent.

II.3.4. There is a lack of reliable and comprehensible information materials to help parents navigate when an acute infectious disease affecting the urinary system occurs.

II.3.5 GP’s do not have enough time during a child consultation visit to familiarize parents with the risk factors and problems related to UTI.

III. MATERIAL, DESIGN AND METHODS

III.1. MATERIAL

The object of the present study are 126 parents, 27 general practitioners from Varna, Burgas and Dobrich regions and a retrospective analysis of medical documentation (epicrisis) of 110 patients.

III.2. SETTING (DESIGN) OF THE STUDY

The design of the present study is "cross-sectional", which combines a retrospective analysis of medical records (epicrisis) and a prospective one, realized through two questionnaire surveys.

The dissertation work was approved by KENY of the Medical University - "Prof. Dr. Paraskev Stoyanov" - Varna with Protocol No. 94 25.06. 2020

To achieve the aim and tasks of the dissertation, we conducted the following studies:

A. SURVEY "UTI - survey for parents"

The study aims to assess the knowledge, practices and attitudes of parents regarding UTI.

Study model and duration: a cross-sectional epidemiological study conducted within one year from July 2020 to December 2021.

General population: parents with children without age limit. The survey sample was formed on a random quota basis from the lists of GPs participating in the survey on the territory of the city of Varna. Their participation is voluntary, subject to the principle of confidentiality.

Signs to watch for in the parent survey:

• Demographic and socio-economic indicators of the parents – biological sex, age, ethnicity, education, employment and others.

• Parents' attitudes regarding the visit for "child consultation" in the GP's office.

• The most common reasons why parents and their children visit the GP's office.

• Their opinion regarding the time spent and recommendations given by GPs regarding UTI

• Parents' trust in their GPs.

• Attitudes of parents in case of elevated temperature and the methods they use to measure it.

• Knowledge about risk factors for the occurrence of UTIs.

• Difficulty collecting urine for testing.

• Understanding the future risk of UTI.

• Sources from which parents receive information on health issues;

Fieldwork: parents filled out the questionnaire independently during a scheduled child consultation at the GP or at home, and were sent an electronic link to the questionnaire.

The survey is prepared in two versions - on paper and in an electronic format developed in Google Forms. The presence of an electronic format of the survey was necessary in order to facilitate the conduct of the survey, due to the declared emergency epidemiological situation in the country related to the spread of COVID-19.

The data collection tool is a direct individual survey comprising 28 questions.

B. STUDY "GP AND UTI IN CHILDHOOD"

Investigating GP practices regarding UTI, as well as the possibility that child counseling can be used as a tool to reduce the risk of developing UTI, with GP's spending enough time to give clear recommendations and accurate information to parents.

Model and duration of the study: cross-sectional epidemiological study conducted within one year from July 2020 to December 2021.

General population: The participants are GP's from Varna, Burgas and Dobrich regions. GP's from the indicated areas were randomly selected from individual and group, urban, rural and mixed Primary Care (PHC) practices.

A condition for the selection of GP's is the presence of children in their practice, which implies greater experience with parents of children. Their participation is voluntary subject to the principle of confidentiality.

Participants were invited using emails and social networks, but a large number declined to participate in the study due to time constraints and heavy workload during the pandemic. We purposively selected participants from those who responded to the invitation to achieve maximum variation in biological sex, years of experience, practice location (rural: >15 kilometers from hospital; urban: ≤15 kilometers from hospital).

Participants were informed that the study was conducted to understand the challenges and difficulties in diagnosing childhood UTI in general practice and that the interviewer was a doctor undertaking a PhD. There was no dropout of participants after study initiation.

Signs to watch for in the GP survey:

• Demographic (age, biological sex) and professional factors (experience), practice location.

• Self-assessment of the time spent on child consultation and prevention promotion.

• Knowledge and recommendations to reduce the risk of developing UTI in childhood;

• Key sources for updating GPs' knowledge of early diagnosis, treatment and prevention of UTI.

• Knowledge about the risk factors for the development of UTI.

• The most common difficulties encountered by GPs in the diagnosis of UTI.

Work in the field: for conducting the research, lists of e-mail addresses of GP practices from Varna, Burgas and Dobrich regions were presented by the National Health Insurance Fund (NHIF). Randomly selected medical specialists were sent a questionnaire.

The survey is prepared in two versions - on paper and in an electronic format developed in Google Forms. The presence of an electronic format of the survey was necessary in order to facilitate the conduct of the survey due to the announced emergency epidemiological situation in the country related to the spread of COVID-19.

The instrument for collecting information necessary for the purpose of the study is a direct individual survey containing 25 questions.

C. Epicrisis - a retrospective analysis of medical records of 110 patients. The following significant indicators were reported:

- age
- biological sex
- height
- weight
- anamnestic data on: frequently ill child, fever, abdominal pain, nausea and vomiting, peripheral oedema, offensive-smell urine, constipation, frequent urination, involuntary leakage of urine.
- family burden
- nutrition in infancy
- immunizations
- pre-hospitalization urine culture results
- patient status data: general condition, febrile °C, skin - (turgor/color), rash, abdomen, flank pain, limbs, throat, succussio renalis

- accompanying disease
- laboratory parameters: hemoglobin (Hb), leukocytes (Leu), CRP, urea, creatinine, total protein, albumin, uric acid, urine (protein, leukocytes, blood, ketobodies, sediment)
- uroculture during the hospital stay
- echographic examination
- other imaging studies
- treatment

III. 3. INFORMATION PROCESSING METHODS

III. 3. 1. Documentary method

For the present work, a selection and analysis of literary sources - textbooks, manuals, articles, publications and normative documents related to the problem of UTI in Bulgaria and worldwide was made.

III. 3. 2. Sociological method

We conducted 2 surveys on the knowledge, attitudes and practices of parents regarding UTI, we identified the most common reasons that make it difficult to make a timely diagnosis from the point of view of GP's, as well as the most common risk factors for the development of UTI

III. 3. 3. Statistical methods

Statistical methods were used in the development of the dissertation to analyze the results of the survey. Analysis included descriptive statistics and was used to describe the main measurements included in the study. The analysis used:

1. Results of means, standard error (SD), range, and minimum-maximum values.
2. Non-parametric tests such as crosstabulation and Chi-square (χ^2) when looking for significant differences in the frequency representation of categorical values.
3. Graphical and frequency (tabular) description and presentation of the variables in the sample.

Microsoft Office (Excel) for Windows 10 and jamovi v.2 were used for the graphic design of the presented information.

All analyzes in the presented scientific paper were processed using the statistical information processing package IBM SPSS for Windows v.25.

4. Logistic regression analysis: applied to establish the influence of specific factors on the diagnosis of UTI.

5. Based on the data obtained from the research, a brochure and a poster were created in Adobe Illustrator.

IV. OWN RESULTS

VI .1. Descriptive analysis of epicrisis data

VI .1.1. General description

The patient sample included 110 patients with a mean age of 7.32 ± 5.1 and height 117 cm ± 32.5 (Table 1). About 56.4% of patients were female (n=62) versus 43.6% male (n=48). Prevalence of disperse among girls is also found from 1.2% to 8%. Only 18 patients provided information on breastfeeding practice, of which 6 (33.3%) were not breastfeeding.

Table 1. Anthropological data of the patients

	Months	Age	Height
Number patients	19	92	69
Mean arithmetic	6.89	7.32	117
Median	7	5.50	116
Standart deviation	4.00	5.01	32.5
Minimal value	1	0.250	46
	12	17.0	180

The results did not show statistically significant differences regarding the obesity of the patients (χ^2=2.59, r=0.587), but percentage showed a greater preponderance of under-weight girls (16.9%) and a preponderance of overweight of the average boy (41, 3). %) (table 2).

Table 2. Overwieight by biological sex

weight				
gender		**overweight**	**normal**	**underweight**	**all**
Male	number	17	32	10	59
	%	28.8 %	54.2 %	**16.9 %**	100.0 %
Female	number	19	23	4	46

		%		**41.3 %**		50.0 %		8.7 %		100.0 %	
All		number		36		55		14		105	
		%		34.3 %		52.4 %		13.3 %		100.0 %	

Additionally, the results of the chi-square analysis found that more than 45% of the patients had some family burden, but no relationship with gender was found (χ^2=0.296, p=0.275) (Table 3).

Table 3. Frequency by family burden and biological sex

обремененост									
Gender				**Burdened**		**unburdened**		**All**	
Female		брой		29		32		61	
		%		47.5 %		52.5 %		100.0 %	
Male		брой		19		26		45	
		%		42.2 %		57.8 %		100.0 %	
All		брой		48		58		106	
		%		45.3 %		54.7 %		100.0 %	

IV .1.2. Anamnesis data

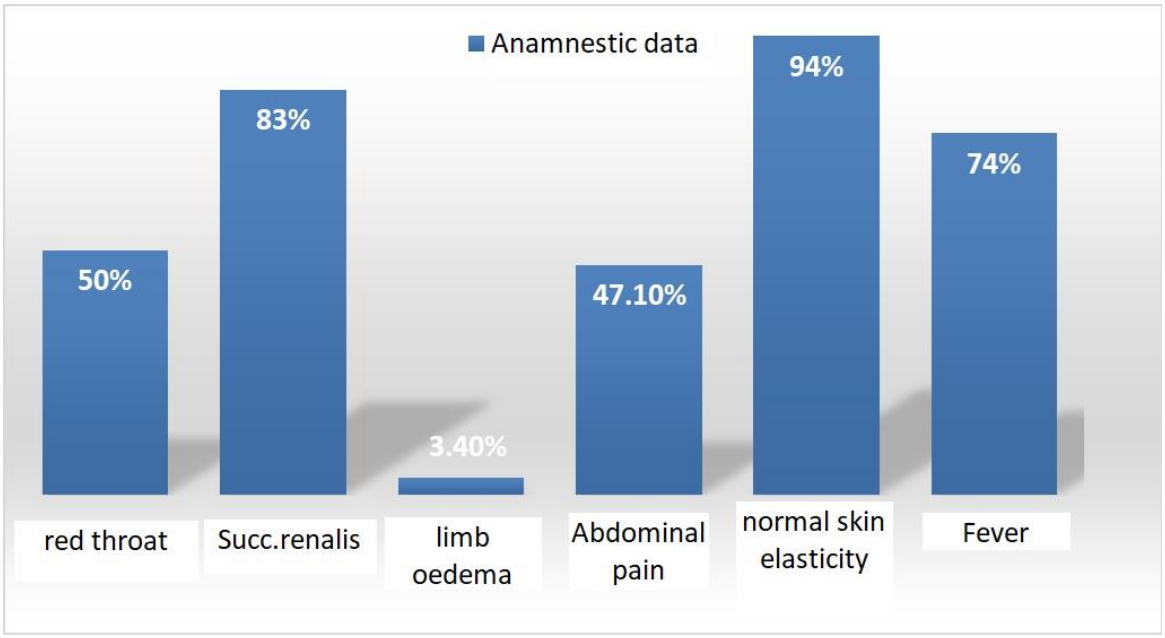
In total, in 98.2% of patients, the condition can be defined as impaired (n=108). The results of the anamnesis data showed that a large number of patients reported problems such as fever (n=57) with an average value of 36.9 ±2.6 C, abdominal pain (n=45), frequent illness (n=34) and polyuria (n=27). Less frequent problems are constipation (n=3), incontinence (n==3) and edema (n=11). It is important to note the fact that more than 90% of patients are immunized with vaccines required for the respective age and development (table 4).

Table 4. Anamnestic data

Value	YES (%/value)	No (%/value)
Febrile	74% (57)	26 % (20)
Abdominal pain	90%(45)	10% (5)
Oedema	47,8%(11)	52,2%(12)
Nausea, vomiting	78,9% (15)	21,1% (4)
Frequent illnes	63%(34)	37% (20)
Offensive smell urine	100% (13)	-
Constipation	100%(3)	-
Incontinence	75%(3)	25% (1)
Polyuria	100%(27)	
Imunisation	94% (94)	6% (6)

Additional history data showed that 50% (n=54) of patients had a hyperemic throat, positive for succ.renalis were over 83% of patients (n=56) versus 16.4% negative (n=11), with peripheral oedema were 3.4% (n=4), abdominal pain was described in 48 patients (47.1%), and flank pain in three patients. Over 94% of patients had normal skin elasticity (n=104), and seven patients had rashes on the body or extremities (Figure 1).

Figure 1. Clinical presentation of UTI in childhood



IV .1.3. Laboratory data

Blood and urine test results are discussed in Tables 13 and 14. Mean hemoglobin values were 122 ± 14.2 with a minimum of 83 and a maximum of 150. The patients' leukocytes ranged between 4.30 and 30 with a mean of 11 ±5.24, and CRP with mean values 37.91±. The rest of the investigated indicators showed a wide range of values, and specifically their rank values of urea 4.38 ± 2.02, creatinine 46.5 ± 44.5, total protein 66.5 ± 10.1, albumin 42.4 ± 6, 61, and uric acid 260 ±90.3, are also presented in Table 5. Additionally, in 98% of patients, urine cultures were sterile, and only 2% were found to have E. coli.

Table 5. Laboratory studies

	Hb	**Leu**	**CRP**	**Urea**	**Creatinin**	**Protein**	**Albumin**	**Uric Acid**
Number of patients	108	108	110	109	109	107	106	86
Average	122	11.0	37.91	4.38	46.5	66.5	42.4	260
Median	123	9.70	3.94	4.10	38	68.0	44.0	245
Standart deviation	14.2	5.24		2.02	44.5	10.1	6.61	90.3
Minimal value	83	4.30	0.0100	1.20	13	7.00	9.00	100
Maximal value	150	30.0	215	18.7	470	82.9	51.0	500

Laboratory results reported worrisome results in an average of about 40% of patients in terms of positive values for protein, leukocytes, blood, ketobodies, and evidence of inflammatory changes in the sediment (table 6).

Table 6. Laboratory tests of urine

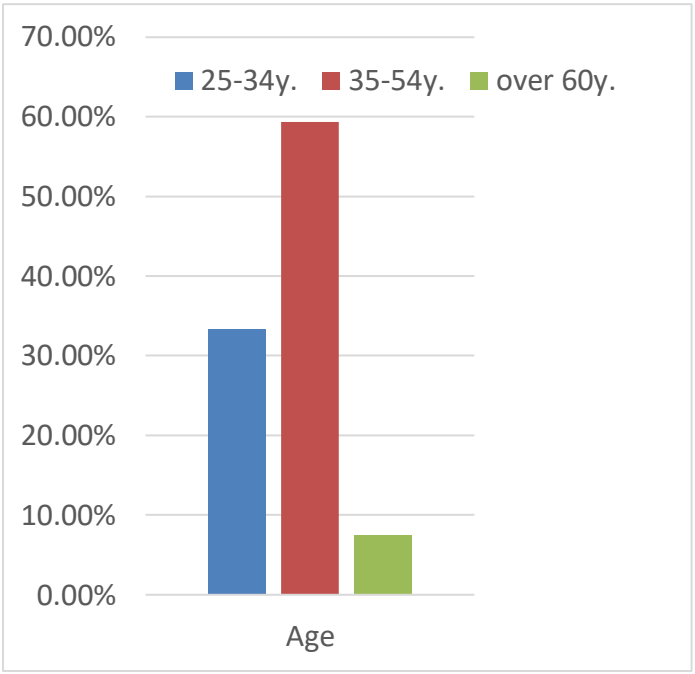
	Protein		Leucocytes		blood		Ketons	
-	60	58.8 %	14	35,9%	12	27,3%	10	41,7%
1+	25	24.5 %	15	38,5%	9	20,5%	8	33,3%
2+	7	6.9 %			7	15,9%	1	4,2%
3+	10	9.8 %	10	25,6%	16	36,4%	5	20,8%

IV.2. Descriptive analysis of GP respondents

IV .2.1. Description of the sample

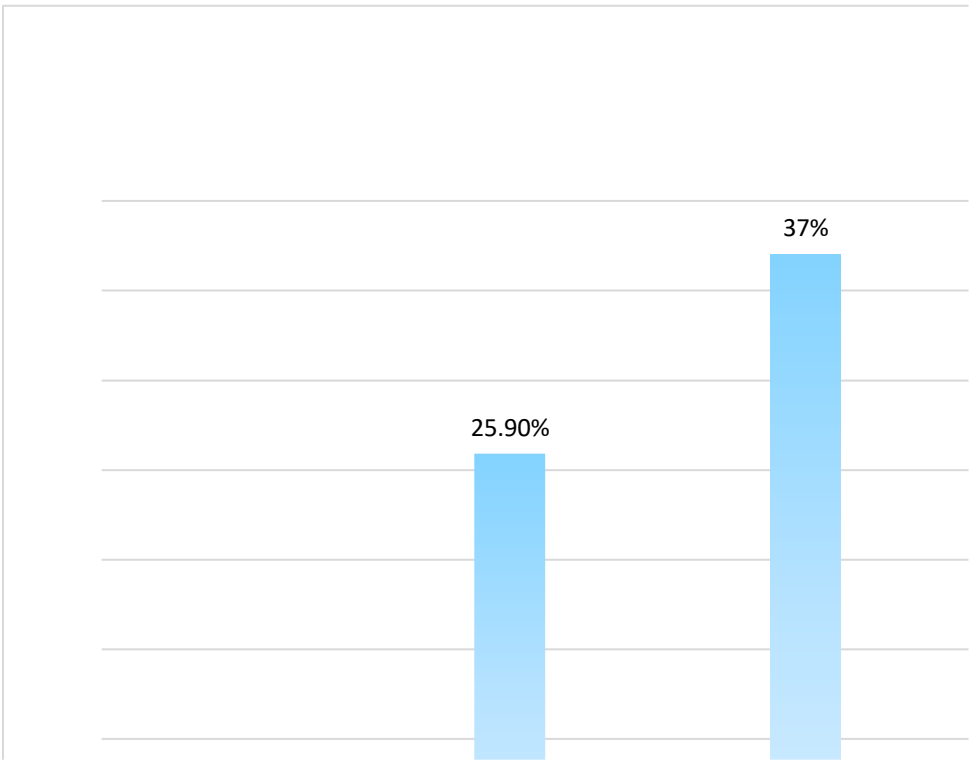
The 27 male (n=10, 37%) and female (n=17, 63%) GPs participating in the survey were mostly aged between 25-34 years (n=9, 33.3%) and 35-54 years (n=16, 59.3%), with GP practitioners over 60 years of age being two (7.4%) (Figure 7). About 61.5% (n=16) of GPs work in the center of a regional city, 26.9% (n=7) work in its periphery, and three GPs (11.5%) answered that they practice both in a city and a village.

Figure 2. Age groups of GPs



More than 50% of the survey respondents have more than 6 years of experience, with 37.1% of them having more than 15 years of experience as GP practitioners (Figure 3).

Figure 3. Experience of surveyed respondents GP



A small part of the respondents (n=4, 15.4%) do not work with children, with the practices of GPs working with up to 50 children (30.8%) being more common, and 19.2% (n=5) working with more than 100 children. by the respondents (table 7).

Table 7. Number of children from 0 to 1 year that is served in one calendar year

	№	%
up to 10	1	3.8 %
up to 20	4	15.4 %
up to 50	8	30.8 %
up to 100	4	15.4 %
Over 100	5	19.2 %
withouth children	4	15.4 %

For comparison, GPs working with children from 2 to 7 years with more than 100 children are 46.2% (n=12), and less than 12% work with up to 100 children (table 8).

Table 8. Number of children from 2 to 7 years who are served in one calendar year

	бр	%
up to 10	4	15.4 %
up to 100	3	11.5 %
up to 20	2	7.7 %
up to 50	4	15.4 %
over 100	12	46.2 %
withouth children	1	3.8 %

On average, respondents spend between 15 minutes (34.6%) and 20 minutes (42.3%) for one child consultation (table 20). A small part of the GPs who participated in the survey spend between 5 (3.8%) and 10 (7.7%) minutes for consultation with children (table 9). It is important to note that the majority of GPs participating in the survey work under the Children's Health program of the NHIF (73%), and about 27% stated that they do not work under the NHIF programme.

Table 9. Consultation time

	бр	%
10 min.	2	7.7 %
15 min.	9	34.6 %
20 min.	11	42.3 %
30 min.	3	11.5 %
5 min.	1	3.8 %

IV .2.2. Prevention

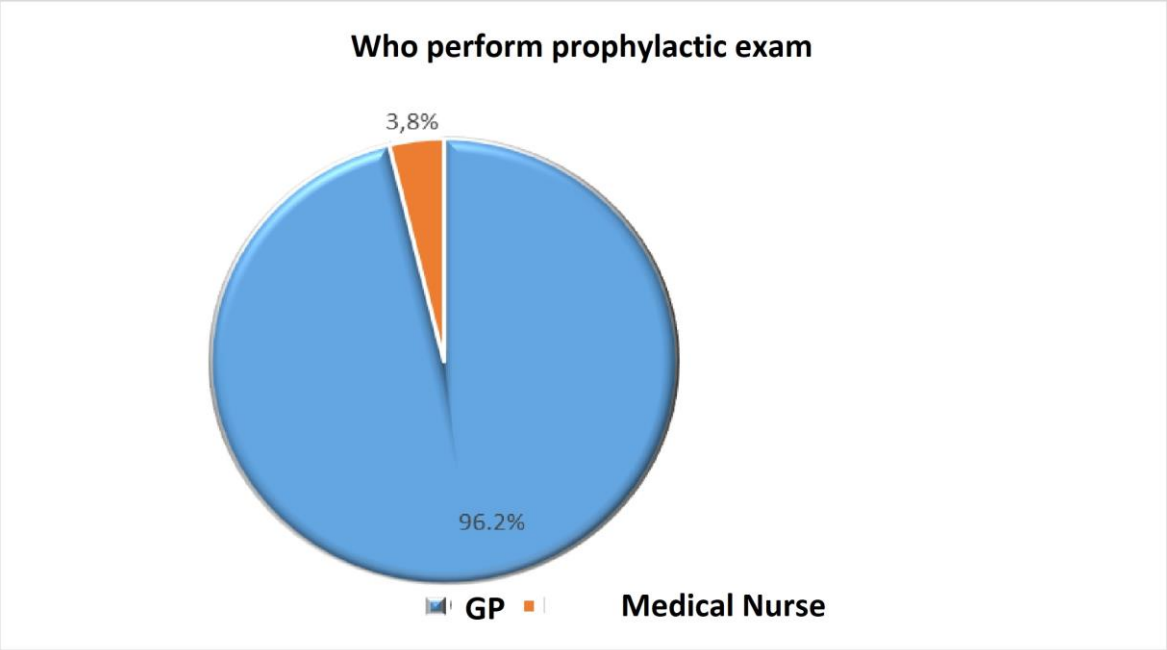
Regarding the practice related to referral to preventive examinations, the results showed that in children over 6 months of age, 61.5% of general practitioners (n=16) stated that 100% of their patients had mandatory preventive examinations including ultrasound kidney examination and FBC and urine examination, while in 1-year-old patients the percentage was about 54% (Table 10).

Table 10. Mandatory preventive examinations

	6 months age		Over year age	
	№	%	№	%
100%	16	61.5 %	14	53.8 %
50%	1	3.8 %	3	11.5 %
80%	4	15.4 %	2	7.7 %
Withouth statistics	5	19.2 %	7	26.9 %

The main person who informs patients about the need for prophylactic examinations and the way of accompanying examinations is carried out mainly by general practitioners (92.3%), and in rare cases by the nurses working with them (7.7%). The practice is the same regarding the person from the team who performs the preventive examination of the patients (figure 4).

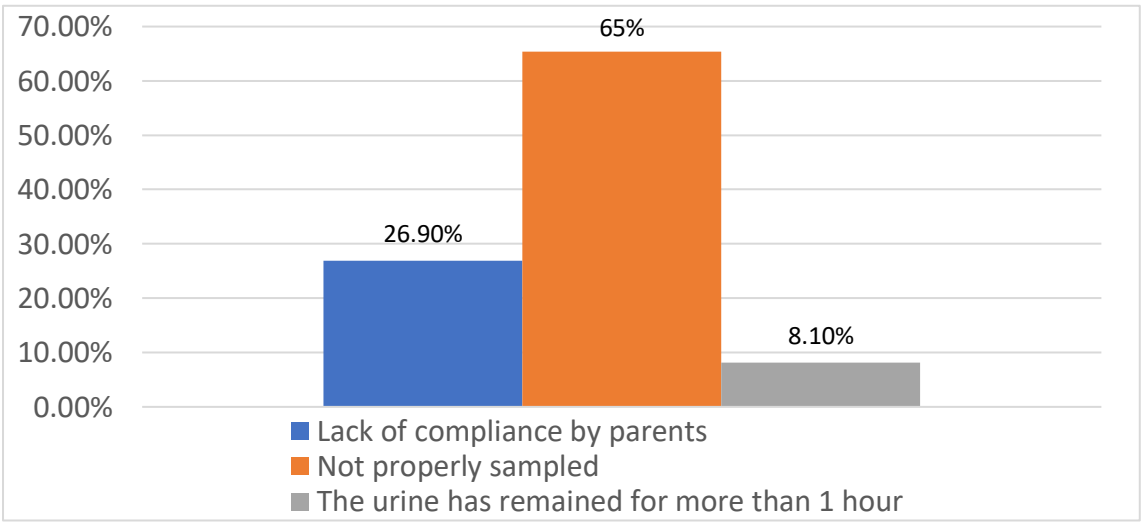
Figure 4. A member of the team performing a preventive examination



IV.2.3. Experience working with children at risk of UTI

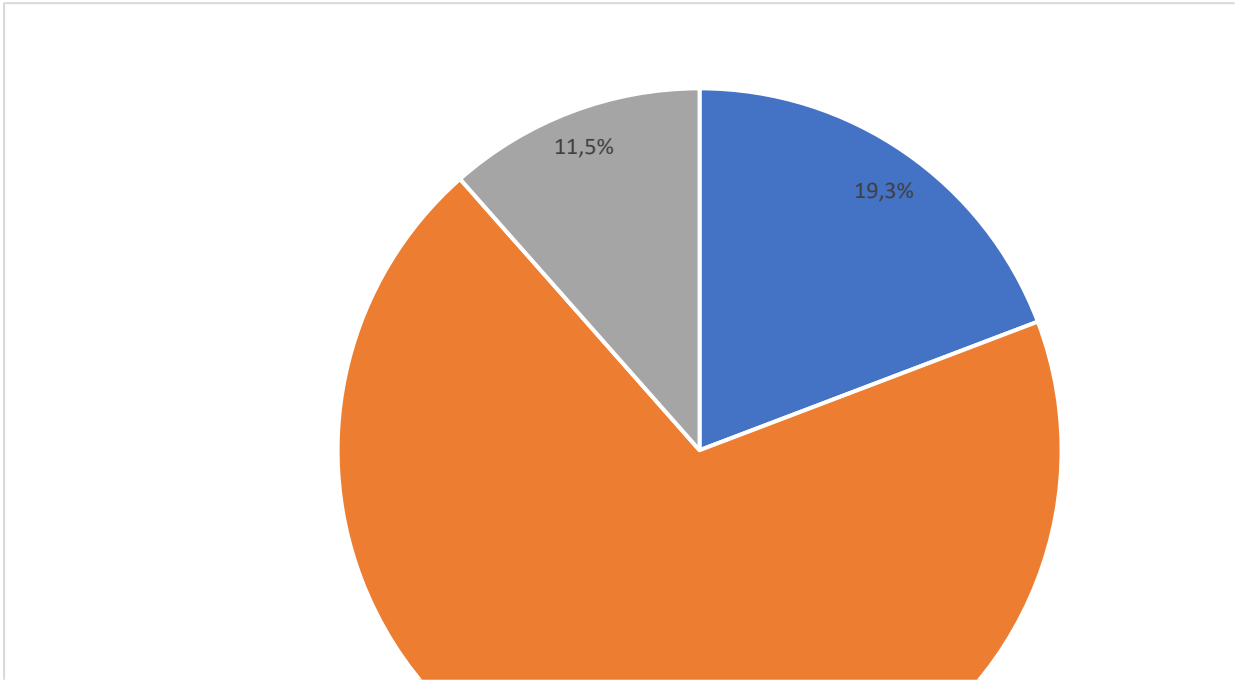
Over half of responding GPs (n=16, 61.5%) stated that the main method they recommend to parents for sample collection is through 'collection bags' or by placing a sterile container under a medium stream of urine (n=8, 30.8%). In the cases in which the results of the examination after taking a sample were compromised, GPs indicated as the main reasons the incorrectly taken sample (30.8%) or stagnant urine (19.2%) (Figure 5).

Figure 5. Most common reasons for compromising urinalysis results



Most GPs have on average about 10 diagnosed children with UTI (n=18, 69.2%), a small proportion (n=3, 11.5%) have about 30 cases or no such patients (n=5, 19.3%) (Figure 6). It is interesting to note that 61.5% (n=16) of respondents indicated that they had patients with asymptomatic UTI, while only 38.5% (n=10) of GP's indicated that patients had symptoms.

Figure 6. Children with diagnosed UTI in PHC



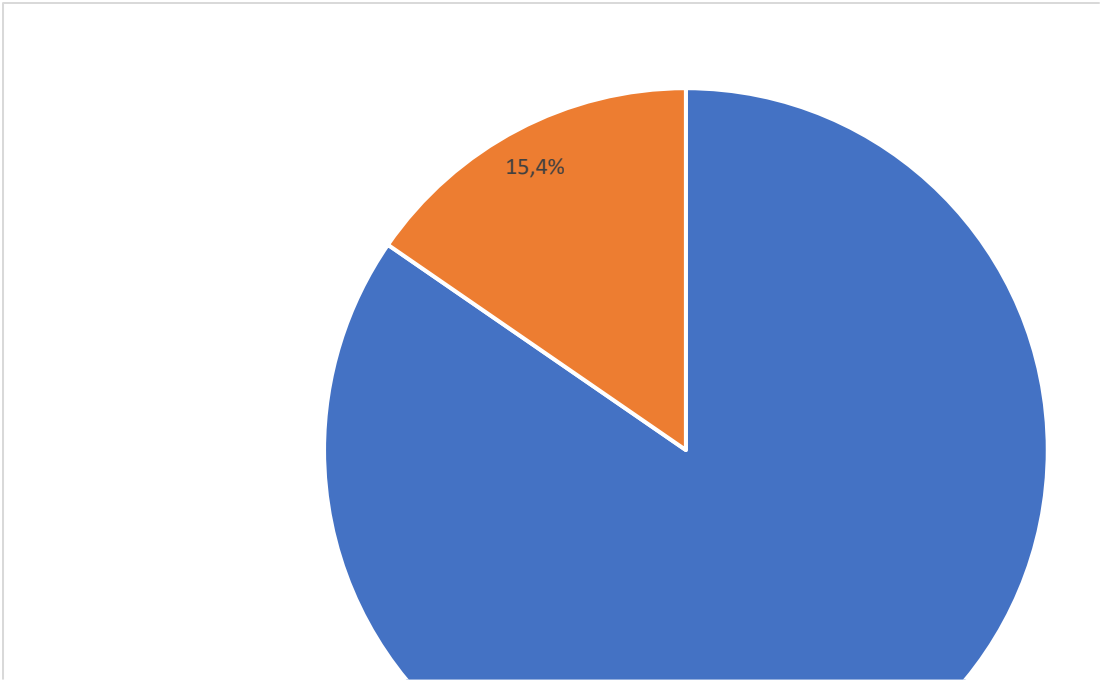
Most often, GPs indicate that urinary tract infections occur in early childhood (n=22, 84.6%) and less often in infancy or newborn (table 11) as more than 84.6% (n= 22)

of the GPs participating in the study declared that they take urine samples before starting antibiotic treatment (Figure 7).

Table 11. Age of onset of the most common infection

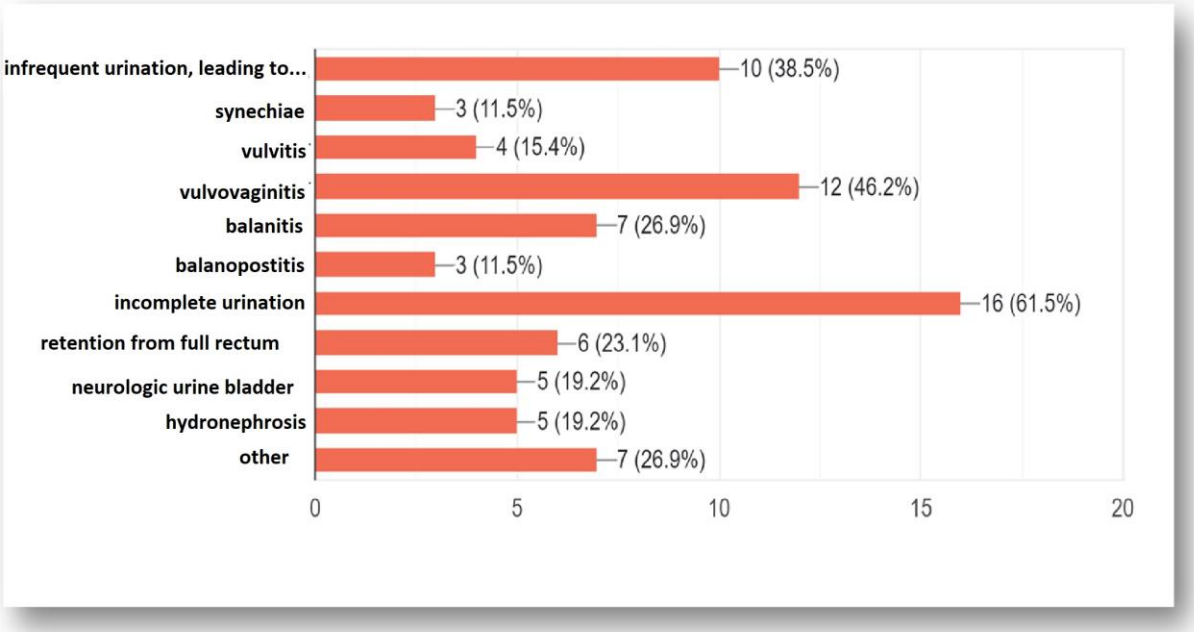
	№	%
Infancy	2	7.7 %
The period of the newborn	2	7.7 %
Early childhood	22	84.6 %

Figure 11. Urine culture before antibiotic treatment



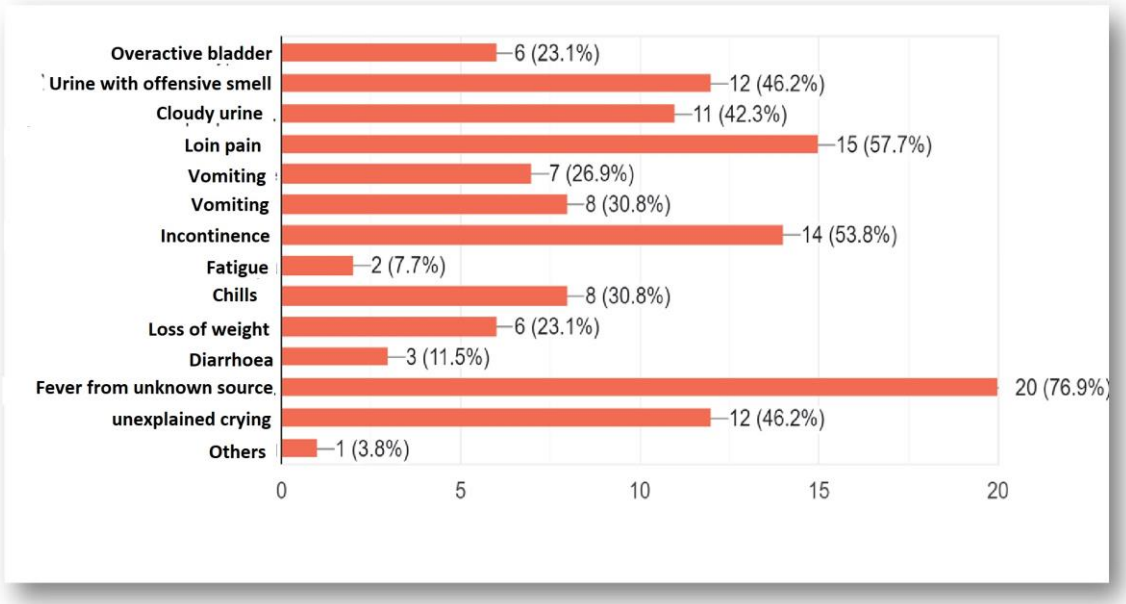
The general practitioners participating in the present study indicated a variety of risks associated with the development of urinary tract infection in childhood, which testifies to the multifacetedness and breadth of the problem.

Figure 12. The most frequent risks for the development of UTI in childhood indicated by GP espondents



As leading symptoms for urinary tract infections, GPs indicate the presence of blood in the urine, cloudy color, feverishness and indistinct crying. The observations and opinions of many of the respondents overlapped, and this is clearly seen in the results in the figure presented.

Figure 13. The leading symptoms of UTI in children that GPs encounter in their practice



The behavior of GPs when a urinary tract infection is suspected is to order FBC, urine and CRP and ultrasound of abdominal organs in more than 70% of the respondents (table 12).

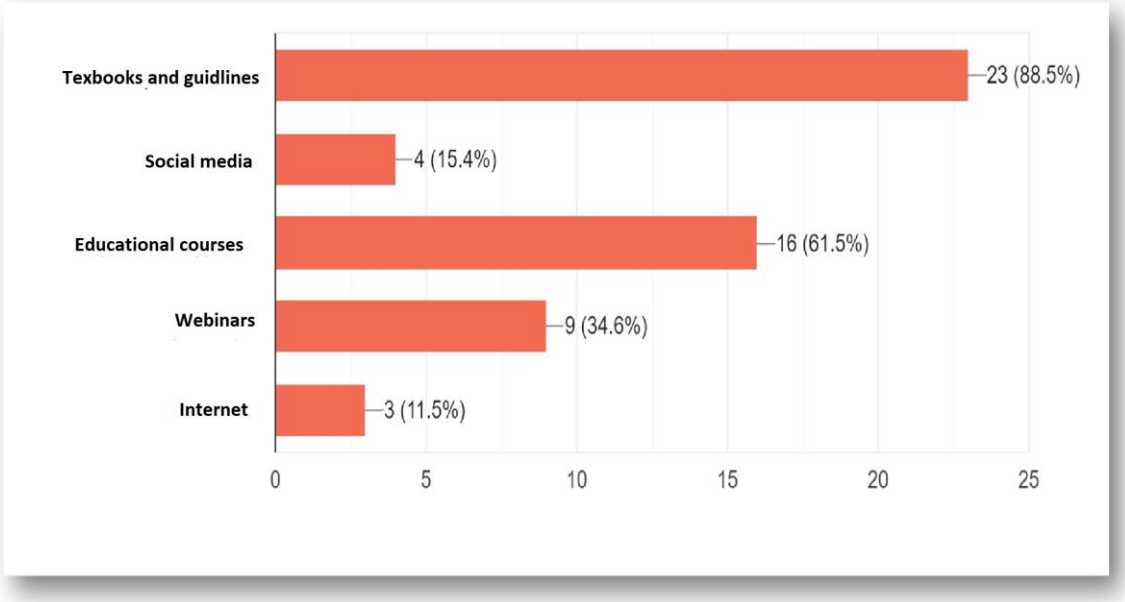
Table 12. Behavior of GPs in case of suspected urinary tract infection

	№	%
You start antibiotic treatment without tests	2	7.7 %
You refer the patient for a consultation with a pediatric nephrologist	2	7.7 %
You order FBC, urine and CRP and abdominal ultrasound and after receiving the results you start treatment	11	42.3 %
You order FBC, urine and CRP tests	9	34.6 %
Others	2	7.7 %

IV .2.4. Awareness and referrals

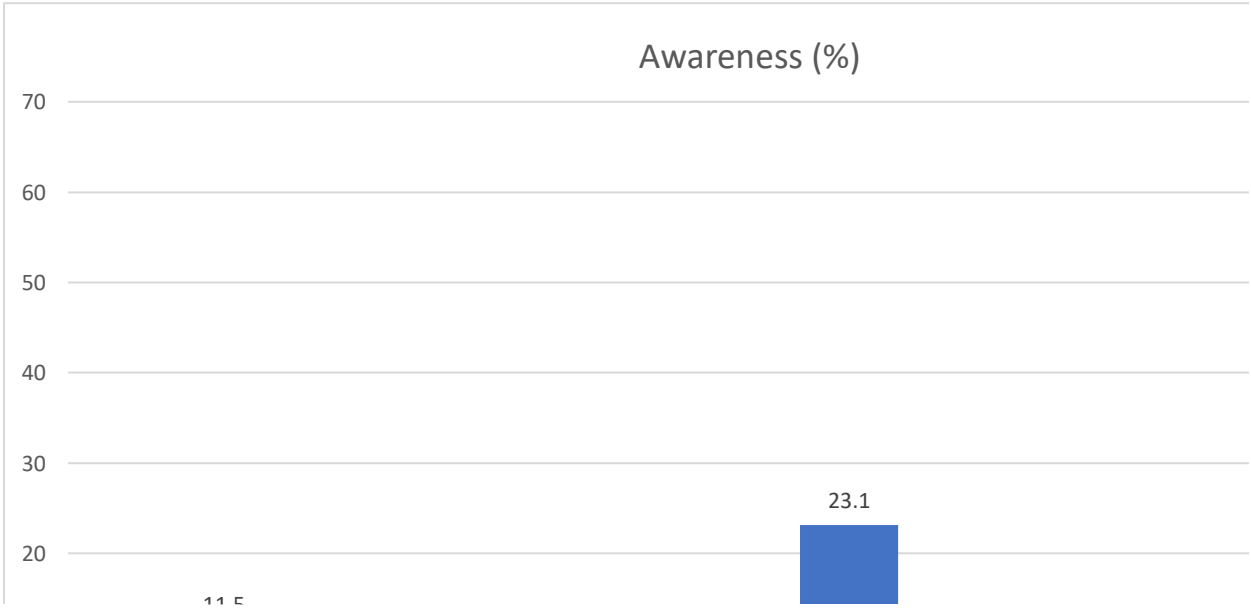
GP's use different sources of information about UTI. The primary source they cite is textbooks and manuals combined with training courses and webinars. Other information channels that improve the awareness of doctors are social networks and the Internet (figure 14).

Figure 14. Main source of information on UTI for GPs



More than 50% of GP’s support the idea that parental awareness in any form about early diagnosis and treatment of children with UTI is particularly important for timely care of children. Methods such as parenting courses, brochures and information from social networks are among the ideas that GP’s indicate as important for good medical practice (Figure 15).

Figure 15. Early diagnosis and parental awareness



The main recommendations that GPs give to parents in relation to the prevention of complications from STIs are related to the child's hygiene, removing diapers and a healthy diet including more fiber, fruits and vegetables.

IV.3. Descriptive analysis of parent respondents

VI .3. 1. Description of the parent sample

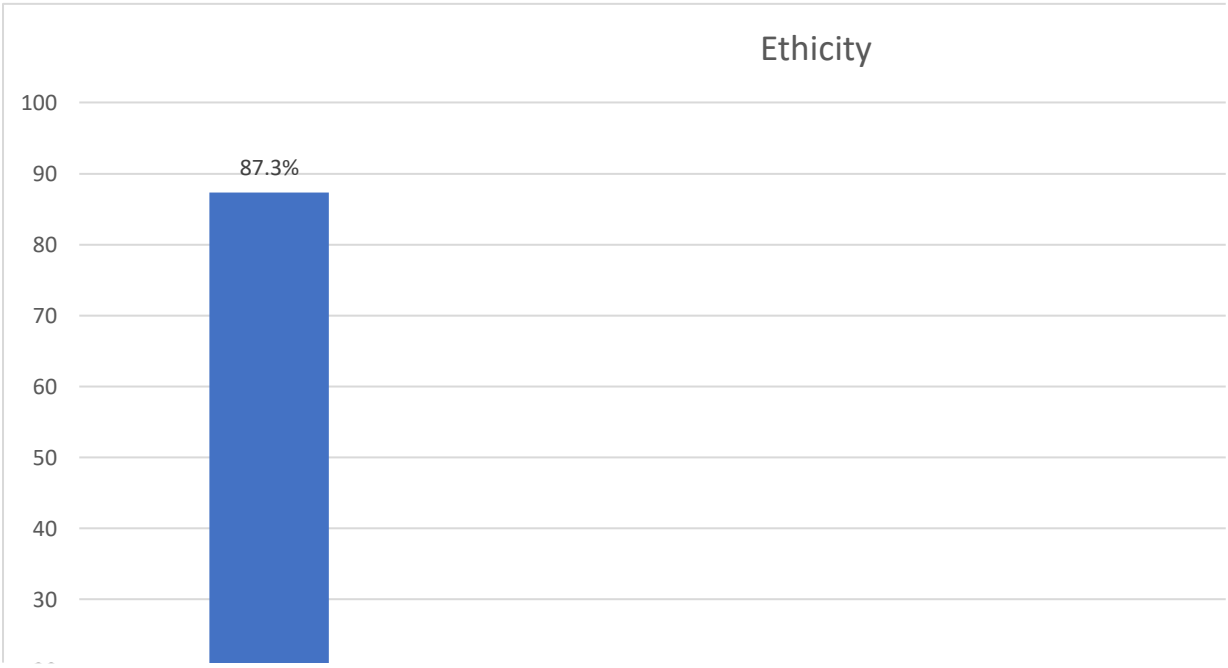
Parents participating in the study were between the ages of 18 and 54, with 80% of them (n=111) between the ages of 25 and 44 (Table 13).

Table 13. Age of parents

	№	%
18 – 24y	2	1.60%
25 - 34 y	58	46.0 %
35 - 44 y	53	42.1 %
45 - 54 y	13	10.3 %

About 95% of the parents were women (n=119) and only 5% were men (n=7). The sample included parents with predominantly Bulgarian ethnicity (Figure 16) and acquired university education (Figure 17).

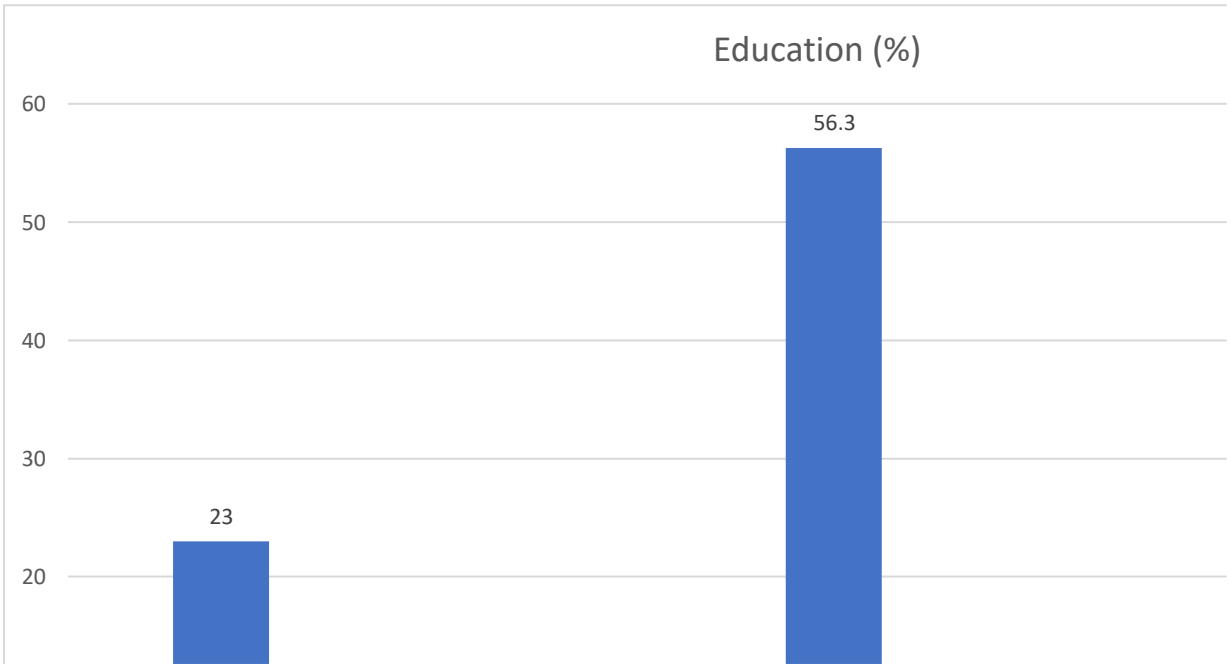
Figure 16. Ethnic origin



On average, parents declare that they have one (55.6%) or two children (34.9%), and 9.5% of them declare that they have more than two children. Most parents (56.3%) had a master's degree, followed by bachelor's degrees (23%) and those with secondary

education (10.3%) (Figure 17). More than 66.7% of the parents are married or living together with a partner (22.2%). A small percentage of parents were divorced (8.7%), single/unmarried (0.8%) or without a partner (1.6%).

Figure 17. Parents' level of education



Parents declare that most of them are employed on a permanent contract (54.8%) or on maternity leave (28.6%) (table 14). Over 95% of the parents live in an urban environment (48.4% on the outskirts of the city; 46.8% in the city center), with only 4.8% living in the countryside.

Table 14. Employment of parents		
	брой	%
Unemplyed	6	4.8 %
Housewife	12	28.6 %
Retired	1	28.6 %
Permanent job	71	28.6 %
Maternity	36	28.6 %

IV.3. 2. Health prevention - awareness and consultations

The results regarding parents' awareness of the health-related package of services show a high level of awareness, because more than 90% of parents state that they are aware of the mandatory preventive examinations and examinations covered by the NHIF (table 15).

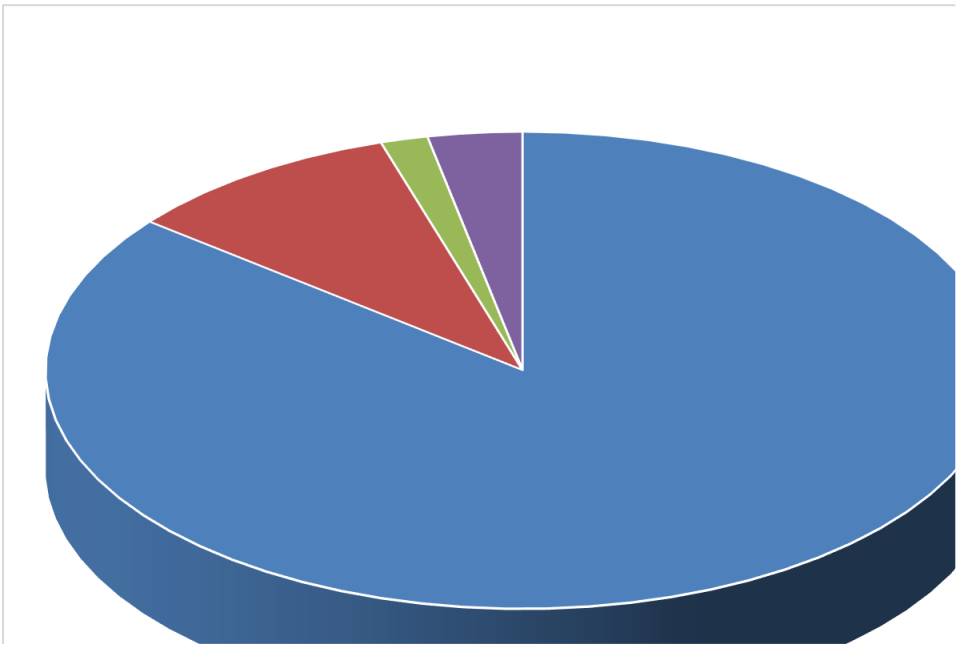
Table 15. Awareness of a health package covered by the NHIF		
	№	%
Yes	78	61.9 %
No	2	1.6 %
Rather Yes	37	29.4 %
Rather No	9	7.1 %

The high health awareness of parents is also explained by the fact that more than 86% of them regularly visit children's consultations under the "Children's Health" program and therefore receive information mainly from the child's personal doctor. A very small proportion of parents do not receive any explanatory information (8%) and do not attend child counseling (4%) (table 16).

Table 16. Awareness of consultations under the "Children's Health" program at the General Practitioner's Office		
	№	%
Child's GP	108	86.4 %
I don't get information	10	8.0 %
Don't attend regular medical consultations	5	4.0 %

Good consultation practices among the children of the sampled parents was also due to the fact that around 96% of parents said they trusted their treating GPs (Figure 18).

Figure 18. Trust in GPs



Parents also declare confidence in immunization practices and recommendations. Over 80% of respondents stated that their children were immunized (table 17).

Table 17. Immunization of children	№	%
Has incomplete immunization status due to illness	6	4.9 %
Not immunized due to refusal of immunizations	1	0.8 %
Not immunized due to delay	5	4.1 %
With mandatory and recommended	41	33.3 %
With the mandatory immunizations	70	56.9 %

IV.3.3. Awareness and consultation for suspected urinary tract infections

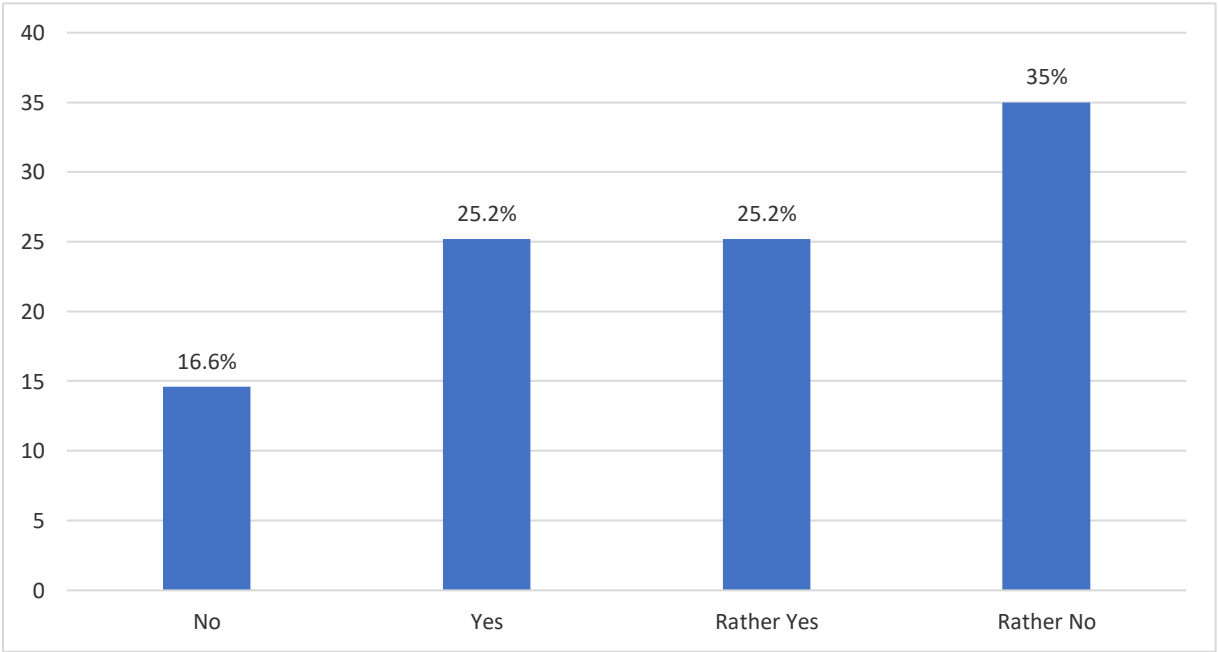
Within the framework of the present study, the question regarding the degree of awareness of parents regarding the risk factors for the development of UTI in childhood was also investigated.

The results clearly showed that most parents do not know anything about the risks and have not been informed by anyone about it. The fact that more than 68% of parents declare that they are not aware of the possible consequences that can arise from a UTI is also worrying (table 18).

Table 18. Awareness of risks and consequences of UTI				
	Awareness of risks for developing UTI		Awareness of the consequences of UTIs	
	№	**%**	**№**	**%**
Yes	29	23 %	29	23.0 %
No	47	37.3 %	60	47.6 %
Closer to yes	25	19.8 %	10	7.9 %
Closer to no	25	19.8 %	27	21.4 %

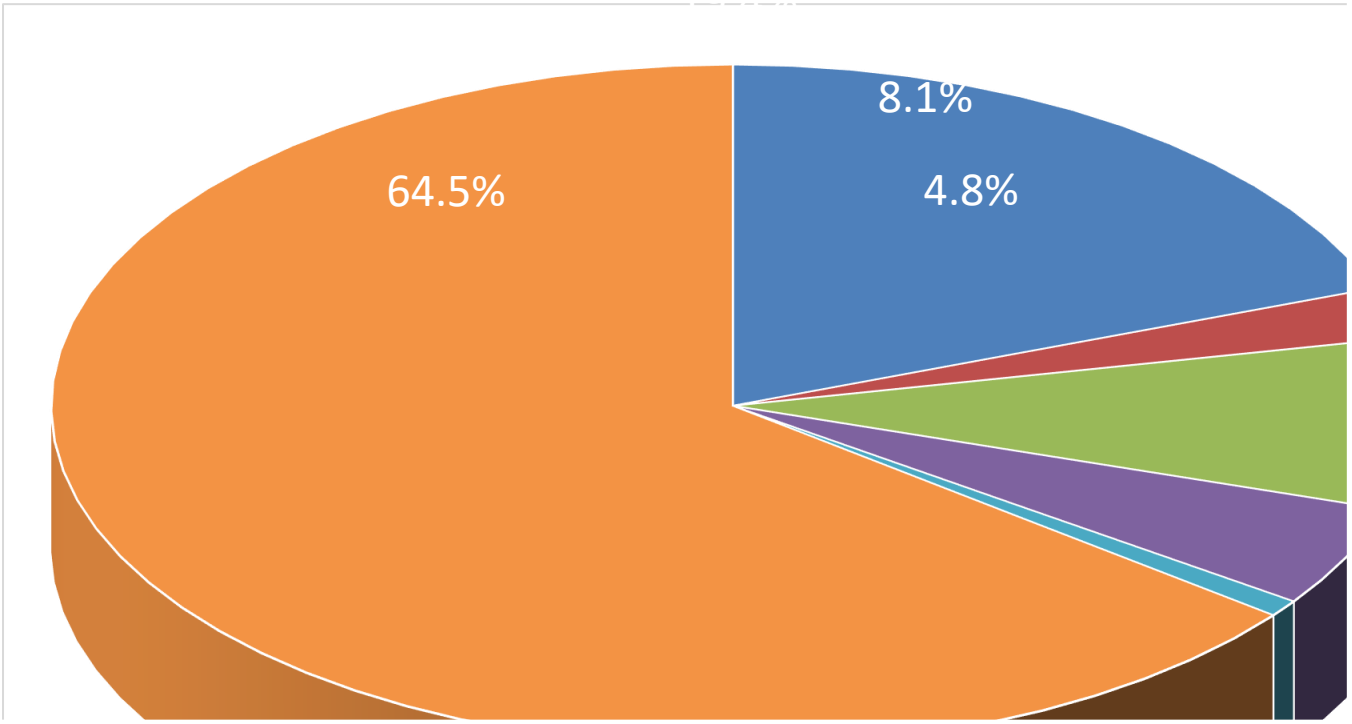
The parents included in the study also expressed a feeling of uncertainty about their own level of awareness about the prevention of the risk of developing urinary tract infections. Over 60% share their worrying uncertainty, with around 40% of them stating that they do not feel misinformed on this issue (Figure 19).

Figure 19. Feeling informed about UTI risk prevention



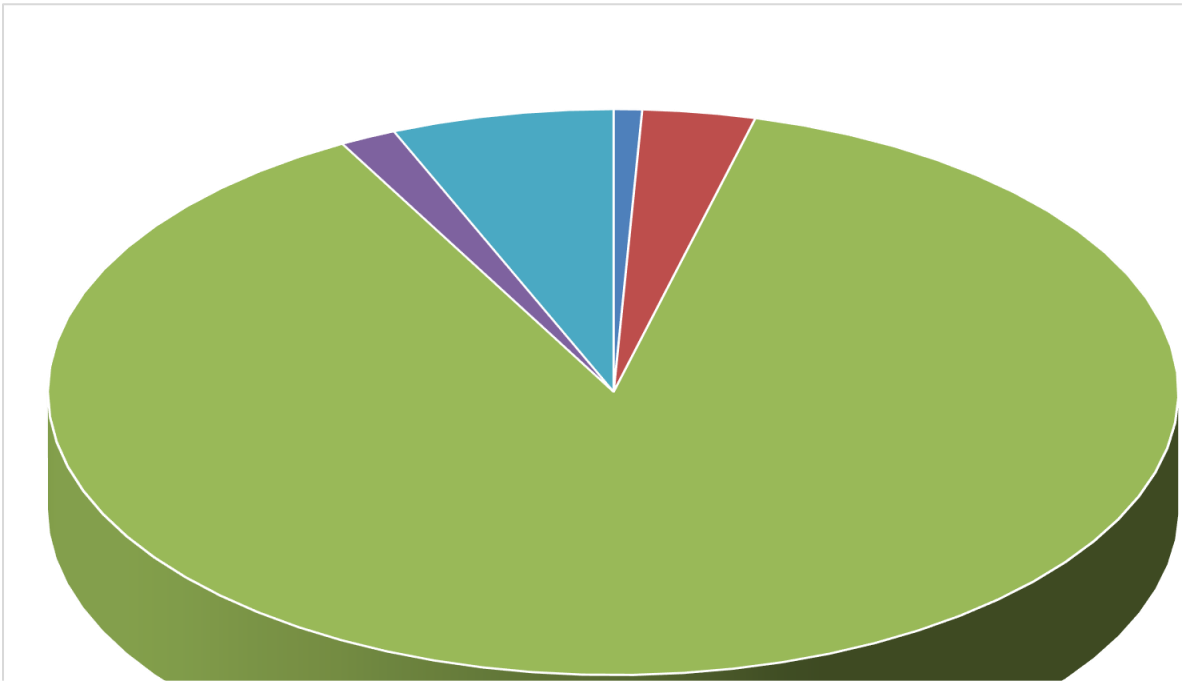
As alternatives for consultation on worrying health issues, parents indicated various forms of awareness such as youtube, facebook and other online information sites (Figure 20).

Figure 15. Most common alternative sources of child health information of greatest interest to parents



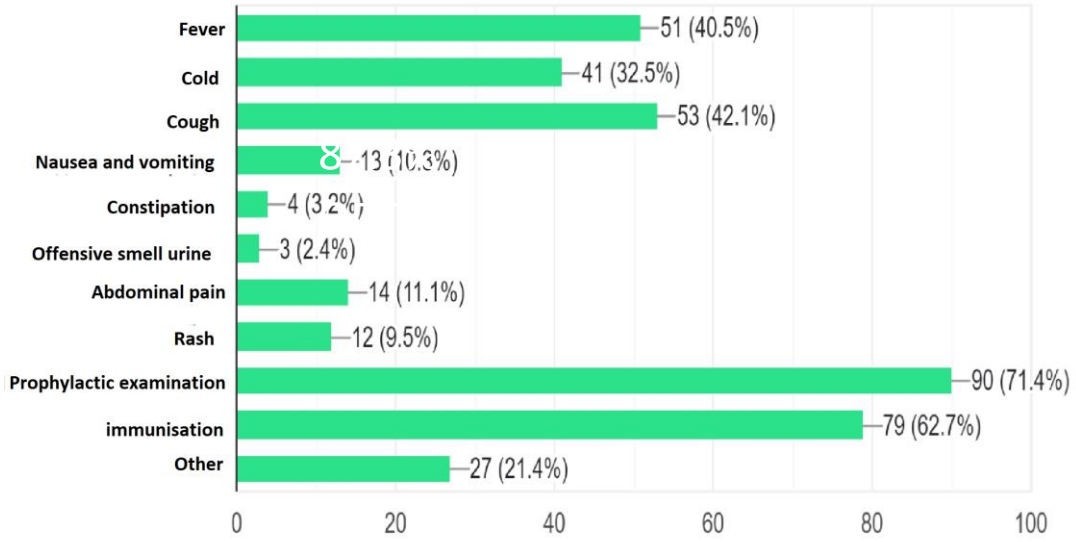
As the main source of information, parents indicate the GP (figure 16).

Figure 16. Most frequently requested information by parents regarding issues related to the child's health problems



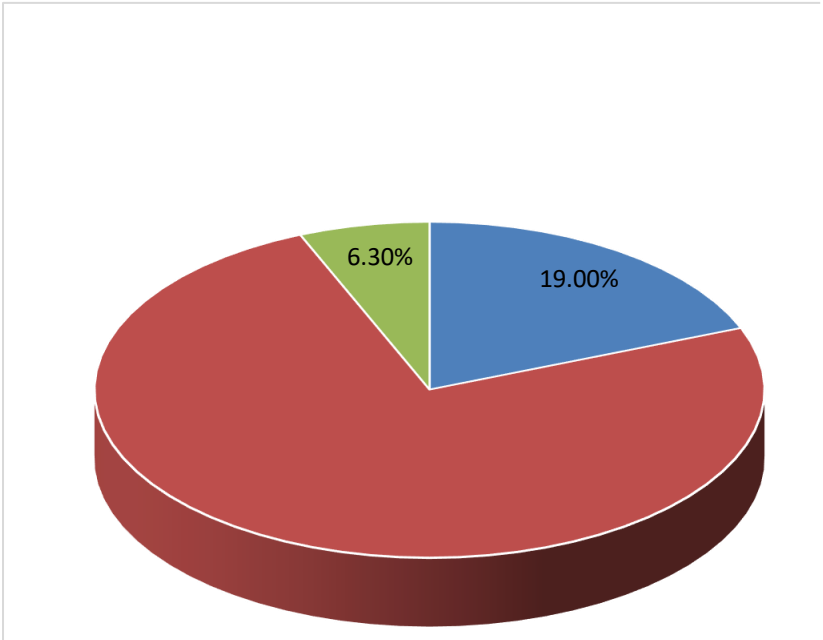
An unexplained febrile condition is one of the most common reasons why parents visit the GP to see their child. The information we received in our research about the most common reasons for visiting the GP is presented in Figure 17.

Figure 17. Most common reasons why parent respondents visited the GP



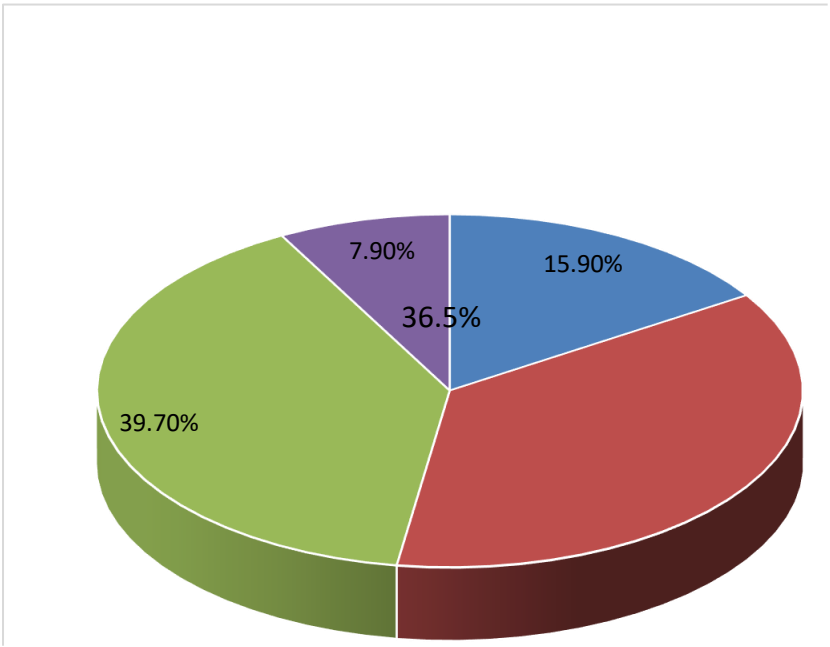
19% of the surveyed parents reported a proven UTI in their child, and 6.3% did not know if their child had a UTI in the past, 74.6% of the surveyed parents answered that their child did not have a UTI (Figure 18).

Figure 18. The frequency of UTI among the children of the surveyed parent respondents



Parents do not recognize the symptoms of a UTI and rarely associate indicators of infection with the possibility of a UTI. For example, parents declare that they do not associate the cases in which their child has an elevated temperature with the possibility of UTI in more than 76% of cases (figure 19).

Figure 19. Temperature as an indicator of UTI in childhood



The most preferred method of measuring temperature by parents is with a thermometer under the arm (71.5%), very few parents do not use a thermometer at all (4.1%) or measure the temperature in the anus, mouth or ear. The results are shown in Table 19.

Table 19. Method for measuring the child's temperature

	№	%
with a thermometer under the arm	88	71.5 %
with a contactless thermometer	16	13.0 %
with hand placed on forehead	5	4.1 %
with a thermometer in the anus	8	6.5 %
with a thermometer in the mouth	1	0.8 %
with a thermometer in the ear	5	4.1 %

Perhaps another explanation for the low awareness of the symptoms and risks of UTI is the fact that parents share that very few children have congenital abnormalities of the

urinary tract (1.6%), hereditary burden from a relative (17.5%) or a situation where their child had a urinary tract infection (19%) (table 20) .

Table 20. Children's risk history

	Relatives with urinary disease		Congenital anomaly of urinary system		Child with UTI	
	№	%	№	%	№	%
Yes	22	17.5 %	2	1.6 %	24	19.0 %
No	86	68.3 %	111	88.1 %	94	74.6 %
I don’t know	18	14.3 %	13	10.3 %	8	6.3 %

IV.3.4. Parental experience with uroculture studies

Urine collection was a challenge for over 30% of parents, and 18.3% of them stated that they did not receive sufficient explanations on how to collect urine for their child's testing (table 21).

Table 21. Difficulties in collecting urine for urine culture

	Difficulties in collecting urine for uroculture		Information on how to collect urine for UTI testing	
	№	%	№	%
Yes	39	31 %	103	81.7 %
No	87	69 %	23	18.3 %

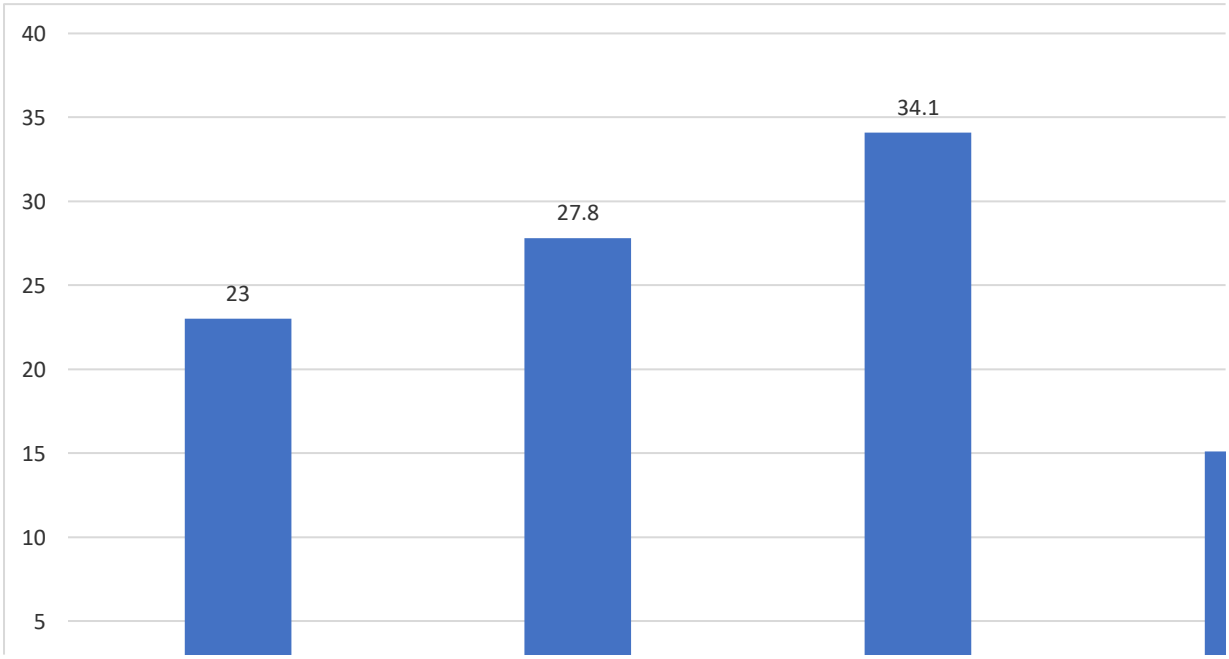
The most common method used by parents to collect urine was by placing a sterile container under an average stream of urine (43.7%) and by using "collection bags" to collect urine attached to the child's skin (42.9%). While the least applied are by collecting urine with a swab in the diaper or from the potty (table 22).

Table 22. Urine collection method		
	№	%
From the potty	5	4.0 %
By collecting urine with a swab (placing a swab in the diaper)	5	4 .0%
By placing a sterile container under a medium stream of urine	55	43.7 %
Through "collector bags" to collect urine, attached to the child's skin	54	42.9 %
Via "urine collector for medium portion of urine"	7	5.6 %

The fact that many parents declare long-term wearing of diapers, which is a prerequisite for the occurrence of UTI, is worrying.

For example, about 15% of parents stated that their child wore a diaper for more than 2 years, and only 23% of parents reported that their child used a diaper for up to 1 year (Figure 20).

Figure 20. Diaper wearing duration



V. DISCUSSION

UTI are known to be difficult to diagnose in PHC because the history and examintion results are often nonspecific and timely urine sampling is required.

Collecting urine samples from infants and children who are not potty trained is a major challenge for parents and GPs.

The diagnosis of UTI can only be accepted with the support of the necessary tests, which necessarily includes a urine test. Difficulty obtaining a sterile urine sample in children often delays the diagnosis of UTI.

Test strips are useful for screening, but urine culture is required for diagnostic confirmation.

Antibiotic therapy should be administered carefully because of increasing antibiotic resistance.

In our study, we conducted an analysis over a period of 40 years of Bulgarian and foreign literary sources according to the databases in PubMed and Google Scholar, we used keywords: urinary tract infections, childhood, parents, prevention, general practitioner, symptoms, risk factors, febrility, uroculture.

The results of the data analysis helped us to understand the need to conduct a study in our country to identify the problems regarding UTI in childhood in PHC.

Although there are many studies worldwide on UTI, it remains unclear which factors are the most important barriers to prevention, early diagnosis and adequate treatment.

From the analysis of the literature data, we understood that in recent years, attention has been focused on the search for a solution to improve the timely diagnosis of UTI, as well as the identification of risk factors.

Barriers to childhood UTI management in PHC that we identified and explored are:

1. Assumption by GPs and parents of a low prevalence of UTI compared to upper respiratory tract infections.

2. Insufficient time to talk about the prevention of the risk of UTI development when conducting a children's consultation in the PHC.

3. Non-specific course of UTI in childhood.

4. Difficulties in collecting sterile urine.

5. Lack of information materials to introduce and direct the attention of parents to the problem of UTI, including risk factors, sterile urine collection methods, prognosis.

6. The comment on the obtained results was made on the basis of a study conducted in three directions:

7. Survey conducted among 126 parents from Varna region.

8. Survey conducted among 27 general practitioners from Varna region.

9. Epicrisis data of 110 patients from the pediatric department of Saint Marina Hospital -

10. Varna.

The patient sample from the epicrisis data analysis included 110 patients with a mean age of 7.32 ± 5.1 and height 117 cm ± 32.5. About 56.4% of patients were female (n=62) versus 43.6% male (n=48). This prevalence is comparable to literature data on the incidence of UTI.

Studies at a different time interval by Bauchner et al., 1987, and Shaikh N et al., 2018 found a prevalence of UTI prevalence among girls of 1.2% to 8%. The higher frequency in

girls is explained by the anatomical structure, shorter urethra and shorter distance to the anal region.

Shaikh N et al. (2018) found a prevalence of UTI of about 7% (5.5–8.4%) in febrile children aged <24 months of both sexes, with or without additional UTI symptoms.

In boys, infection is more common in the first 3 months of life and then shows a downward trend, while in girls the prevalence is highest in the first 12 months of life (Shaikh N et al., 2008).

Studies by Bachur et al. (1987) and Zorc J. et al. (2005) showed that uncircumcised status and high temperature (rectal temperature ≥39°C) were risk factors for developing UTI in boys during the first year of life.

Uncircumcised status in boys has been identified as an important risk factor for UTI and appears to have a greater impact on younger children (Bachur et al., 1987; Wiswell et al., 1993; To T. et al., 1998; Zorc J . et al., 2005; Gorelick M.H., Hoberman A.T., 2003).

More studies have reported an average incidence of about 5% of UTI in infants who had a fever with no clear primary source in a normal physical status. González M et al. (2019) conducted a multicenter prospective study of boys younger than 12 months and girls younger than 24 months with unexplained febrile status ≥39°C and found a higher incidence of UTI (15.5%) compared to the incidence of UTI reported in previous studies.

The results of our study showed that most GPs had an average of about 10 diagnosed children with UTI (n=18, 69.2%), a small proportion (n=3, 11.5%) had about 30 cases or no such patients (n=5 , 19.3%). It is interesting to note that 61.5% (n=16) of respondents indicated that they had had patients with asymptomatic UTI, and only 38.5% (n=10) of GPs indicated that patients had developed symptoms.

Our GP respondents indicated that urinary tract infections most often occurred in early childhood (n=22, 84.6%) and less frequently in infancy or the newborn.

Analysis of literature data on the prevalence of UTI shows that an awareness and understanding of the incidence of UTI in different subgroups of children allows the physician to roughly estimate the likelihood of urinary infection in childhood. This information is important in the evaluation of a child with suspected UTI (Shaikh N, Morone NE et al., 2008).

The results of these studies are valuable for practice and include:

• The overall prevalence of UTI is approximately 7% in febrile infants and young children, but varies by age, sex, and circumcision status.

• Prevalence is highest among uncircumcised male children, especially those under three months of age.

• Female children have a two to four times higher prevalence of UTI than circumcised male children.

From the study, we found that an assumption of a low prevalence of UTI compared to upper respiratory tract infections by GPs and parents is a risk factor for delaying or missing UTI in childhood.

The main source of information about UTI that GPs indicated in our survey were textbooks, manuals, training courses and webinars. Other information channels from which doctors draw information are social networks and the Internet.

On average, the surveyed GPs in our study spend between 15 minutes (34.6%) and 20 minutes (42.3%) for one pediatric consultation. A small part of the GPs who participated in the survey spend between 5 (3.8%) and 10 (7.7%) minutes for consultation with children.

Most of the GPs participating in the survey work under the "Child Health" program of the NHIF (73%), and about 27% stated that they do not work under the NHIF program.

In terms of referral practice, the results showed that in children over 6 months of age, 61.5% of GPs (n=16) stated that 100% of their patients had mandatory prophylactic examinations. Examinations include an ultrasound examination of the kidneys, FBC and urine.

For children over 1 year of age, the percentage of preventive examinations performed drops to about 54%. This is explained by a reduction in the frequency of preventive examinations from 12 to 4 times a year, visits become three times less frequent, and parents often forget to seek a general practitioner themselves, unless it is necessary for an acute reason.

Skipping regular prophylactic examinations at GPs skips the prevention of the risk of developing UTIs in childhood.

To minimize the risk of long-term complications, it is important that urinary tract infections are recognized early and treated quickly and adequately.

The results of our study show that the main person who informs patients about the need for prophylactic examinations, how to conduct them and accompanying examinations, is mainly done by general practitioners (92.3%), and in rare cases - by nurses working with them (7.7 %). The practice is the same regarding the person from the team who performs the preventive examination of the patients.

The care of the GP or nurse conducting the preventive examinations should be aimed at familiarizing the family with information in understandable language (Gates A, et al., 2018). Parents should be fully informed about the risk factors for the development of UTI, and if necessary, familiarize themselves with the possibilities of diagnosis, treatment and consequences.

As a first step towards developing informational tools to increase parents' knowledge of UTI in childhood and implementation in PHC, we conducted a systematic review of their experiences and information needs.

Methods such as parenting courses, brochures and information from social networks are among the ideas that GPs point to as important for good medical practice.

The recommendations that GPs give to parents in relation to the prevention of complications from UTIs are related to the child's hygiene, removing the diaper and a healthy diet, including more fiber, fruits and vegetables.

Results of the study by Harmsen M. et al. (2007) showed that a large percentage of parents recognized the typical symptoms of UTI. But, according to the parents, neither they nor the GP thought about UTI in case of atypical symptoms.

The realization that UTI can be a serious disease with consequences in the future is usually a late realization by parents. They reported that the reason for the delay in diagnosis was because health workers often did not explicitly mention the consequences (Harmsen M. et al., 2007).

The results of our study show that parents' knowledge about UTI, including symptoms, risk factors, prognosis, consequences and urine collection for testing, varies, with the majority of parents lacking the necessary knowledge and never being informed about it.

We found very few such studies in the literature, which informs us that there is a need to work in this direction in order to find an appropriate way of sharing information, according to the environment and culture in which it is applied.

Involving the GP or health worker in disseminating information to parents about STIs in childhood is a good decision (Neill, S., 2008).

The results we obtained are that parents trust the information received from doctors more than that from other sources.

Similar to the results of the Owen et al., 2003 study, parents in our study also reported that they wanted more easily accessible, detailed, and reputable information about UTI on the Internet.

When asked which formats as a source of information about the child's health are of the greatest interest, the parents in the survey we conducted prefer a complex approach 64.5%, and they would most trust a website 19.4%, followed by Facebook 8.1% and a brochure 4 .8%.

These results show the need for GPs to introduce in their individual practice support materials, brochures, social networks (Facebook, Twitter, LinkedIn, Instagram, TikTok, Snapchat) and sites (YouTube, Pinterest), as well as their own sites.

Because of widespread misconceptions about the symptoms of UTI in childhood, parents may delay seeking medical attention if obvious signs (eg, changes in urine odor) are not present, even if clinically unsubstantiated.

For infants aged 0 to 24 months, the most common symptom is a high fever for which there is no other apparent cause, but there may also be non-specific symptoms such as vomiting, irritability or jaundice (Gates A, et al., 2018).

In the epicrisis data study, the results we obtained described 98.2% of patients with impaired general condition (n=108), following fever, abdominal pain, frequent sick child, polyuria.

On the other hand, we obtained worrying results regarding the recognition of UTI symptoms by parents. They rarely associate indicators of infection with the likelihood of a UTI. In more than 76% of the surveyed parents, they declare that they do not associate the cases in which their child has an elevated temperature with the possibility of UTI.

Many parents are afraid of a high temperature, which is why they often conduct unnecessary and aggressive self-medication.

Initiating immediate therapy for fever is associated with reassurance of parents/guardians and has no clinical rationale.

The use of physical methods and medical treatment is recommended for high fever ≥39°C, children at risk of febrile seizure or cardiovascular disease.

An aggressive approach in the treatment of a febrile condition runs the risk of masking the symptoms of UTI when this disease is not known or thought about.

In the scientific literature, urine culture is accepted as the gold standard for the diagnosis of UTI (Stephens G.M. et al., 2015). One of the leading problems in the diagnosis of UTI is obtaining sterile urine for culture.

From the obtained results, it can be seen that the parental experience with urine tests has difficulties. Urine collection was a challenge for over 30% of parents, and 18.3% of them stated that they did not receive sufficient explanations on how to collect urine for their child's testing.

In our study, the largest percentage of surveyed GPs and parents responded that they preferred the "clean catch" and "by attaching a sterile bag" method of urine collection. The advantages are that the methods are non-invasive, and urine is obtained relatively easily and painlessly (Doern C.D., 2016; Desai D.J. et al., 2016).

The disadvantage of non-invasive methods of urine collection is easy contamination with periurethral flora, especially in girls and uncircumcised boys, and it often takes sever-

al attempts or days to collect urine (Robson W.L., Leung A.K., 2011; Simões e Silva A.C., Oliveira E.A., 2015).

Of the bacteria isolated from the urocultures taken from the epicrisis data, in 9 patients the following were registered: E.coli, E.foecalis, Klebsiella, Morganella morgani, resistant to cephalosporins, Pseodomonas, and Str.piogenus. These data correlate with the scientific literature, and the presence of "sterile cultures" is explained by previously started antibiotic treatment in an outpatient setting.

The literature clearly highlights the need to develop new non-invasive urine collection methods and devices to ensure low contamination rates in non-potty-trained children.

Recent studies have shown that new techniques by stimulation of urination can speed up urine collection time to 5 minutes for urine collection by "clean catch" (Herreros Fernandez ML et al., 2013; Kaufman J, Tosif S et al., 2017).

For faster collection of clean urine in infants Kaufman J. et al. (2017) conducted a randomized controlled trial and developed a new method of urine collection, the method was named “Quick-Wee”.

Apart from urinalysis, peripheral blood count and C-reactive protein, ultrasound examination (US) of the kidney and bladder is the method of first choice for imaging the urinary tract non-invasively, safely, easily to perform and without radiation (Leung A.K., 2011).

Ultrasound examination is a useful method in predicting the risk of renal scarring as well (Shaikh N., Hoberman A., 2018). In acutely ill children and children unresponsive to standard antimicrobial treatment, renal and bladder ultrasonography should be performed as soon as possible to rule out urinary tract obstruction or renal abscess (Shaikh N., Hoberman A., 2018).

Within the framework of the present study, the question regarding the degree of awareness and knowledge of parents about risk factors, prevention of risk for development, as well as the consequences of UTI in childhood was also investigated.

The results clearly showed that most parents do not know anything about the risks and have not been informed about it by anyone.

Circumcision is the number one risk factor in childhood, uncircumcised boys are at higher risk of UTI. Circumcision reduces the risk of UTI in boys, but involves a surgical procedure (Singh-Grewal D. et al., 2005).

Routine circumcision in the neonatal period is not recommended, as 110 to 140 male infants would need to be circumcised to prevent one episode of UTI (Desai D.J., 2016). Topical corticosteroid applied to the distal stenotic part of the foreskin can be taken as a measure in boys with recurrent UTIs (Williams G.J., et al., 2012).

Constipation and urinary retention are frequently cited risk factors in the scientific literature, making regular bowel and bladder emptying habits prevent UTI, and if constipation is present, it should be properly treated (Korbel L. et al., 2017; Leung A.K., 2011; Leung AK, Chan PY. et al., 1996; Robinson J.L., Finlay J.C., et al., 2015).

Breastfeeding has a protective effect and protects infants from UTI (Pisacane, A., et al., 1992). In a study by Marild et al. (2004) diagnosed children with UTI had a shorter duration of breastfeeding compared to controls.

The results did not show statistically significant differences in terms of obesity of the patients (χ^2=2.59, p=0.587), but percentage showed a greater preponderance of underweight girls (16.9%) and preponderance of overweight among boys (41.3 %).

Su Yeong Ko et al. (2018) demonstrate that obesity and UTI have a strong association, especially in infants aged 0-5 months, and advise paying attention to febrile and obese

children (up to 5 months of age) visiting the doctor's office. For obese children up to 5 months of age, they also recommend having their urine tested for potential UTI.

A genetic component and environmental factors clearly play an important role in the development of UTI. If uropathogens invade the lower urinary tract, host and environmental factors contribute to the pathogen's ability to cause disease (Sobel J. D., 1997).

Antibiotics are used for UTI prophylaxis, but routine antibiotic prophylaxis is rarely justified to prevent a single episode of UTI, given the adverse effects and emergence of antimicrobial resistance (Leung AKC, 2019; Williams G, Craig JC, et al., 2019).

The benefits and risks of antimicrobial prophylaxis should be discussed on an individual basis (Robinson J.L., Finlay J.C., et al., 2015).

Antimicrobial resistance has increased in recent years as microorganisms producing extended-spectrum beta-lactamases have emerged (Delbet J.D., et al., 2017).

The choice of antibiotics should consider local data on antibiotic resistance patterns (Awais M., et al., 2015). It may be adjusted based on response to treatment and susceptibility testing of the isolated uropathogen (Leung AKC, 2011).

Parental fear is a risk factor for missed diagnosis of UTI. It is most often provoked by carrying out diagnostic procedures that are not fully understood (Karmona L. Et al. 2010), worries about the diagnosis and prognosis of their child.

According to Hendee WR (2012), delaying or avoiding a procedure due to fear can lead to greater health risks than those associated with the procedure itself.

Trust between doctor and patient, respectively parent, is the basis of treatment. Many parents do not believe that GPs are good sources of information about UTI. International studies of doctors' knowledge and clinical practice related to UTI confirm parents' experiences.

A survey of 251 US physicians found knowledge of prevalence and risk factors for childhood UTI to be suboptimal. Of the physicians surveyed, 60% reported that there was often a delay in diagnosing childhood UTIs, and only about ½ of them felt confident performing a catheterization to collect a urine sample (Bunting-Early TE, Shaikh N, et al., 2017).

Another study by A. Hadjipanayis (2015) among 1,129 European physicians found that 50% were unaware of common childhood UTI risk factors and many did not follow evidence-based diagnostic and treatment practices (Hadjipanayis A, et al., 2015).

In all studies, apart from Selekman RE, et al. (2017), parents want more timely information about their child's condition.

When the information received from their health centers was not satisfactory, parents looked for information on the Internet, but they also wanted to have it through traditional means such as posters, brochures and presentations (Harmsen et al., 2007).

VI. CONCLUSION

Although at first glance UTI seem to be an easy task to solve, in practice we encounter many problems and unanswered questions regarding their early diagnosis, research, treatment and prevention in childhood.

Strategies to reduce the risk of UTI and the risk of recurrent UTI in children have been described in the literature, but there is also much debate about the effectiveness of the measures that are applied to eliminate the risk and conduct prophylaxis.

Constipation, obesity, incomplete emptying of the bladder, insufficient fluid intake, hygiene, heredity, immunity and congenital abnormalities are among the leading risk factors for the development of UTI.

Uncircumcised boys are at higher risk of STIs in the first months after birth.

Girls after the first year are exposed to a higher risk of UTI because of the anatomical feature, the shorter urethra and its location near the anus.

With an existing risk factor, a virulent causative agent is also necessary, which in combination will cause UTI in the lower or upper parts of the urinary system and determine the severity of the disease.

Fever is the most common symptom in UTI, and unclear febrile status is a common problem in general practice. The differential diagnosis of febrility is diverse and requires clarification before starting treatment, because this is how the clinical picture of the course of UTI is most often masked and the problem remains smoldering.

Educating parents about temperature measurement, behavior in case of temperature condition of the child in different age periods is of great benefit and is one of the roles of GP.

Urinalysis is necessary to diagnose or rule out UTI in a large proportion of febrile children in PHC.

Urine culture is the gold standard for diagnosing UTI. Collecting urine and obtaining sterile urine for urinalysis at an age when children are not urinating voluntarily presents a great challenge and is often the cause of delayed results.

Urine sampling by suprapubic aspiration or catheterization has a low contamination rate and confirms the diagnosis of UTI, but is an invasive method, causes pain and suffering to both children and parents, and should only be used in cases of recurrent UTI. Severe VUR or difficulty using non-invasive methods of obtaining urine.

By using "collection bags" to collect urine, UTI can only be ruled out if the test strip is negative for both leukocyte esterase and nitrites or the microscopic analysis and urine culture are negative for both pyuria and bacteriuria.

The "clean catch" of a medium stream of urine is obtained after cleansing the external genitalia and has good diagnostic accuracy in potty-trained children. With the Quick-Wee method, with the help of stimulation, a medium stream of urine can easily be collected from babies as well.

Ultrasound examination of urinary system is increasingly used in general practice as a non-invasive method, easily performed by an experienced physician and represents a diagnostic criterion for UTI. It detects changes in the size, shape and echogenicity of the renal parenchyma, as well as obstructive lesions of the urinary tract.

In children with febrile UTI, antibiotic treatment should be initiated as early as possible to eradicate the infection, prevent bacteremia, improve outcome, and reduce the likelihood of renal involvement.

It is appropriate to take a urine culture sample before starting treatment, and if the antibiotic proves to be ineffective, to change it according to the result of the antibiogram.

Antibacterial prophylaxis is useful in children with recurrent UTI and severe VUR.

Hygiene is essential, including wiping from the anterior perineum to the anal area and regular rinsing of the perineum in girls and the foreskin and glans in boys.

The combination of an interactive way of presenting health information by the GP during a child's consultation/examination has the greatest result in the perception of the information by the parents. These results helped us to find suitable tools to increase parents' knowledge and to produce a brochure and poster.

For the future, new biomarkers are being developed to improve the diagnostic accuracy of UTI in childhood. Plasma NGAL is a more promising biomarker than serum procalcitonin, serum C-reactive protein and leukocyte values.

There is also a need to develop new and effective antibiotics, especially for UTI caused by multidrug-resistant microorganisms, and to establish the optimal dose and duration of treatment.

Parents also declare confidence in immunization practices and recommendations. Over 80% of respondents stated that their children were immunized. These results indicate a positive physician-parent interaction that benefits children's health. The development of new vaccines or the improvement of existing vaccines has the potential benefit of preventing the risk of developing UTI or reducing the number of recurrent UTI in children.

VII. CONCLUSIONS

1. In the study we conducted, we confirmed the data from the literature sources that GPs suggest a low prevalence of UTI in childhood. Knowing the prevalence of UTIs in different subgroups of children allows the doctor to tentatively estimate the probability of a urinary infection, resp. timely appointment of research to confirm the diagnosis of UTI.

2. The clinical presentation of UTI is very varied and nonspecific, especially in infants and young children, and this is one of the leading reasons for delayed or missed diagnosis of UTI. Fever may be the leading or only symptom. Children are often irritable, lethargic, refuse to eat, may have vomiting or diarrhea, and newborns are characterized by prolonged jaundice. In older children, typical symptoms are dysuria, frequent urination, secondary incontinence, abdominal or back pain, pain above the pubis, and positive succussio renalis.

3. Parents most often associate the unpleasant smell of urine with UTI, and in the absence of this symptom, they almost do not admit a problem with the urinary system. Children report crying or, less commonly, discomfort during urination.

4. In our available scientific literature, we found that there are a limited number of studies assessing parental knowledge, attitudes and practices about UTI in children, and most of them are from 10 or more years ago.

5. Parents' fear is often the result of a lack of information, and some of them were not aware of the symptoms of UTI in childhood and did not know the harmful health consequences they can lead to later.

6. Our results show that parental experience with urine tests has difficulties. Urine collection was a challenge for over 30% of parents, and 18.3% of them stated that they did not receive sufficient explanations on how to collect urine for their child's testing.

7. The results of our study confirmed the literature that GPs prefer adhesive bags to 'clean catch', catheterisation or suprapubic aspiration in infants for urine collection, as the method is non-invasive and 'easy to use'. But they also reported disadvantages: a high contamination rate, great effort on the part of parents, loss of valuable sampling time due to failed attempts, and subsequent delay in diagnosis and treatment.

8. In general medical practice, there is a need to identify more specific biomarkers to improve the diagnostic accuracy of UTI.

9. We recommend the ultrasound examination in case of any suspicion of urinary infection, even before the child is 6 months old, as a harmless, repeatedly applicable follow-up method with a high informative value for structural deviations from the excretory system.

10. Our data show that for children, the most frequent (71.4%) visit to the GP is for a preventive examination, in 62.7% for immunizations, in 42.1% for a cough and in fourth place in 40.5% for a temperature.

11. The results obtained from our study show that there is a need for training and awareness of parents regarding the unclear febrile state and the measurement of the child's temperature.

12. The lack of sufficient time when visiting the GP is due to difficulties in organizing the work in the PHC, and this also leads to a delay in the diagnosis of UTI.

13. Knowledge of risk factors by GPs and awareness of parents is essential to prevent or reduce UTI in childhood. Failure to identify young patients at risk can lead to kidney damage with consequences in adulthood.

14. Additional training is needed to increase the qualification of health workers in relation to UTI and to improve the awareness and health culture of parents and their trust in medical professionals.

VIII. CONTRIBUTIONS

1. Original scientific and applied contributions

1.1. For the first time in our country, a large-scale study was conducted on the current problems regarding UTI in childhood, including general practitioners and parents, with a view to establishing the most common reasons that make it difficult to make a timely diagnosis.

1.2. We found that although parents indicated the GP as the main source of information on their child's health issues and in particular on UTI, the general assessment was that they received insufficient information from GPs¸ regarding recommendations on what to monitor and how to protect their children from the occurrence or recurrence of UTI.

1.3. More than 50% of GPs in our survey support the idea that parental awareness in any form about early diagnosis and treatment of children with UTI is particularly important for timely care of children. Methods such as parenting courses, brochures and information from social networks are among the ideas that GPs point to as important for good medical practice.

1.4. The main reasons we identified for more difficult detection, resp. delay in establishing UTI in childhood in primary care are: relatively low prevalence of UTI in children, lack of information among parents regarding recognition of the non-specific characteristics of the course of UTI in childhood, as well as difficult urine collection in young children .

2. Contributions of a confirmatory nature

2.1. Involving the GP or health care professionals in spreading information to parents about childhood UTI is a good solution to prevent unreliable sources of information on the internet and is a major route to solving the most common problems regarding diagnosis, treatment and the prevention of urinary infections in children.

2.2. We identified a need for hands-on training among GPs in primary care clinics on: new non-invasive methods of urine collection, bag-sticking itself, 'clean-catch' urine collection using the Quick-Wee method, and information on new biomarkers in diagnosis of UTI.

2.3. We developed an algorithm of action in general medical practice for suspected UTI and recurrent UTI in childhood, which would be useful for any general practitioner.

2.4. We have developed a policy of action in the form of a brochure and an educational poster, with the help of which GPs will inform parents about STIs in childhood.

IX. ARTICLES AND COMMUNICATIONS RELATED TO THE STUDY

1. R. Alexovska, I. Hristova, M. Bliznakova, V. Aleksandrova, Zh. Ruseva, V. Madzhova "Frequency and features of urinary tract infections among febrile children in infancy", "Actual Nephrology", no. 1, Volume 15, 2021

2. R. Alexovska, Iv. Hristova, V. Alexandrova, E. Hristova, V. Madzhova. "Urinary tract infections in childhood and the role of the general practitioner in their prevention and treatment". Sp. Pediatrics and Infectious Diseases, 2021, 13(1): 3-8

3. R. Alexovska, Iv. Hristova, V. Alexandrova, E. Hristova, V. Madzhova. "Assessment of risk factors for childhood urinary tract infections". Sp. Pediatrics and Infectious Diseases, 2021, 13(1): 9-12

4. R. Alexovska, Iv. Hristova, V. Alexandrova, M. Bliznakova, V. Madzhova. "The role of parents in the diagnosis and treatment of children with urinary tract infections - an assessment of their knowledge, attitudes and practices". Sp. General Medicine, 2021, 23(5): 2025

5. V. Alexandrova, Iv. Hristova, R. Alexovska, Zh. Ruseva, V. Madjova. "Vaccines - past and future". Sp. "Varna Medical Forum", no. 1, online edition, 04.2021