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Psychometric properties of the Croatian version of the King's Health Questionnaire in multiple sclerosis patients

Psihometrijska svojstva hrvatske verzije King's Health Questionnaire-a kod bolesnika s multiplom sklerozom

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Summary

Introduction: Multiple sclerosis (MS) is a chronic progressive disease of the central nervous system that results in a wide range of clinical manifestations. Further, 90% of MS patients report some type of lower urinary tract symptoms (LUTS), including sexual disorders, which impact their health-related quality of life (HRQoL). The aim of this study was to determine the psychometric properties of the Croatian version of the King's Health Questionnaire (KHQ) in MS patients.

Methods: Our research problem was examined using the KHQ, which includes eight domains: general health perception (GHP), lower urinary tract symptoms impact (LUTSI), role limitations (RL), physical limitations (PL), social limitations (SL), personal relationships (PR), emotional problems (EP) and sleep/energy disturbances (SED). The data was descriptively analyzed, and internal consistency was assessed by Cronbach's alpha. Pearson correlations were performed on the eight domains of the KHQ. The level of significance was set to $p<0.05$.

Results: Eighty-two MS patients were assessed (mean age 44±11 years, 67% females). The more common LUTS in MS patients were related to the following domains: GHP (54.27±23.51), LUTSI (44.31±36.31), PR (40.45±31.43) and PL (39.43±37.36). The less common LUTS were related to the following domains: RL (37.40±36.44), SL (35.23±33.12), SED (27.85±26.46) and EP (27.51±32.81). Cronbach's alpha for the KHQ total score was 0.97 (range for domains: 0.78-0.97), indicating high internal consistency. All of the KHQ domains were highly correlated (Pearson correlation range: 0.32-0.89).

Conclusion: The Croatian version of KHQ can be a valid and reliable instrument for the helpful measure for LUTS in Croatian-speaking MS patients.

Keywords: Croatia, King's Health Questionnaire, lower urinary tract symptoms, multiple sclerosis

Sažetak

Uvod: Multipla skleroza je kronična progresivna bolest centralnoga živčanog sustava koja rezultira širokim rasponom kliničkih manifestacija. Nadalje, 90% bolesnika koji boluju od multiple skleroze prijavljuje neke oblike simptoma donjeg mokraćnog sustava, uključujući seksualnu disfunkciju koja utječe na njihovu kvalitetu života povezanu sa zdravljem. Cilj ovoga rada je odrediti psihometrijska svojstva hrvatske verzije King's Health Questionnaire (KHQ) upitnika među bolesnicima koji boluju od multiple skleroze.

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Metode: Cilj istraživanja ostvarili smo koristeći KHQ upitnik koji je sastavljen od osam domena: generalna percepcija zdravlja, utjecaj simptoma donjeg mokraćnog sustava, radna ograničenja, fizička ograničenja, društvena ograničenja, osobne veze, emocije, san/energija. Podaci su opisno analizirani, a unutarnja pouzdanost je procijenjena pomoću Cronbach alpha koeficijenta. Pearsonove korelacije primijenjene su na svih osam domena, a razina značajnosti postavila se na $p<0.05$.

Rezultati: U istraživanje su uključena 82 bolesnika s multiplom sklerozom (prosječna starost 44±11 godina, 67% žene). Češći simptomi donjeg mokraćnog sustava bili su povezani sa sljedećim domenama: generalna percepcija zdravlja (54.27±23.51), utjecaj simptoma donjeg mokraćnog sustava (44.31±36.31), osobne veze (40.45±31.43) i fizička ograničenja (39.43±37.36). Rjeđi simptomi donjeg mokraćnog sustava bili su povezani sa sljedećim domenama: radna ograničenja (37.40±36.44), društvena ograničenja (35.23±33.12), san/energija (27.85±26.46) i emocije (27.51±32.81). Cronbach alpha koeficijent za ukupni KHQ rezultat iznosio je 0.97 (raspon za domene od 0.78 do 0.97), što upućuje na visoku unutarnju pouzdanost. Sve KHQ domene bile su visoko povezane (Pearsonove korelacije bila je u rasponu od 0.32 do 0.89).

Zaključak: Hrvatska verzija KHQ upitnika može biti validan i pouzdan instrument koji pomaže mjerenju simptoma donjeg mokraćnog sustava kod bolesnika koji boluju od multiple skleroze na hrvatskom govornom području.

Ključne riječi: Hrvatska, King's Health Questionnaire, simptomi donjeg mokraćnog sustava, multipla skleroza

Introduction

Lower urinary tract symptoms (LUTS) represent a group of symptoms that are caused by diseases and medical conditions of the bladder and urethra. The International Continence Society (ICS) separates LUTS into three groups: storage, voiding, and postmicturition symptoms.[1] The prevalence of LUTS in the general population is high, measuring 64.3% - 76.3% in previous studies conducted in that domain.[2,3] Severe cases of LUTS, especially when reported among patients suffering from another primary chronic disease, are associated with a decrease in the quality of life (QoL),[4] and that is the reason why proper management of LUTS is a must for maintaining the patient's QoL and wellbeing.

A chronic medical condition that, among all other disease manifestations, also includes LUTS in its clinical picture is multiple sclerosis (MS). MS represents a progressive inflammatory demyelinating disease of the central nervous system (CNS).[5] MS is also one of the most common diseases that affects CNS; it has a lifetime risk of 1 in 400 cases.[6] As the disease progresses, about 75% of MS patients will face a performance decrease in activities of daily living in the later stages of the disease. In around 15 % of patients, disabilities often become severe in a short period of time.[7] Therefore, MS, which results in a wide range of clinical manifestations, greatly impacts patients' health-related quality of life (HRQoL).[8]

MS is usually diagnosed in people aged from 20 to 40 years, and it is more often diagnosed in females. Furthermore, 90% of MS patients suffer from some types of LUTS.[9] Moreover, the North American Research Committee on MS (NARCOMS) estimated that 65% of MS patients report one or more LUTS, including sexual disorders, which also impact their HRQoL.[10] LUTS in MS patients range from urgency to urge urinary incontinence, incomplete bladder emptying, or hesitancy. Because of the multifocal and diffuse involvement of the CNS, LUTS in MS patients differ in intensity among different patients. In addition, LUTS are a serious risk to upper urinary tract safety.[11] The most common LUTS in MS patients are urgency, frequency, and neurogenic detrusor overactivity (NDO).[12]

Speaking about the impact of LUTS on patients' QoL and HRQoL, it is necessary to estimate and choose among available questionnaires that have wide clinical use for the measurement of QoL and HRQoL of those patients. Early versions of HRQoL questionnaires for LUTS patients focused mainly on the patient's physical ability to move, perform daily activities, eat, drink, and take care of personal hygiene.[13] However, they did not assess other aspects of patients' lives, such as social interactions, interpersonal and sexual relationships, career, and psychological well-being.[14] In the domain of LUTS patients' QoL associated with sexual function, several questionnaires are widely clinically used: Urogenital Distress Inventory (UDI),[15] Bristol Female Lower Urinary Tract Symptoms Questionnaire (B-FLUTS),[16] Urinary Incontinence Quality of Life Instrument (I-QoL),[17] Incontinence Impact Questionnaire (IIQ)[18], King's Health Questionnaire (KHQ),[19] Pelvic Organ Prolapse/Urinary Incontinence Sexual Function Questionnaire (PISQ),[20] International Consultation on Incontinence Questionnaire-Short Form (ICIQ-SF).[21]

Among them, KHQ is widely used as it is simple to administer, easily understandable by participants, and covers several life domains. Today, KHQ is translated into more than 45 languages, including French, Dutch, Italian, German, Portuguese, Spanish, Japanese, Korean, Chinese etc.[22] Other advantages

include the short time required to complete the questionnaire, age and gender appropriateness and coverage of various bladder conditions including stress incontinence, urge incontinence, mixed incontinence and overactive bladder. KHQ is also a recommended tool by the European Clinical Practice Guidelines (ECPG).[23] KHQ was formulated by Kelleher et al. in 1997, and the final version of the questionnaire was the result of six different pilot studies after validity and reliability were assessed using standard psychometric techniques. The original validation process was conducted on 293 respondents, and it was concluded that KHQ is a valid and reliable instrument for the assessment of QoL in women with urinary incontinence.[19]

Due to the earlier stated benefits of the KHQ questionnaire over other already available questionnaires in Croatia, we decided to validate the Croatian version of the KHQ using a sample of patients that underwent neurological care at Clinical Hospital Centre Osijek in Croatia and in this paper, we present the main results of our study. The aim of this study was to determine the psychometric properties of the Croatian version of the KHQ in MS patients.

Participants and methods

Participants

This research data was analyzed on 82 MS patients (67% females, 33% males) with an average age of 44±11 years and who underwent neurological care at Osijek Clinical Hospital Centre, Croatia. All the patients were required to sign a statement of informed consent before we started the research**.**

Questionnaire procedures

Our research problem was examined using the KHQ, which includes eight domains: general health perception (GHP), lower urinary tract symptoms impact (LUTSI), role limitations (RL), physical limitations (PL), social limitations (SL), personal relationships (PR), emotional problems (EP) and sleep/energy disturbances (SED). The responses in KHQ have a four-point rating system. The eight domains are scored between 0 (best result) and 100 (worst result).[19,24] We received approval from the original author to translate the KHQ questionnaire into Croatian. In the translation stage, two bilingual researchers with experience in clinical practice independently translated the original tool. In the back-translation stage, another translator who had not previously encountered the original tool translated the Croatian version back into English. Back-translation worked well in avoiding translation errors because a large part of the original language structure is retained. The translated tool was finalized in the final stage. This process requires comparing the two versions as a whole, and it confirmed that there were no meaningful differences between the original and translated versions. All differences were reviewed and corrected through discussions. The consensus process was repeated to complete the translation if corrections were needed due to the accuracy of translation or cultural differences.

Statistical analysis

The data was descriptively analyzed, and internal consistency was assessed by Cronbach's alpha. Pearson correlations were performed on the eight domains of the KHQ. The level of significance was set to $p<0.05$.

Results

When descriptive statistics of KHQ domains were measured, it was found that the more common lower urinary tract symptoms (LUTS) in MS patients were related to the following domains: GHP (54.27±23.51), LUTSI (44.31±36.31), PR (40.45±31.43) and PL (39.43±37.36). The less common LUTS were related to the following domains: RL (37.40±36.44), SL (35.23±33.12), SED (27.85±26.46) and EP (27.51±32.81). In terms of internal consistency of the KHQ total score and KHQ domains, Cronbach's alpha for the KHQ total score was 0.97 (range for domains: 0.78-0.97), indicating high internal consistency (Table 1).

Table 1 Descriptive statistics and internal consistency of KHQ domains
Tablica 1. Opisna statistika i unutarnja pouzdanost KHQ domena

KHQ domain (n of items) *KHQ domena (broj stavki)*	**Mean (SD)** *Srednja vrijednost (SD)*	**Minimum score** *Minimalni rezultat*	**Maximum score** *Maksimalni rezultat*	**Median (IQR)** *Medijan (IQR)*	**Cronbach's alpha**
GHP (1)	54.27 (23.51)	0	100	50.00 (25.00)	-
LUTSI (1)	44.31 (36.31)	0	100	33.33 (66.67)	-
RL (2)	37.40 (36.44)	0	100	33.33 (66.67)	0.91
PL (2)	39.43 (37.36)	0	100	33.33 (66.67)	0.78
SL (3)	35.23 (33.12)	0	100	22.22 (44.45)	0.86

KHQ domain (n of items) *KHQ domena (broj stavki)*	Mean (SD) *Srednja vrijednost (SD)*	Minimum score *Minimalni rezultat*	Maximum score *Maksimalni rezultat*	Median (IQR) *Medijan (IQR)*	Cronbach's alpha
PR (2)	40.45 (31.43)	0	100	33.33 (33.34)	0.97
EP (3)	27.51 (32.81)	0	100	11.11 (44.44)	0.88
SED (2)	27.85 (26.46)	0	100	25.00 (50.00)	0.93

KHQ: King's Health Questionnaire; GHP: general health perception; LUTSI: lower urinary tract symptoms impact; RL: role limitations; PL: physical limitations; SL: social limitations; PR: personal relationships; EP: emotional problems; SED: sleep/energy disturbances; SD: standard deviation; IQR: interquartile range
KHQ: King's Health Questionnaire; GHP: opća zdravstvena percepcija; LUTSI: utjecaj simptoma donjeg sustava urinarnog trakta; RL: ograničenja uloga; PL: fizička ograničenja; SL: društvena ograničenja; PR: osobni odnosi; EP: emocionalni problemi; SED: poremećaji spavanja/energije; SD: standardna devijacija; IQR: interkvartilni raspon

When testing intercorrelations between KHQ domains, it was found that all KHQ domains were highly correlated (Pearson correlation range: 0.32-0.89) (Table 2).

Table 2 Intercorrelations between KHQ domains
Tablica 2. Interkorelacije između KHQ domena

	GHP	LUTSI	RL	PL	SL	PR	EP	SED
GHP	1							
LUTSI	0.49*	1						
RL	0.51*	0.89*	1					
PL	0.40*	0.86*	0.89*	1				
SL	0.49*	0.79*	0.85*	0.86*	1			
PR	0.32*	0.38*	0.46*	0.44*	0.51*	1		
EP	0.41*	0.73*	0.79*	0.79*	0.86*	0.46*	1	
SED	0.50*	0.72*	0.78*	0.80*	0.81*	0.41*	0.71*	1

KHQ: King's Health Questionnaire; GHP: general health perception; LUTSI: lower urinary tract symptoms impact; RL: role limitations; PL: physical limitations; SL: social limitations; PR: personal relationships; EP: emotional problems; SED: sleep/energy disturbances; *: statistically significant correlation at $p<0.05$
KHQ: King's Health Questionnaire; GHP: opća zdravstvena percepcija; LUTSI: utjecaj simptoma donjeg sustava urinarnog trakta; RL: ograničenja uloga; PL: fizička ograničenja; SL: društvena ograničenja; PR: osobni odnosi; EP: emocionalni problemi; SED: poremećaji spavanja/energije; statistički značajna korelacija pri $p<0,05$*

Discussion

The aim of this study was to determine the psychometric properties of the Croatian version of the King's Health Questionnaire (KHQ) in MS patients. Even though there are some papers in Croatia written in QoL of patients with MS domain, to the best of our knowledge, and since this was a process of validation, this is the first study in Croatia that investigates HRQoL for patients with MS suffering from LUTS and uses Croatian version of the KHQ questionnaire.

We found it necessary and important to investigate HRQoL of MS patients suffering from LUTS because of the mentioned and proven statement that 90% of MS patients suffer from some type of LUTS.[9] Moreover, the North American Research Committee on MS (NARCOMS) estimated that 65% of MS patients report one or more LUTS, including sexual disorders, which also impact their HRQoL.[10] To improve the mentioned HRQoL of MS patients suffering from LUTS, it is first necessary to make as complete and high-quality assessment of their HRQoL as possible.

The reason why we chose to validate the Croatian version of the KHQ questionnaire for the purpose of assessing HRQoL of MS patients suffering from LUTS rather than use already translated and clinically used questionnaires in Croatia, is mainly because of KHQ questionnaire's specific design, which is easy to administer, easily understandable by participants and it covers several domains of life. Other advantages include the short time required to complete the questionnaire, age and gender appropriateness, and coverage of various bladder conditions, including stress incontinence, urge incontinence, mixed incontinence, and overactive bladder.[23] The results of this paper were discussed in connection with published literature in HRQoL of patients with MS suffering from LUTS domain from around 35 years ago until today.

As mentioned earlier, KHQ is a widely used questionnaire in assessing QoL among patients suffering from LUTS. A large number of research include KHQ questionnaire in its methodology, and the most significant part of the research is mainly focused on the process of KHQ validation and QoL assessment among patients suffering from lower urinary tract symptoms, overactive bladder, and urinary incontinence.[25-35] Other, a minor part of the research was focused on the process of KHQ validation and QoL assessment among LUTS patients diagnosed with MS,[32,36] just like in our case.

In 2004, Uemura and Homma assessed the reliability and validity of King's Health Questionnaire in patients with symptoms of overactive bladder with urge incontinence in Japan on the total of 293 patients with LUTS, including 98 males and 195 females. While in our sample, the highest and worst result was measured for GHP domain - 54.27 (23.51), in both female and male parts of their sample, the highest and worst result was measured for LUTSI domain (64.6 for males and 63.2 for females). In our research, all KHQ domains reached high internal consistency reliability, with Cronbach's alpha being higher than 0.70. On the other hand, in the research of Uemura and Homma, high internal consistency was not reached RL (0.67) and PR (0.47) domains in the male part of the sample and for RL (0.66) and PL (0.68) domains in the male part of the sample.[25]

Another study was conducted in the same year; Tamanini et al. investigated concurrent validity, internal consistency, and responsiveness of the Portuguese version of the King's Health Questionnaire (KHQ) in women after stress urinary incontinence surgery on the total of 68 female patients. The test was done before and after surgery. In terms of internal consistency reliability before surgery, the RL, PL, and SED domains measured Cronbach's alpha below 0.70, while after the surgery, all domains achieved high internal consistency reliability, the same as in our sample. The highest and, therefore the worst result after the surgery was measured for GHP domain (23.5 ± 16.2), same as in our research. The lowest and there the best result after operation was measure for SL domain (2.6 ± 8.7).[26]

Bjelic-Radisic et al. conducted research on psychometric properties and validation of the German-language King's Health Questionnaire in women with stress urinary incontinence on 145 female participants. In their validation process, the highest mean value was measured for LUTSI domain (72.0 ± 29.8) and the lowest for SL domain (17.88 ± 28.5), and the same as in our research, all domains reached high internal consistency reliability.[27]

Chieh-Lung Chou et al. researched the validity of the Traditional Chinese version (from 2009) of the King's Health Questionnaire for Taiwanese patients with an overactive bladder on the total of 47 patients. They made the first testing and then the test-retest procedure in 2 circles. In both processes, the same domain came out as one with the highest result - LUTSI domain (68.09 ± 34.72 for first testing and test-retest procedure in test one and 57.45 ± 30.06 for first testing and test-retest procedure in test two), and also same domain came out as one with the lowest result - PR domain (20.71 ± 31.74 for first testing and test-retest procedure in test one and 16.67 ± 24.27 first testing and test-retest procedure in test two). In both testing circles and both first testing and test-retest procedures, all KHQ domains measured Cronbach's alpha above 0.70.[28]

Margolis et al. researched 24 US patients to establish the content validity of the King's Health Questionnaire in men and women with overactive bladder. Without measuring the internal consistency reliability of KHQ domains, they reported the highest mean score for the LUTSI domain - 55.6 (25.4), and the lowest score for the PR domain - 18.5 (19.7), while this domain was the only one that was answered by 18 instead of all 24 participants.[29]

While most of the research included only women or women in the majority, Huang et al. the reliability and validity of the King's Health Questionnaire for male lower urinary tract symptoms in Taiwan was on 393 male participants. The results of their study are probably the most similar to ours in terms of the highest measured mean value and in terms of internal consistency reliability, where all domains measured Cronbach's alpha higher than 0.70. The highest mean value was calculated for the GHP domain (37.1 ± 20.9) and the lowest for the PR domain (4.1 ± 11.6).[30] the PR domain is related to the items about the relationships with one's partner and sexual life. Some previous studies conducted in this domain reported that erectile dysfunction could be caused by LUTS,[37,38] and the possible reasons might be the conservatism of Eastern culture, such as in Taiwan, which might lead to lower reporting about sexual behaviors.

Kaya et al. researched the reliability and validity of the Turkish King's Health Questionnaire in women with urinary incontinence on a sample of 264 female patients. Like in many previous researches, the highest mean score was reported for the LUTSI domain (72.1±27.7) and the lowest for the PR domain (24.1±32.7). In terms of internal consistency reliability, it was measured as high for all KHQ domains. Including our research, this is a rare example of research where intercorrelations between

KHQ domains were tested. In our research, it was found that all KHQ domains were highly correlated (Pearson correlation range: 0.32-0.89), while in the research of Kaya et al., interdomain correlation coefficients between GHP domain and other KHQ domains were low, ranging from 0.13 to 0.28. That indicates that GHP items are not closely related to incontinence-specific domains.

On the other hand, there were moderate to high correlations (from 0.34 to 0.63) between the LUTSI domain and other KHQ domains, except for GHP. There was also good convergent validity with high correlation coefficients (0.72 and 0.75) among conceptually related RL, PL SL domains. Correlations of the PR domain with other domains were relatively lower than other inter-domain correlation coefficients, ranging from 0.36 to 0.58.[31]

Another study from a similar domain was conducted in Turkey by Karapolat et al. They investigated the bladder-related quality of life in people with neurological disorders, as well as the reliability and validity of the Turkish version of the King's Health Questionnaire in a total of 35 patients with spinal cord injury (SCI). Another part of the study was conducted on MS patients, which will be discussed later in this paper. In part of the research among patients with SCI, all domains reached high internal consistency reliability. The highest mean value was again found for the LUTSI domain (78.1 ± 26.8) and the lowest for the SED domain (39.5 ± 27.4). According to the authors, the limitation of the study was that the SCI people were not analyzed according to the urodynamic findings. Information on urodynamic findings would have provided an objective measure of bladder dysfunction severity.[32]

The most recent research in the KHQ validation domain was conducted by Joshi and Rathi in late 2023 and published in early 2024. Two authors conducted research about translation, cross-cultural adaptation, reliability, and validation of King's Health Questionnaire in the Marathi language. The research was conducted on 123 patients in India. Just like in the majority of previously discussed research from this domain, the highest mean value was again measured for the LUTSI domain (74.0±14.8), while the lowest and, therefore, the best result was calculated for the PR domain (28.5 ± 10.2). Internal consistency reliability was above 0.70 except for SL (0.68) and SED domain (0.48). Regarding testing intercorrelations between KHQ domains, the correlation indices found in each specific category ranged from 0.53 (GHP domain) to 0.81 (gravity measurements), which were regarded as moderate to strong. The only domain with a moderate correlation coefficient (0.53) was the GHP domain.[33] Since the patients were not being treated, this outcome was already anticipated because it was the only one that could experience some spontaneous change.[39]

Okamura et al. the reliability and validity of the KHQ for lower urinary tract symptoms in both genders on 1002 participants in total. Participants were divided in sample A which consisted of 75 women and 179 men consulted by urologists, and sample B which consisted of 419 women and 330 men consulted by general practitioners. Mean values and Cronbach's alpha of sample A were measured separately for women and men. Both women and men of sample A had the highest mean value for GHP domain (women - 52.7, men - 45.3) and the lowest mean value for PR domain (women - 7.4, men - 16.2). Cronbach alpha for both women and men of sample A was measured high for all KHQ domains. In terms of correlation analysis, it showed convergent validity among PL, RL, and SL domains in whole sample A, and discriminant validity among PR, EO, and SED domains also in whole sample A. As expected, KHQ scores of domains in sample B were lower than those in sample A for all domains except GHP domain.[34]

The reliability and validity of KHQ were also tested by Ferreira da Mata et al. in 152 men undergoing radical prostatectomy.[35] In this research, and the one previously discussed, which was conducted by Huang et al., 30 represented only two studies from this domain that do not include female patients. In the research of Ferreira da Mata et al. Cronbach's alpha ranged from 0.64 to 0.84. The only domain that did not reach high internal consistency reliability was the SED domain.[35]

Regarding the process of KHQ validation and QoL assessment among LUTS patients diagnosed with MS, just like in our case, fewer studies were found.[32,36] In terms of measuring QoL of MS patients in general, independently of LUTS, Baumstarck et al. concluded that QoL measures might provide clinicians with information regarding the general health status of their MS patients who might have otherwise gone unrecognized. They also stated that neurologists should consider QoL measures in the same way as routine objective measures such as symptomatic evaluation scales, laboratory tests, and radiographs to manage the care of MS patients.[40]

Research from Karapolat et al. was already partially discussed earlier because it did not include only MS patients. However, regarding MS patients included in their research, all KHQ domains reached high internal consistency reliability, the same as their participants with SCI and our participants with MS. In terms of mean values, the highest was measured for PL domain (49.2 ± 38.4) and the lowest for PR domain (24.3 ± 24.5), same as for their participants

with SCI. Except for slightly higher results in GHP domain, their MS group of participants measured lower results in all KHQ domains than their participants with ICS, indicating better results for all domains except for GHP domain.[32]

Finally, Ersin et al. also conducted a research about the correlation between disability status and QoL in a total of 32 MS female patients with urinary incontinence. They found a statistically significant negative correlation between urinary incontinence-related QoL and disability status (EDSS score), meaning that MS patients with high EDSS scores have low KHQ scores.[36]

Conclusions

According to our results, our participants' general health perception (GHP) was self-estimated as average. Except for the GHP domain, the highest value was measured for the lower urinary tract symptoms impact (LUTSI) domain. On the other hand, the lowest values were measured for emotional problems (EP) and sleep/energy disturbances (SED) domains. Cronbach's alpha ranged from 0.78 to 0.97, and a statistically significant correlation was found between all KHQ domains when Pearson correlations were performed. Therefore, when looking at the results of internal consistency reliability and intercorrelation between separate dimensions of KHQ, and when comparing them with relevant research and relevant literature from this domain, it can be concluded that the Croatian version of KHQ can be a valid and reliable instrument for a helpful measure for LUTS in Croatian-speaking MS patients.

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