Impact of Voiding and Incontinence Symptoms on Health-Related Quality of Life in Serbian Male Population

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Purpose: To investigate the impact of lower urinary tract symptoms on health-related quality of life (QoL) in Serbian population considering socio-demographic characteristics, habits, and health status.

Materials and Methods: The study was conducted in the Primary Healthcare Center «Novi Beograd», Serbia. The study included 1424 male participants, aged 40 years and above. QoL was assessed by using the -36Item Short Form Health Survey (SF36-) questionnaire, while voiding and incontinence symptoms were measured using the International Continence Society Male Short Form (ICS male SF) questionnaire.

Results: Voiding and incontinence symptoms significantly correlate with all domains of QoL. Voiding and incontinence symptoms have a high influence on general health, social functioning, physical functioning and body pain. After adjusting for age and education, voiding and incontinence symptoms had a similar influence on QoL. In the multivariate model the influence of cardiovascular diseases and income on QoL was lower than voiding and incontinence symptoms..

Conclusion: Voiding and incontinence symptoms affect QoL domains differently. Incontinence symptoms have a greater impact on QoL than voiding symptoms.

Keywords: urinary incontinence; quality of life; cultural characteristics; psychology; male.

INTRODUCTION

The world statistics is showing the high prevalence of Lower Urinary Tract Symptoms (LUTS) such as urine storage, voiding and post-micturition[(1)] among older population.[(2)] A prediction is that even a greater portion of persons will be affected with LUTS due to population aging. Only storage symptoms are estimated to affect 1.6 billion, while overactive bladder will affect additional 546 million individuals by 2018 due to population growth and the overall ageing of the worldwide population.[(3)] LUTS influence normal daily activities and all domains of health related quality of life (HRQoL).[(4)] Therefore, LUTS is related to significant healthcare costs, absenteeism, low work productivity and sexuality dissatisfaction, leading to sleep disorders, limited mobility, loneliness, anxiety and depression.[(5,6)] All that makes LUTS a significant clinical and public health management issue.[(2,7)] The incidence of having 'at least one' storage LUTS is high, ranging from 43% in Canadian men, and 45% of Korean men to 48% of men in The European Prospective Investigation into Cancer and Nutrition (EPIC) study and 69.4% of men in the epidemiology of lower urinary tract symptoms (EpiLUTS) study.[(8-11)] LUTS can be divided into three categories: storage, voiding and post-micturition.[(7)] Storage symptoms are nocturia, urgency, increased micturition frequency and urinary incontinence. Voiding symptoms are weak stream, intermittent flow, hesitancy and straining. Post-micturition symptoms are a sensation of incomplete emptying and a post-micturition dribble. Voiding and post-micturition symptoms are not as prevalent as storage symptoms, as epidemiology studies report that storage and voiding symptoms occur most often together in 18-21% men.[(8,9)] Many people are not aware of the significance of those symptoms and tolerate and neglect LUTS considering this condition as a result of ageing.[(5)] Benign prostatic hyperplasia (BPH), urethral stenosis and hypermobility and detrusor overactivity, bladder stones or bladder tumors usually cause LUTS in men. In addition, various system conditions like hypertension, diabetes mellitus, cardiovascular disease, metabolic syndrome, obesity, dyslipidemia, hyperinsulinemia are known to influence LUTS occurrence.[(12)] Serbia is one of the oldest populations in Europe Region, with standardized death rate per 100,000 population due to diseases of genitourinary system that vary from 14 in 2001 to 19 in 2011.[(13)] In 2013, the specific mortality rate for males only was 32 per 100,000 population due to diseases of genitourinary system.[(14)] The same year, general practice services have registered over 86000 cases with prostate hyperplasia or 15 per 1000 population[(14)] which is considerably higher than 12.5 per 1000 or over 71000 cases registered in

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2012.[15] To our knowledge, there were no published HRQoL studies on persons with LUTS in Serbia. The aim of this study was to estimate the impact of voiding and incontinence symptoms on quality of life (QoL) in urban male population considering socio-demographic characteristics, habits, and health status.

MATERIALS AND METHODS

Study Design and Population

This is a descriptive study of HRQoL of series of male patients that have visited general practitioners at the Primary Healthcare Center "Novi Beograd" (PHC) of Belgrade (capital of Serbia) from December 2011 until May 2012 (six-month period). The study was carried out in the largest municipality of Belgrade (Novi Beograd) which accounts for 214,000 residents (2011 census).[16] The underlying reason for community based PHC approach is because persons with LUTS do not perceive LUTS as a health problem for a long time, but when they decide to seek help, they have to visit their general practitioner first (gate keeper).[17,18] According to official statistics,[16] the study participants represent 2.8% of the total male population of 40 years or older residing at Novi Belgrade. Respondents' age structure, marriage and education status, number of household members and weight profile appropriately represent the population of the municipality.[14,15] However, risk behavior such as smoking and alcohol consumption was less frequent than reported by other authors,[14,15] very likely because study respondents were those who visited general practitioners for a therapy or advice and being aware of their health status most of them have abandoned unhealthy life style habits. Diabetes mellitus in Serbia affects 8.6% of population[14] while in our study 5.3% of respondents had diabetes mellitus. In addition, most of our respondents had cardiovascular diseases that are the most frequent non-communicable disease in Serbia.[14,15] Regarding all the above-mentioned points, our study population reasonably represents the population of Serbia as well. The study had two inclusion criteria, being male and aged 40 years or older. Patients with diagnosed cancer of any organ at any stage and diagnosed depression, or anxiety were excluded from the study. Participants who did not complete the questionnaires were also excluded. All eligible patients were informed orally and in written form about the purpose and ethical standards of the study and were kindly asked to voluntary participate in the study. All persons gave their informed consent prior their inclusion to study. This study has been approved by Ethics Committee of PHC Novi Beograd. A total of 1424 patients fulfilling criteria were included in the study and anonymously and properly completed three types of questionnaires. The response rate was 95% (1424/1500).

Study Instruments

The first questionnaire was about general socio-economic status (age, education, profession, employment, marital status, having children, apartment/house ownership, salary level), and general health data (body weight and height, daily smoking of 20 cigarettes and more, alcohol consumption, being diagnosed with angina pectoris, myocardial infarction, stroke and diabetes). The second questionnaire was the International Continence Society Male Short Form (ICS male SF), intended for evaluating the occurrence of LUTS.[19] The questionnaire has been translated and culturally adapted. Translation was done by two professional English translators. Firstly, the questionnaire was translated to Serbian language and then secondly, professional English translator undertook a back translation to English language. The back translated questionnaire was compared to the original questionnaire and no significant differences were observed. A pilot study with five patients was performed, and these patients evaluated the Serbian version of questionnaire. Minor changes were undertaking with by their suggestions. The questionnaire contained voiding symptoms (5 questions) and incontinence symptoms (6 questions) domains. This questionnaire also had three additional questions, urination frequency during day and night, and overall impact of urinary problems on life. Responses were designed by five-point Likert scale type, where a lower grade represented better condition. Two extracted components of total eleven questions explained 69.9% of variance. High reliability was observed in five items of voiding symptoms, Cronbach›s $\alpha = 0.893$ (α if item deleted 0.860-0.886) and six items of incontinence symptoms, Cronbach's $\alpha = 0.894$ (α if item deleted 0.862-0.894). The third questionnaire was The 36-Item Short Form Health Survey (SF-36) generic assessment domain for HRQoL, previously translated and adapted for Serbian population.[20] This questionnaire contains eight domains intended for evaluating physical health and mental functioning. The first four domains (physical functioning, role-physical, bodily pain and general health) were used to assess physical health from the patient›s point of view whilst others deal with vitality, social functioning, role-emotional and mental health issues. Patients gave answers on numerical scale. Answers were coded, and scores for the eight domains were calculated on a 0-100 scale. Higher scores represented better results from patient›s point of view.[20]

Statistical Analyses

The results were presented as frequency with percent and mean ± SD. Principal components analysis with varimax rotation and reliability analysis were used for validation of ICS male SF questionnaire. Spearman correlation, Pearson correlation, Point bi-serial correlation were determined to assess relationship between patients characteristics (socio-demographic, health status, LUTS) and QoL. Linear regression modeling was applied to assess correlation of voiding and urinary symptoms with QoL. Modeling was done in several steps to avoid the influence of confounding factors. In the first step, only voiding and incontinence scores were entered as independent variables and the eight domains of the SF-36 as dependent variables. In the second step, voiding and incontinence symptoms were adjusted for age. Then, in the next step, urinary symptoms were adjusted for age and education. In the fourth model, adjustment was made for age and education and one of the following: morbidity, income, number of household members and apartment/house ownership. In the final step, all predictors were entered into the model. In order to shorten the results, only standardized beta and *P* values of voiding and incontinence symptoms were presented, as well as r square. All data were analyzed using Statistical Package for the Social Science (SPSS Inc, Chicago, Illinois, USA) version 15.0. All *P* values less than .05 were considered significant.

RESULTS

Table 1. Demographic and clinical characteristics of the study participants.

Variables	n (%)
Age, mean ± SD (min-max)	55.5 ± 10.1 (40-80)
Married (or union)	982 (69.0)
Number of household members	
1	182 (12.8)
2-4	1116 (78.4)
≥ 5	126 (8.8)
Education	
Basic	130 (9.1)
High school	775 (54.4)
College/Faculty	519 (36.9)
Own apartment/house	968 (68.0)
Income higher than 200 Euros	690 (48.5)
Body Mass Index	
< 25	664 (46.6)
25-29.9	588 (41.3)
≥ 30	172 (12.1)
Smoking	347 (24.4)
Alcohol consumption	378 (26.5)
Co-morbidity (all)	288 (20.2)
Angina pectoris	211 (14.8)
Myocardial infarction	19 (1.3)
Stroke	13 (0.9)
Diabetes mellitus	75 (5.3)

Abbreviation: SD, standard deviation.

Participants were mostly males in their sixties and with secondary school or higher education. Two thirds had own apartments but one eight lived alone. More than 51% had 200€ net monthly incomes which is the minimal income in 2012 in Serbia according to the Statistical office of the Republic of Serbia. Half respondents were either overweight or obese (according to Body Mass Index for adults). A quarter of them were smokers and alcohol consumers. One fifth of them had cardiovascular diseases, in most cases angina pectoris (**Table 1**). Our study population had characteristics similar to the other those studies conducted in Serbia . Most participants (61.1%) claimed that voiding has no effect on their QoL (**Table 2**). Average voiding (VS) and incontinence symptoms (IS) were low. Physical functioning and social functioning had the highest score, and general and mental health had the lowest average values (**Table 2**). VS and IS have a statistically significant relationship with SF-36 domains. Correlation coefficients are lower in some domains such as mental health, emotional health, and role physical. But, correlation coefficients of these variables are higher than others in number of QoL domains (**Table 3**). All five steps of regression modeling are presented in **Table** 4, thus the first model is non-adjusted, the second is age, and education adjusted, third is age, education and morbidity adjusted. The fourth model is age, education and income adjusted model. The final model is age, education, morbidity, income, household member number and apartment ownership adjusted (**Table 4**). Voiding and incontinence symptoms correlate significantly with all domains of QoL, measured through the SF-36 questionnaire. In the non-adjusted model voiding symptoms highly correlated with physical functioning and general health, while incontinence symptoms are correlated with physical functioning, body pain, general health and social functioning. After adjusting for age and education, standardized beta were lower in all domains, mostly in physical functioning. After adjusting for age, education and morbidity or income, coefficients were very similar as well after adjusting for all predictors (the previous including household members and apartment/house ownership) (**Table 4**).

DISCUSSION

This study is the first conducted in Serbia assessing the impact of voiding and incontinence symptoms on life quality in urban males of Belgrade. It is to emphasize that countries with limited health care resources, like Serbia, should take an advantage of QoL assessments in order to involve patients with certain health disorders in better understanding of their health problems and in decision making about potential treatments. Based on the results of our study, almost two-thirds of participants claimed that voiding has no effects to HRQoL. For the other third, we found a highly significant statistical relationship between voiding and incontinence symptoms with all SF-36 HRQoL domains except mental health (perhaps because of exclusion of patients with mental illness from the study). According to Serbian National Health Survey, 3.9% of males of 15 years and older had urinary incontinence.[21] Our study highlighted that voiding and incontinence symptoms have higher influence on some domains like general health, social functioning, physical functioning and body pain than on role physical, vitality and role emotional, although effects were statistically significant. It is important to emphasize that incontinency had a higher impact on role physical and social functioning than voiding symptoms. Same domains of HRQoL are associated with LUTS severity (social functioning, vitality and role physical).[6] Also, revealed a high correlation between LUTS intensity and HRQoL, especially on role physical, social functioning, vitality, mental health and general health domains.[22] In our study, explained variability was low as in other studies.[23,24] Similar to findings of other researchers[23,24] the intensity of voiding or storage bother, had a significant correlation with HRQoL. Due to chronic character of these problems, our patients could have adapted to their difficulties, thus mental health was not as poor as was emotional role. One half of our study participants' had salaries below minimum, which suggested difficult living conditions. Therefore reduced social functioning was expected. Experts agreed that it is difficult to determine normal voiding frequency. A majority of males without lower urinary tract symptoms in the USA, had a frequency of 7 voiding per day.[25] On the contrary, the Incontinence Society of Singapore claimed that normal 24-hour voiding frequency was of 4 to 5 voiding.[26] Voiding frequency is in direct correlation with ageing and it is expected to increase during life.[22,27] In our study almost half

Table 2. Urinary status (ICS male SF) and Quality of life (SF-36).

Questionnaire	Variables			
ICS male SF				
	Voiding frequency during day	4 hours or more	658	46.2
		3 hours	392	27.5
		2 hours	245	17.2
		every hour	129	9.1
	Voiding frequency during night (time)	None	587	41.2
		Once	436	30.6
		2	241	16.9
		3	117	8.2
		≥ 4	43	3.0
	Impact of voiding on life	Not at all	870	61.1
		Some	395	27.7
		Quite	127	8.9
		Much	32	2.2
		Mean ± SD	Median (min-max)	
	Voiding symptoms	3.8±4.5	2 (0-20)	
	Incontinence symptoms	3.2±4.4	1 (0-24)	
SF-36				
	Physical functioning	69.5 ± 27.9	75 (0-100)	
	Role-physical	56.7 ± 43.4	75 (0-100)	
	Bodily pain	59.9 ± 27.4	52 (0-100)	
	General health	53.8 ± 15.4	52 (0-100)	
	Vitality	56.1±10.8	55 (20-100)	
	Social functioning	62.2±22.6	62.5 (0-100)	
	Role-emotional	58.3±43.7	66.6 (0-100)	
	Mental health	50.4±6.8	52.0 (16-80)	

Abbreviations: SF-36, 36-Item Short Form Health Survey; ICS male SF, International Continence Society Male Short Form.

Table 3. Voiding score and incontinence score tertiles and quality of life measured by SF-36.

SF-36 Domains	Voiding Score			Incontinence Score		
	≤ 1	2-5	≥ 6	0	1-4	≥ 5
Physical functioning	81.5 ± 23.7	65.5 ± 26.8	56.0 ± 27.3	81.9 ± 23.1	69.5 ± 25.6	50.2 ± 26.1
Role-physical	62.0 ± 44.7	57.8 ± 42.1	48.3 ± 41.5	64.5 ± 44.0	58.4 ± 42.4	42.8 ± 40.1
Bodily pain	68.0 ± 26.8	59.9 ± 27.8	48.5 ± 23.5	69.1 ± 26.8	61.9 ± 25.9	43.7 ± 21.8
General health	57.8 ± 14.3	55.2 ± 14.3	47.1 ± 15.5	57.8 ± 14.6	56.5 ± 14.0	44.8 ± 14.0
Vitality	58.3 ± 10.4	55.5 ± 11.1	53.4 ± 10.7	58.2 ± 10.2	57.0 ± 10.8	51.6 ± 10.5
Social functioning	68.8 ± 22.3	61.0 ± 22.4	53.9 ± 20.3	69.4 ± 22.2	64.3 ± 21.4	48.9 ± 18.3
Role-emotional	63.9 ± 44.0	59.6 ± 42.1	49.2 ± 43.2	65.7 ± 43.9	62.8 ± 41.3	58.3 ± 43.6
Mental health	50.0 ± 6.5	49.6 ± 7.1	51.6 ± 6.7	50.3 ± 6.3	49.7 ± 6.8	51.1 ± 7.3

Abbreviation: SF-36, 36-Item Short Form Health Survey.

Table 4. Multivariate regression analyses with SF-36 domains as dependents and voiding and incontinence symptoms as independents variables.*

Regression Models	Voiding Symptoms		Incontinence Symptoms	
	R^2	Standardized β	R^2	Standardized β
Model 1 no adjustment				
Physical functioning	0.188	-0.433	0.224	-0.473
Role-physical	0.024	-0.155	0.042	-0.206
Bodily pain	0.115	-0.339	0.137	-0.371
General health	0.148	-0.385	0.148	-0.385
Vitality	0.055	-0.235	0.065	-0.255
Social functioning	0.104	-0.322	0.139	-0.372
Role-emotional	0.028	-0.169	0.060	-0.244
Mental health	0.020	0.141	0.006	0.080
Model 2 adjusted for age and education				
Physical functioning	0.239	-0.345	0.264	-0.388
Role-physical	0.040	-0.111	0.053	-0.167
Bodily pain	0.153	-0.295	0.167	-0.325
General health	0.191	-0.327	0.185	-0.320
Vitality	0.098	-0.183	0.103	-0.197
Social functioning	0.142	-0.289	0.169	-0.340
Role-emotional	0.037	-0.145	0.064	-0.230
Mental health	0.044	0.110	0.035	0.031 NS
Model 3 adjusted for age, education and morbidity				
Physical functioning	0.239	-0.348	0.264	-0.388
Role-physical	0.041	-0.104	0.054	-0.165
Bodily pain	0.153	-0.292	0.168	-0.322
General health	0.206	-0.309	0.205	-0.308
Vitality	0.100	-0.175	0.105	-0.194
Social functioning	0.145	-0.280	0.173	-0.335
Role-emotional	0.037	-0.143	0.064	-0.230
Mental health	0.055	0.095	0.048	0.022 NS
Model 4 adjusted for age, education and income				
Physical functioning	0.239	-0.345	0.264	-0.388
Role-physical	0.040	-0.111	0.053	-0.168
Bodily pain	0.156	-0.295	0.169	-0.323
General health	0.207	-0.327	0.198	-0.315
Vitality	0.115	-0.182	0.118	-0.192
Social functioning	0.151	-0.289	0.175	-0.337
Role-emotional	0.040	-0.145	0.066	-0.228
Mental health	0.049	0.110	0.040	0.028 NS
Model 5 adjusted for age, education, income, number of household members and own apartment				
Physical functioning	0.279	-0.341	0.271	-0.380
Role-physical	0.044	-0.101	0.057	-0.161
Bodily pain	0.163	-0.286	0.175	-0.312
General health	0.224	-0.307	0.220	-0.300
Vitality	0.130	-0.170	0.132	-0.180
Social functioning	0.165	-0.273	0.188	-0.322
Role-emotional	0.042	-0.137	0.068	-0.224
Mental health	0.062	0.096	0.055	0.021 NS

Abbreviation: NS, not significant.
*All *P* values for all models are less than .001.

of participants had normal voiding frequency (every 4 hours or more), while less than 30% had frequent urination (every two hours or less). These results should be to considered with regard to the fact that voiding frequency during the day depends on liquid intake. The studies that explored correlation of lifestyle and LUTS, found that alcohol consumption correlated with urgency and voiding and incontinence symptoms.[12] Nocturia represents one or more than one voiding during night, interrupting sleep. However, some researches claim that nocturia is more than one voiding during the night.[28] EPIC study revealed that nocturia is the most frequent LUTS. Also according to results of the Boston Area Community Health (BACH) cohort study, more than 25% of males suffer from nocturia, where diabetes mellitus, cardiovascular disease, cerebrovascular disease, obesity and diuretics are predisposing factors.[1] But, if we applied a stricter criterion (two or more voidings during night), 30% of our participants had nocturia. Similar results were obtained in cross-sectional study among elderly men in 21 general practices.[29] In EpiLUTS study, a majority of participants (92.8%) did not show any kind of bother.[3] In our study most of participants claimed no bother or some bother (89%), which demonstrates a similar percentage of urinary bother in both populations. Aging and education are in positive correlation with LUTS intensity.[2,30-32] Our study population's age and education level varied and it was necessary to adjust the relation of voiding and incontinence symptoms with them. The impact of voiding and incontinence symptoms on QoL domains was still significant after adjustment for age and education and that was found in other studies as well.[31,32] Morbidity and LUTS are correlated, especially in some chronic diseases such as diabetes mellitus, coronary artery disease and stroke. These morbidities have a negative impact on LUTS intensity because of vascular and neurological pathogenesis.[33] After adjustment for age, education and morbidity (diabetes mellitus, cardiovascular and cerebrovascular diseases and asthma), no significant changes in regression coefficients were obtained in any specific QoL domains. It indicates that influence of urinary bother on QoL is higher than observed diseases. Other studies have similar results as our study, which confirms a high impact of LUTS on QoL, higher than many other conditions.[30,31] The BACH and UREPIC studies (the UREPIK survey collected information on this relationship in the Netherlands, Korea, France and the UK) showed that LUTS had a similar or higher effect on QoL as stroke, myocardial infarction and other life threatening disease.[32] The same studies revealed that morbidity, excepting myocardial infarction, had no influence on the mental component as QoL domain. A higher impact of LUTS on QoL than of diabetes mellitus, gout and hypertension was also confirmed by other researchers.[24] Age, education and income adjusted model, revealed that voiding and incontinence symptoms had a higher impact than income. The final model with additional adjustment for, household members, and apartment ownership did not change coefficients significantly.

Study Limitations

The findings of this study are limited to the one male community in Belgrade. For better generalization, further studies should be conducted on a larger scale and should include possibility of comparing the QoL data between the patients with LUTS and patients with no symptoms. The questionnaires were self-administered by participants and data affected participant's memory and perception to some extent, thus findings might be under or overestimated. This study, nonetheless, is an original attempt to assess the HRQoL of male adults with LUTS in Serbia. In line with that, in this study the ICS male SF questionnaire has been translated and culturally adapted for Serbian population, therefore it provides a foundation for further research. The inclusion of general practitioners in the collection of data has raised their awareness about the relationship between the quality of lofe and LUTS and might have enhanced their approach to clinical management of LUTS for the better HRQoL of patients.

CONCLUSION

LUTS have a high impact on QoL. Incontinence symptoms have higher impact on QoL than voiding symptoms. Voiding and incontinence symptoms significantly affect different domains of QOl after adjustment for comorbidities, income and household characteristics.

CONFLICT OF INTEREST

None declared.

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REFERENCES

1. Irwin DE, Milsom I, Kopp Z, Abrams P, Artibani W, Herschorn S. Prevalence, severity, and symptom bother of lower urinary tract symptoms among men in the EPIC study: impact of overactive bladder. Eur Urol. 2009;56:14-20.
2. Irwin DE, Kopp ZS, Agatep B, Milsom I, Abrams P. Worldwide prevalence estimates of lower urinary tract symptoms, overactive bladder, urinary incontinence and bladder outlet obstruction. BJU Int. 2011;108:1132-8.
3. Abrams P, Manson J, Kirby MG. Incidence and Epidemiology of Storage Lower Urinary Tract Symptoms. Eur Urol Rev. 2012;7:50-4.
4. Coyne KS, Wein AJ, Tubaro A, et al. The burden of lower urinary tract symptoms: evaluating the effect of LUTS on health-related quality of life, anxiety and depression: EpiLUTS. BJU Int. 2009;103 Suppl 3:4-11.
5. Coyne KS, Sexton CC, Irwin DE, Kopp ZS, Kelleher CJ, Milsom I. The impact of overactive bladder, incontinence and other lower urinary tract symptoms on quality of life, work productivity, sexuality and emotional well-being in men and women: results from the EPIC study. BJU Int. 2008;101:1388-95.
6. Coyne KS, Kvasz M, Ireland AM, Milsom I,

Kopp ZS, Chapple CR. Urinary incontinence and its relationship to mental health and health-related quality of life in men and women in Sweden, the United Kingdom, and the United States. Eur Urol. 2012;61:88-95.

7. Irwin DE, Mungapen L, Milsom I, Kopp Z, Reeves P, Kelleher C. The economic impact of overactive bladder syndrome in six Western countries. BJU Int. 2009;103:202-9.
8. Coyne KS, Kaplan SA, Chapple CR, et al. EpiLUTS Team. Risk factors and comorbid conditions associated with lower urinary tract symptoms: EpiLUTS. BJU Int. 2009; 103(Suppl 3):24-32.
9. Herschorn S, Gajewski J, Schulz J, Corcos J. A population-based study of urinary symptoms and incontinence: the Canadian Urinary Bladder Survey. BJU Int. 2008;101:52–8.
10. Lee YS, Lee KS, Jung JH, et al. Prevalence of overactive bladder, urinary incontinence, and lower urinary tract symptoms: results of Korean EPIC study. World J Urol. 2011;29(2):185-90.
11. Irwin DE, Milsom I, Hunskaar S, et al. Population-based survey of urinary incontinence, overactive bladder, and other lower urinary tract symptoms in five countries: results of the EPIC study. Eur Urol. 2006;50:1306-14.
12. Boyle P, Robertson C, Mazzetta C, Keech M, Hobbs R, Fourcade R, et al. UrEpik Study Group: The prevalence of lower urinary tract symptoms in men and women in four centres. The UrEpik study. BJU Int. 2003;92:409-14.
13. European Health for All database (HFA-DB). [http://www.euro.who.int/en/data-and-evidence/databases/european-health-for-all-database-hfa-db]
14. The Institute of Public Health of Serbia "Dr Milan Jovanovic Batut", Health Statistical Yearbook 2013. p. 123.
15. The Institute of Public Health of Serbia "Dr Milan Jovanovic Batut", Health Statistical Yearbook 2012; 2013. p. 123.
16. Statistical Office of the Republic of Serbia. Population by age and sex, by settlements. [http://popis2011.stat.rs/?page_id=2162&lang=en\]
17. Teunissen D, van Weel C, Lagro-Janssen T. Urinary incontinence in older people living in the community: examining help-seeking behavior. Br J Gen Pract, 2005;55:776-82.
18. Buckley BS, Lapitan MC. Prevalence of urinary and faecal incontinence and nocturnal enuresis and attitudes to treatment and help-seeking amongst a community-based representative sample of adults in the United Kingdom. Int J Clin Pract. 2009;63:568-73.
19. Donovan JL, Peters TJ, Abrams P, Brookes ST, de aa Rosette JJ, Schäfer W. Scoring the short form ICS male SF questionnaire. International Continence Society. J Urol. 2000;164:1948-55.
20. Ware JE, Sherbourne CD. The MOS 36-Item Short-Form Health Survey (SF-36), I: Conceptual framework and item selection. Med Care. 1992;30:473-83.
21. Boricic K, Vasic M, Grozdanov J, et al. Results of the 2013 Health Survey of the population of Serbia. Belgrade: The Institute of Public Health of Serbia "Dr Milan Jovanovic Batut". 2014. p. 34
22. Hunter DJ, McKee M, Black NA, Sanderson CF. Health status and quality of life of British men with lower urinary tract symptoms: results from the SF-36. Urology. 1995;45:962-71.
23. Engström G, Henningsohn L, Walker-Engström ML, Leppert J. Impact on quality of life of different lower urinary tract symptoms in men measured by means of the SF36 questionnaire. Scand J Urol Nephrol. 2006;40:485-94.
24. Welch G, Weinger K, Barry MJ. Quality-of-life impact of lower urinary tract symptoms: results from the health professionals follow-up study. Urology. 2002;59:245-50.
25. Latini JM, Mueller E, Lux MM, Fitzgerald MP, Kreder KJ. Voiding frequency in a sample of asymptomatic American men. J Urol. 2004;172:980-4.
26. Tatt FK: Society For Continence, Singapore; 2001.
27. Kay L, Stigsby B, Brasso K, Mortensen SO, Munkgaard S. Lower urinary tract symptoms--a population survey using the Danish Prostatic Symptom Score (DAN-PSS) questionnaire. Scand J Urol Nephrol. 1999;33:94-9.
28. Tikkinen KA, Johnson TM 2nd, Tammela TL, et al. Nocturia frequency, bother, and quality of life: how often is too often? A population-based study in Finland. Eur Urol. 2010;57:488-96.
29. Gourova LW, van de Beek C, Spigt MG, Nieman FH, van Kerrebroeck PE. Predictive factors for nocturia in elderly men: a cross-sectional study in 21 general practices. BJU Int. 2006; 97:528-32.
30. Hawkins K, Pernarelli J, Ozminkowski RJ, et al. The prevalence of urinary incontinence and its burden on the quality of life among older adults with medicare supplement insurance. Qual Life Res. 2011;20:723-32.
31. Malmsten UG, Milsom I, Molander U, Norlen LJ. Urinary incontinence and lower urinary tract symptoms: an epi-demiological study of men aged 45 to 99 years. J Urol. 1997;158:1733-7.
32. Engstrom G, Walker-Engstrom ML, Loof L, Leppert J. Prevalence of three lower urinary tract symptoms in men a population-based study. Fam Pract. 2003;20:7-10.
33. Martin S, Lange K, Haren MT, Taylor AW,

Wittert G. Members of the Florey Adelaide Male Ageing Study. Risk factors for progression or improvement of lower urinary tract symptoms in a prospective cohort of men. J Urol. 2014;191:130-7.