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Review

PREDICTORS OF HEALTH-RELATED QUALITY OF LIFE IN INFORMAL CAREGIVERS OF DEMENTIA PATIENTS IN ZAGREB, CROATIA, A CROSS SECTIONAL STUDY

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SUMMARY

We aimed to estimate health-related quality of life (HRQoL) in family-member caregivers of patients with dementia in Croatia and to assess relevant predictors.

A cross-sectional study in family medicine practices in Zagreb (Health Care Center Zagreb-West) was performed in period 10/2017-9/2018 and included 131 dyads consisting of a patient with dementia and one dominant informal caregiver. Patient measures included Mini-mental-state-examination (MMSE), Barthel-index and the Neuropsychiatric Inventory-Questionnaire (NPI-Q). Caregiver measures included 36-Item Short-Form-Health-Survey (SF-36), Zarit-Burden-Interview (ZBI) and structured questionnaire regarding general information on caregiver and patient.

SF-36 is a reliable instrument to estimate HRQoL (Cronbach $\alpha \geq 0.79$ for all domains). Caregiver HRQoL was higher than reported in Croatian population in physical functioning (PF), role physical (RP), general health (GH), social functioning (SF) and role emotional (RE) domains. More pronounced neuropsychiatric symptoms in patient with dementia were associated with caregiver's lower HRQoL in vitality (VT) and mental health (MH) domains. Caregivers with higher caregiver burden assessed by ZBI had lower HRQoL in RP, bodily pain (BP), GH, VT, SF, RE and MH domains. In multivariate analyses, higher caregiver's burden was independent predictor of lower HRQoL in RP, VT, RE and MH domains. Neuropsychiatric symptoms and use of day-care service were recognized as independent predictors of lower HRQoL (in PF, BP and GH, SF, RE domains, respectively).

Neuropsychiatric symptoms and caregiver burden are associated with HRQoL in caregivers of patients with dementia. Interventions including psychological support and learning of skills necessary to tackle individual problems may help in improvement of HRQoL.

Key words: *caregiver burden – dementia - family practice - health related quality of life*

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INTRODUCTION

Aging of population results in an increased prevalence of dementia (Prince et al. 2013, Mitrečić et al. 2020). Prevalence of dementia in Croatia is estimated to be 6.2% (Alzheimer-Europe 2014), similar to other countries in the Danube region (Mehrabian et al. 2019). Prevalence of mild cognitive impairment without dementia among persons >65 years of age in family medicine practice was reported to be 17% (Hanzevacki et al. 2011). Cognitive deterioration results in a newly formed need for caregiving and imposes additional responsibilities on family members and society (Cylus et al. 2020). Family members are confronted with new problems, fears and tasks which require reorganization and adaptation of their current way of life. One to two family members need to regularly assist in the activities of daily living as well as to provide necessary logistic and safety conditions.

Quality of life is an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns (WHOQOL 1999). Impaired health does not necessary imply lower quality of life (Duka Glavor et al. 2019). The 36-Item Short Form Health Survey (SF-36) is widely used instrument to estimate health related quality of life (HRQoL) and which encompasses its physical, mental, social role fulfilling aspects and personal perception of well-being (Ware & Sherbourne 1992). It is designed to evaluate HRQoL in medical research and population norms for different countries have been published. Results in the Croatian population are consistent with those from other European countries, but the HRQoL is lower (Juresa et al. 2000, Maslic Sersic & Vuletic 2006).

HRQoL was assessed using SF-36 in a large number of studies investigating caregivers of dementia patients usually reporting lower HRQoL than in general population (Zhang et al. 2014, Yikilkan et al. 2014, Garzon-Maldonado et al. 2017, Arango-Lasprilla et al. 2010, Martin-Carrasco et al. 2009, Argimon et al. 2004, Berg-Weger et al. 2003). Burden imposed by caregiving was shown to be strongly associated with HRQoL, more strongly with its mental than physical components (Kurz et al. 2003, Li & Lewis 2013, Yang et al. 2012, Machnicki et al. 2009, Naglie et al. 2011, Moreno et al. 2015). Individually tailored interventions aimed at caregivers are needed to help them provide care for their patients at home for longer time. There are only a few studies investigating population of caregivers of patients with dementia in Croatia and wider region (Milić Babić et al. 2014, Ostojic et al. 2014, Kovačić Petrović & Repovečki 2016, Uzun et al. 2019). However, there are no published data on caregiver HRQoL and related predictors. Thus, we aimed to investigate HRQoL in informal caregivers family members of patients with dementia and to assess relevant predictors of HRQoL in Croatia.

SUBJECTS AND METHODS

Subjects

We performed a cross-sectional study in 60 family medicine practices in west part of city of Zagreb in period from October 2017 to September 2018. Electronic medical records were screened for non-institutionalized patients with dementia that were diagnosed with International Classification of Diseases [ICD-10] codes F00, F01, F02, F03 or G30 either by specialist of neurology or psychiatry. Dyads of one dominant informal caregiver that was a family member and patient with dementia were included in the study. Patients who were institutionalized, did not have a diagnosis confirmed by a neurology or psychiatry specialist, or had a caregiver that was not a family member were excluded. Study aimed to include 131 caregiver-patient dyads in line with previous studies as this was estimated to be a sufficient sample size to reproduce previously reported associations of HRQoL and caregiver burden.

Methods

Procedure

Families willing to participate were contacted again and a meeting was arranged in their household or in family medicine doctor's practice. After being informed about aims and methods in detail, and after caregiver (and patient if appropriate) signed written informed consent, an interview with the caregiver and the patient with fulfillment of instruments was performed.

The study was approved by the Health Care Center Zagreb-West and University of Zagreb School of Medicine Review Boards.

Instruments

We have used 6 instruments: the 36-Item Short Form Health Survey (SF-36), the Zarit Burden Interview (ZBI), the Mini mental state examination (MMSE), the Barthel index, the Neuropsychiatric Inventory-Questionnaire (NPI-Q) and a Structured questionnaire including general questions about a caregiver and a patient.

The 36-Item Short Form Health Survey (SF-36) (Ware & Sherbourne 1992, Juresa et al. 2000) was used to estimate HRQoL and was conducted with a caregiver. Questionnaires measures HRQoL in eight domains namely psychical functioning (PF), role physical (RP), bodily pain (BP), general health (GH), vitality (VT), social functioning (SF), role emotional (RE) and mental health (MH), results are provided as a score ranging from 0-100 points, higher score representing better HRQoL.

The Zarit Burden Interview (ZBI) (Zarit et al. 1980, Lucijanić et al. 2020) was used to estimate caregiver burden and was conducted with a caregiver. Questionnaire provides result ranging from 0-88 points, higher score representing higher burden. Originally proposed burden categories by Zarit and al. are absent to mild burden (0-20 points), mild to moderate burden (21-40 points), moderate to severe burden (41-60 points) and severe burden (61-88 points).

The Mini mental state examination (MMSE) (Folstein et al. 1975, Boban et al. 2012) was used to assess level of cognitive impairment in a patient with dementia and was conducted with a patient. Questionnaire provides result ranging from 0-30 points, lower score representing higher degree of cognitive impairment.

The Barthel index (Mahoney & Barthel 1965) was used to assess level of functional impairment of a patient and was conducted with a caregiver. Questionnaire provides score ranging from 0-100, lower score representing higher level of functional impairment.

The Neuropsychiatric Inventory-Questionnaire (NPI-Q) (Cummings et al. 1994) was used to assess presence and severity of neuropsychiatric symptoms in a patient and was conducted with a caregiver. Questionnaire provides score ranging from 0-144 points, higher total NPI-Q score representing more pronounced neuropsychiatric symptoms.

Structured questionnaire including general questions about a caregiver and a patient and was conducted with a caregiver. Data collected about a caregiver were age, gender, years of education, employment status, relationship with a patient, length of caregiving, living in a same household with a patient, need for day care services, hours dedicated per week, hours of someone else's help per week, smoking status and morbidities. Data collected about a patient with dementia were age, gender, years of education, type of dementia, duration of dementia and comorbidities. Assessed morbidities/comorbidities were arterial hypertension, diabetes mellitus, malignant disease, rheumatic symptoms requiring therapy, asthma/chronic obstructive lung disease (COPD) in both caregiver and patient and anxious-depressive symptoms requiring therapy in a caregiver.

Statistical methods

Categorical variables were presented as frequencies and relative frequencies.

For the quantitative variables, normality of distribution was tested using the Kolmogorov-Smirnov test. Non-normally distributed numerical variables were presented as median and interquartile range (IQR) and were compared between groups using the Mann Whitney U test and the Kruskal Wallis ANOVA. Normally distributed variables were presented as mean ± standard deviation and were compared between groups using the t-test. SF-36 domain scores were compared with Croatian population norms (Maslic Sersic & Vuletic 2006) using the t-test.

Correlation between two numerical variables was tested using the Spearman correlation and is described by Spearman coefficient of correlation Rho.

Reliability of SF-36 domains was expressed with Cronbach α coefficient of internal consistency.

Logistic regression was used for multivariate analysis of predictors of lower HRQoL, domain scores that were used as dependent variables were dichotomized at median value. ZBI, age and gender of caregiver, age and gender of patient, MMSE score, Barthel index score, total NPI-Q score, need for day care services and all other variables that were univariately associated with overall any domains were included into the variable selection process via backwards method (inclusion criterion P<0.15, exclusion criterion P>0.2).

P values <0.05 were considered statistically significant. MedCalc version 19.0.4. (MedCalc Software bvba, Ostend, Belgium) was used for all presented analyses.

RESULTS

Among 97302 insured persons in 60 family medicine practices, a total of 135 dyads consisting of one patient with dementia and his/her dominant informal caregiver were identified and approached by their family medicine physician and investigator. A total of 131 caregivers agreed to participate in the study (response rate 97%).

Mean age of caregivers was 62.1±13 years, they were mostly females [92/131 (70.2%)] and children of patients [67/131 (51.1%)]. Mean age of patients was 79.4±7.1, they had median MMSE of 15 points corresponding to moderately severe dementia, median Barthel index of 85 corresponding to absence of functional dependency and median NPI-Q score of 26 indicating presence of neuropsychiatric symptoms.

SF-36 in comparison to Croatian population

Internal consistencies of SF-36 domains were good (Cronbach α ≥0.79) as shown in Table 1. In comparison to Croatian population, informal caregivers of patients with dementia presented with significantly higher HRQoL in psychical functioning, role physical, general health, social functioning and role emotional domains, whereas there was no statistically significant difference in bodily pain, vitality and mental health domains as shown in Table 1.

Relationship of HRQoL with severity of dementia and caregiver burden

Caregivers' and patients' characteristics and their relationship with HRQoL are presented in Table 2. Severity of cognitive impairment assessed through MMSE score did not show univariate statistically significant associations with HRQoL. Higher functional impairment as assessed by lower Barthel index was associated with lower HRQoL in general health (Rho=0.2; P=0.022), vitality (Rho=0.32; P<0.001), role emotional (Rho=0.2; P=0.023) and mental health domains (Rho=0.26; P=0.003). More pronounced neuropsychiatric symptoms as assessed by higher NPI-Q score were significantly associated with lower HRQoL in vitality (Rho=-0.22; P=0.011) and mental health domains (Rho=-0.22; P=0.013).

Statistically significant negative correlation was present between ZBI score and all SF-36 domains with the exception of psychical functioning. Domains role physical and bodily pain showed very weak correlation (Rho -0.17 and -0.2, respectively) despite statistically significant result. Other domains showed weak to moderate

Table 1. Internal consistency of SF-36 domains and comparison of HRQoL between caregivers and Croatian population

Domains	Cronbach α	Caregivers of patients with dementia (n=131) mean ± st. deviation	Croatian population (n=9070) mean ± st. deviation	t-test
PF	0.89	83.8±17.2	69.1±30.0	*P<0.001**
RP	0.92	76.2±38.5	61.5±44.8	*P<0.001**
BP	0.88	68.9±27.4	64.6±30.5	P=0.109
GH	0.85	63±23	54.8±22.6	*P<0.001**
VT	0.80	50.6±19.7	53.2±22.7	P=0.192
SF	0.93	88.4±22.1	73.8±27.8	*P<0.001**
RE	0.86	85.8±31	68.6±43.7	*P<0.001**
MH	0.79	63±17.3	61.9±21.4	P=0.558

* statistically significant at level P<0.05

Table 2. Overview of caregivers' and patients' characteristics and their relationship with SF-36 domains

	Summary	PF	RP	BP	GH	VT	SF	RE	MH
Caregiver age (years)	M±SD	Rho=-0.55	Rho=-0.27	Rho=-0.31	Rho=-0.44	Rho=-0.21	Rho=-0.16	Rho=0	Rho=-0.19
	62.1±13	*$P<0.001^{c,}$**	*$P=0.002^{c,*}$*	*$P<0.001^{c,*}$*	*$P<0.001^{c,*}$*	*$P=0.014^{c,*}$*	$P=0.073^{c}$	$P=0.973^{c}$	*$P=0.031^{c,*}$*
Caregiver gender (n=131)	N (%)	Median	Median	Median	Median	Median	Median	Median	Median
Male	42 (32.1%)	90	100	67.5	70	50	100	100	66
Female	89 (67.9%)	85	100	67.5	65	45	100	100	68
		$P=0.417^{b}$	$P=0.101^{b}$	$P=0.802^{b}$	$P=0.803^{b}$	$P=0.179^{b}$	$P=0.835^{b}$	$P=0.541^{b}$	$P=0.898^{b}$
Relationship with a patient (n=131)	N (%)	Median	Median	Median	Median	Median	Median	Median	Median
Spouse	51 (38.9%)	80	100	67.5	50	40	100	100	60
Children	67(51.1%)	95	100	77.5	70	55	100	100	68
Other	13 (9.9%)	100	100	77.5	80	50	100	100	68
		$P<0.001^{a,*}$	$P=0.112^{a}$	$P=0.241^{a}$	*$P<0.001^{a,*}$*	$P=0.056^{a}$	$P=0.189^{a}$	$P=0.942^{a}$	*$P=0.017^{a,*}$*
		*(1 vs 2; 1 vs 3)**			*(1 vs 2; 1 vs 3)**				*(1 vs 2)**
Patient age (years)	79.4 ±7.1	Rho=-0.11	Rho=-0.17	Rho=-0.19	Rho=0.02	Rho=-0.09	Rho=0.09	Rho=-0.02	Rho=0.06
		$P=0.215^{c}$	$P=0.057^{c}$	*$P=0.032^{c,*}$*	$P=0.794^{c}$	$P=0.318^{c}$	$P=0.323^{c}$	$P=0.856^{c}$	$P=0.511^{c}$
Patient gender (n=131)	N (%)	Median	Median	Median	Median	Median	Median	Median	Median
Male	39 (29.8%)	80	100	67.5	60	40	100	100	60
Female	92 (70.2%)	90	100	70	70	55	100	100	68
		$P=0.015^{b,*}$	$P=0.056^{b}$	$P=0.481^{b}$	*$P=0.025^{b,*}$*	*$P=0.015^{b,*}$*	$P=0.766^{b}$	$P=0.608^{b}$	*$P=0.038^{b,*}$*
Length of caregiving (years)	2 IQR (1-3)	Rho=-0.05	Rho=-0.06	Rho=-0.1	Rho=-0.1	Rho=-0.21	Rho=-0.08	Rho=0.06	Rho=0
		$P=0.563^{c}$	$P=0.503^{c}$	$P=0.246^{c}$	$P=0.280^{c}$	*$P=0.017^{c,*}$*	$P=0.352^{c}$	$P=0.511^{c}$	$P=0.982^{c}$
Type of dementia (n=131)	N (%)	Median	Median	Median	Median	Median	Median	Median	Median
Alzheimer disease	76 (58%)	90	100	90	65	47.5	100	100	64
Vascular	47 (35.9%)	85	100	57.5	65	50	100	100	72
Parkinson disease	6 (4.6%)	92.5	100	68.8	55	50	100	100	68
Lewy body	1 (0.8%)	65	0	45	50	40	100	100	68
Frontotemporal	1 (0.8%)	90	50	45	60	55	37.5	66.7	60
		$P=0.534^{a}$	$P=0.277^{a}$	*$P=0.046^{a,*}$*	$P=0.822^{a}$	$P=0.977^{a}$	$P=0.144^{a}$	$P=0.321^{a}$	$P=0.320^{a}$
				*(1 vs 2)**					
Use of day care services (N=131)	N (%)	Median	Median	Median	Median	Median	Median	Median	Median
Yes	33 (25.2%)	90	100	77.5	65	45	87.5	100	60
No	98 (74.8%)	87.5	100	67.5	65	50	100	100 ↑	68
		$P=0.272^{b}$	$P=0.992^{b}$	$P=0.539^{b}$	$P=0.300^{b}$	$P=0.943^{b}$	*$P<0.001^{b,*}$*	*$P<0.001^{b,*}$*	$P=0.550^{b}$
MMSE score	15 IQR	Rho=0.07	Rho=0.08	Rho=-0.04	Rho=0.1	Rho=0.09	Rho=-0.04	Rho=0.05	Rho=0.09
	(9-20)	$P=0.407^{c}$	$P=0.364^{c}$	$P=0.634^{c}$	$P=0.237^{c}$	$P=0.307^{c}$	$P=0.675^{c}$	$P=0.563^{c}$	$P=0.307^{c}$
Barthel index score	85 IQR	Rho=0.01	Rho=0.1	Rho=0.06	Rho=0.2	Rho=0.32	Rho=-0.02	Rho=0.2	Rho=0.26
	(65-100)	$P=0.946^{c}$	$P=0.237^{c}$	$P=0.489^{c}$	*$P=0.022^{c,*}$*	*$P<0.001^{c,*}$*	$P=0.829^{c}$	*$P=0.023^{c,*}$*	*$P=0.003^{c,*}$*
NPI-Q score	26 IQR	Rho=-0.05	Rho=-0.09	Rho=-0.06	Rho=-0.11	Rho=-0.22	Rho=-0	Rho=-0.13	Rho=-0.22
	(12-39)	$P=0.555^{c}$	$P=0.329^{c}$	$P=0.525^{c}$	$P=0.203^{c}$	*$P=0.011^{c,*}$*	$P=0.982^{c}$	$P=0.155^{c}$	*$P=0.013^{c,*}$*
Overall ZBI score	27 IQR	Rho=-0.06	Rho=-0.17	Rho=-0.2	Rho=-0.25	Rho=-0.35	Rho=-0.27	Rho=-0.36	Rho=-0.44
	(21-39)	$P=0.525^{c}$	*$P=0.047^{c,*}$*	*$P=0.024^{c,*}$*	*$P=0.004^{c,*}$*	*$P<0.001^{c,*}$*	*$P=0.002^{c,*}$*	*$P<0.001^{c,*}$*	*$P<0.001^{c,*}$*

* statistically significant at level $P<0.05$; [a] Kruskal-Wallis ANOVA test with post-hoc test by Conover; [b] Mann Whitney U test; [c] Spearman correlation

Table 3. Overview of caregivers' and patients' comorbidities and their relationship with SF-36 domains

	Summary N (%)	PF Median	RP Median	BP Median	GH Median	VT Median	SF Median	RE Median	MH Median
Caregiver arterial hypertension									
Yes	68 (51.9%)	85	100	67.5	57.5	40	100	100	66
No	63 (48.1%)	95	100 ↑	90	75	55	100	100	68
		$P<0.001^{b}$ *	$P=0.001^{b}$ *	$P=0.015^{b}$ *	$P<0.001^{b}$ *	$P=0.027^{b}$ *	$P=0.449^{b}$	$P=0.564^{b}$	$P=0.899^{b}$
Caregiver diabetes mellitus									
Yes	14 (10.7%)	72.5	100	57.5	60	45	100	100	64
No	117 (89.3%)	90	100	70	65	50	100	100	68
		$P=0.027^{b}$ *	$P=0.555^{b}$	$P=0.176^{b}$	$P=0.145^{b}$	$P=0.791^{b}$	$P=0.183^{b}$	$P=0.527^{b}$	$P=0.686^{b}$
Caregiver malignant disease									
Yes	9 (6.9%)	75	50	45	45	45	100	100	68
No	122 (93.1%)	90	100	67.5	65	50	100	100	66
		$P=0.032^{b}$ *	$P=0.060^{b}$	$P=0.346^{b}$	$P=0.034^{b}$ *	$P=0.895^{b}$	$P=0.667^{b}$	$P=0.832^{b}$	$P=0.681^{b}$
Caregiver rheumatic symptoms									
Yes	30 (22.9%)	70	37.5	45	40	40	100	100	60
No	101 (77.1%)	95	100	80	70	50	100	100	68
		$P<0.001^{b}$ *	$P<0.001^{b}$ *	$P<0.001^{b}$ *	$P<0.001^{b}$ *	$P=0.022^{b}$ *	$P=0.312^{b}$	$P=0.210^{b}$	$P=0.118^{b}$
Caregiver anxious-depressive sy.									
Yes	24 (18.3%)	85	100	57.5	37.5	40	100	100	50
No	107 (81.7%)	90	100	70	70	50	100	100 ↑	68
		$P=0.061^{b}$	$P=0.146^{b}$	$P=0.027^{b}$ *	$P<0.001^{b}$ *	$P=0.017^{b}$ *	$P=0.362^{b}$	$P<0.001^{b}$ *	$P<0.001^{b}$ *
Caregiver asthma/COPD									
Yes	9 (6.9%)	85	100	67.5	65	40	100	100	56
No	122 (93.1%)	90	100	67.5	65	50	100	100	68
		$P=0.443^{b}$	$P=0.982^{b}$	$P=0.618^{b}$	$P=0.774^{b}$	$P=0.134^{b}$	0.886^{b}	$P=0.536^{b}$	$P=0.099^{b}$
Patient arterial hypertension									
Yes	83 (63.4%)	85	100	67.5	65	50	100	100	64
No	48 (36.6%)	90	100	78.8	67.5	50	100	100	68
		$P=0.066^{b}$	$P=0.396^{b}$	$P=0.037^{b}$ *	0.512^{b}	$P=0.429^{b}$	$P=0.250^{b}$	$P=0.387^{b}$	$P=0.644^{b}$
Patient diabetes mellitus									
Yes	19 (14.5%)	85	100	67.5	60	50	100	100	72
No	112 (85.5%)	90	100	67.5	65	50	100	100	64
		$P=0.686^{b}$	$P=0.635^{b}$	$P=0.678^{b}$	$P=0.459^{b}$	$P=0.877^{b}$	$P=0.840^{b}$	$P=0.624^{b}$	$P=0.584^{b}$
Patient malignant disease									
Yes	15 (11.5%)	85	100	57.5	60	40	100	100	64
No	116 (88.5%)	90	100	67.5	65	50	100	100	68
		$P=0.930^{b}$	$P=0.889^{b}$	$P=0.331^{b}$	$P=0.587^{b}$	$P=0.157^{b}$	$P=0.895^{b}$	$P=0.158^{b}$	$P=0.502^{b}$
Patient rheumatic symptoms									
Yes	32 (24.4%)	85	100	67.5	67.5	50	100	100	68
No	99 (75.6%)	90	100	67.5	65	50	100	100	64
		$P=0.568^{b}$	$P=0.483^{b}$	$P=0.318^{b}$	$P=0.809^{b}$	$P=0.753^{b}$	$P=0.970^{b}$	$P=0.308^{b}$	$P=0.540^{b}$
Patient asthma/COPD									
Yes	5 (3.8%)	80	100	67.5	40	30	100	100	52
No	126 (96.2%)	90	100	67.5	65	50	100	100	68
		$P=0.583^{b}$	$P=0.494^{b}$	$P=0.363^{b}$	$P=0.492^{b}$	$P=0.071^{b}$	$P=0.472^{b}$	$P=0.295^{b}$	$P=0.148^{b}$

*statistically significant at level $P<0.05$; ^{b}Mann Whitney U test

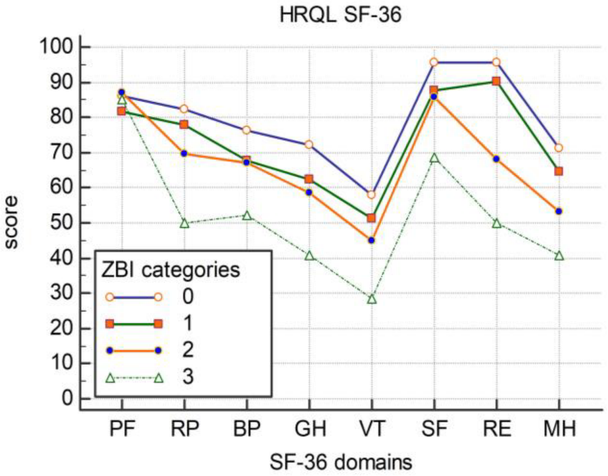

Figure 1. Relationship between HRQoL and ZBI burden categories (0 - absent to mild burden; 1 - mild to moderate burden; 2 - moderate to severe burden; 3 - and severe burden)

statistically significant negative correlation with mental health domain showing highest correlation (Rho -0.44). Relationship between SF-36 domains and ZBI burden categories is shown in Figure 1, HRQoL was consistently lower in all SF-36 domains with increasing categories of caregiver burden.

Caregivers' and patients' comorbidities and their univariate relationship with HRQoL are presented in Table 3.

Multivariate analyses of predictors of SF-36 domains

We performed a series of multivariate logistic regression models investigating independent predictors of particular SF-36 domains. Mutually independent predictors of lower HRQoL in psychical functioning domain were older caregiver age (OR 1.27, P<0.001), female caregiver sex (male OR 0.15, P=0.035), lower MMSE (OR 0.9, P=0.041), higher NPI-Q score (OR 1.05, P=0.021), shorter caregiver education (OR 0.34, P=0.005), caring for a patient with help of other persons (self-care OR 0.07, P=0.035), less hours dedicated per week (OR 0.97, P=0.036), less hours of help received per week (OR 0.96, P=0.018), caregiver arterial hypertension (OR 5.71, P=0.013), caregiver malignant disease in previous 5 years (OR 265.06, P=0.002), caregiver rheumatic disease requiring therapy (OR 9.46, P=0.009), younger patient age (OR 0.91, P=0.042), female patient sex (male OR 0.07, P=0.010) and patient arterial hypertension (OR 9.84, P=0.005).

Mutually independent predictors of lower HRQoL in role physical domain were higher ZBI (OR 1.03, P=0.038), lower number of persons providing help (OR 0.58, P=0.041), caregiver arterial hypertension (OR 4.97, P=0.003) and caregiver rheumatic disease requiring therapy (OR 11.94, P<0.001).

Mutually independent predictors of lower HRQoL in bodily pain domain were higher NPI-Q (OR 1.05, P=0.001), no high education degree (degree OR 0.14, P=0.002), caregiver non-employment (employment OR 0.13, P=0.001), less hours dedicated per week (OR 0.97, P=0.017), living in a same household (OR 6.79, P=0.048), caregiver rheumatic disease requiring therapy (OR 4.84, P=0.005), older patient age (OR 1.12, P=0.004) and dementia other than AD (AD OR 0.3, P=0.017).

Mutually independent predictors of lower HRQoL in general health domain were female caregiver sex (male OR 0.1, P=0.017), attending day care service (OR 10.52, P=0.009), spouse relationship (OR 18.67, P=0.009), caregiver arterial hypertension (OR 6.18, P=0.011), caregiver malignant disease in previous 5 years (OR 86.14, P=0.009), caregiver rheumatic disease requiring therapy (morbidity OR 6.11, P=0.022), caregiver anxious-depressive syndrome requiring therapy (OR 8.56, P=0.021) and shorter patient education (OR 0.78, P=0.005).

Mutually independent predictors of lower HRQoL in vitality domain were lower Barthel index (OR 0.97, P=0.002), higher ZBI (OR 1.06, P<0.001), spouse relationship (OR 4.84, P=0.004) and patient malignant disease in previous 5 years (OR 7.07, P=0.016).

Mutually independent predictors of lower HRQoL in social functioning domain were older caregiver age (OR 1.06, P=0.007), attending day care service (OR 4.13, P=0.004) and higher ZBI (OR 1.05, P=0.011).

Mutually independent predictors of lower HRQoL in role emotional domain were attending day care service (OR 14.09, P<0.001), higher ZBI (OR 1.06, P=0.009), more hours dedicated per week (OR 1.03, P=0.011), active smoking (OR 13.79, P=0.002), caregiver anxious-disorder syndrome requiring therapy (OR 8.6, P=0.004) and female patient sex (male OR 0.13, P=0.031).

Mutually independent predictors of lower HRQoL in mental health domain were higher ZBI (OR 1.08, P<0.001), longer caregiver education (OR 1.47, P=0.013), caregiver non-employment (employment OR 0.27, P=0.032), living in a same household (OR 6.46, P=0.027), caregiver rheumatic disease requiring therapy (OR 3.61, P=0.043), caregiver anxious-depressive syndrome requiring therapy (morbidity OR 5.55, P=0.029), male patient sex (OR 3.03, P=0.037), AD dementia (OR 2.9, P=0.035) and patient asthma/COPD (OR 48.17, P=0.026).

DISCUSSION

To the best of our knowledge, our study is the first to investigate HRQoL in caregivers family members of patients with dementia in Croatia and wider region, and to report independent contributions of caregiver- and patient-related parameters to particular domains of HRQoL. We would like to emphasize several points.

Study was conducted in family medicine practice and assessed a population of informal caregivers of patients with dementia who care for their family member at home. Very high response rate of 97% is an indicator of very good cooperation of family medicine physicians and families of patients with dementia. Family medicine practices are the first place where patients with dementia and their caregivers can be timely identified and targeted with specific interventions.

SF-36 is a reliable instrument with good internal consistency in our sample of caregivers. In contrast to majority of previously published studies (Zhang et al. 2014, Yikilkan et al. 2014, Arango-Lasprilla et al. 2010, Martin-Carrasco et al. 2009, Cucciare et al. 2010), caregivers of patients with dementia in Croatia had higher HRQoL than general population in psychical functioning, role physical, general health, social functioning and role emotional domains. Manninen et al. 2003 from Finland also reported higher HRQoL in caregivers of patients with dementia which was attributed to availability of social support and absence of stigmatization in an advanced society (Manninen et al. 2003). According to some authors psychical functioning and social functioning domains are the least affected by caregiving (Garzon-Maldonado et al. 2017, Argimon et al. 2004). Good physical health is required to provide adequate care at home and domains associated with physical aspects of HRQoL (psychical functioning, role physical, bodily pain) showed non-existent to weak correlations with burden in our study. Lowest HRQoL scores in our study were observed in vitality domain which is in line with previous observations (Garzon-Maldonado et al. 2017). Our HRQoL scores are mostly similar to the study conducted in Andalusia caregivers (Garzon-Maldonado et al. 2017) which included 97 caregivers (mostly females and children of patients) but reported lower HRQoL in comparison to general population. It should be noted that published data for HRQoL in Croatian general population are lower than in other European countries. Length of caregiving was shown to be negatively correlated with HRQoL (Garzon-Maldonado et al. 2017) and caregivers in our study had shorter length of caregiving on average in comparison to studies that reported HRQoL lower than in general population (Arango-Lasprilla et al. 2010, Martin-Carrasco et al. 2009, Cucciare et al. 2010).

Mental health and vitality are only domains with lower HRQoL in caregivers caring for patients with more pronounced neuropsychiatric symptoms. This is in line with previous studies reporting better mental health associated with less pronounced neuropsychiatric symptoms (Zhang et al. 2014, Markowitz et al. 2003). When considering multivariate analyses, after adjusting for other meaningful variables we recognized severity of neuropsychiatric symptoms as an independent contributor to lower HRQoL in psychical functioning and bodily pain domains where no univariate associations were evident, depicting that domains assessing physical aspects of HRQoL are also affected by neuropsychiatric symptoms.

Caregiver burden is an important contributor to lower HRQoL in a number of previous studies (Li & Lewis 2013, Yang et al. 2012, Machnicki et al. 2009) and our study as well. Psychical functioning domain did not show significant association with burden, whereas role physical and bodily pain domains has significant but very weak negative correlation with burden in our study. Other domains showed weak to moderate significant negative correlation with burden, with domains vitality, social functioning, role emotional and mental health showing stronger association which is in line with previous studies (Machnicki et al. 2009). In multivariate analyses, we recognized higher caregiver burden as an independent predictor of lower HRQoL in role physical, vitality, role emotional and mental health domains, further depicting importance of assessing caregiver burden for understanding changes in caregiver HRQoL.

Increased psychological load negatively affects HRQoL as shown in patients with posttraumatic stress disorder (Braš et al. 2019, Jukić et al. 2019). Association of depression and mental aspects of HRQoL has been recognized previously and lower score in the mental component of SF-36 questionnaire was reported to be a predictor of depression (Cucciare et al. 2010). Presence of anxious-depressive syndrome requiring therapy was also independent predictor of lower HRQoL in mental health, role emotional and general health domains in our study. Early interventions might lead to improved outcomes in patients with psychiatric problems (Matić et al. 2018) which might be translate to caregivers of patients with dementia as well. Recognition of a treatable condition that has wide impact on multiple domains of HRQoL is very important as it has a substantial potential for improvement of caregiver HRQoL. Informal caregiving is associated with a number of stressors and additional health risks for caregivers family members (Goren et al. 2016). Caregivers' and patients' comorbidities other than anxious-depressive disorder are also recognized as important predictors of lower HRQoL in our study. This confirms findings reported in other types of psychiatric disorders (Filipčić et al. 2016). It should be noted that chronic somatic comorbidities are associated with psychiatric treatment success (Filipcic et al. 2017) and their better control might also be important for alleviating caregiver burden and improving HRQoL. Thus, screening for early signs and appropriate timely treatment of anxious-depressive disorder and other somatic comorbidities should be considered as basic intervention in caregivers family members of patients with dementia.

Need for day care service was also recognized as an important predictor of lower HRQoL in general health, social functioning and role emotional domains. These associations might be related to more obligations that caregivers have with preparing and persuading the patient to go to the day care service. Also, caregivers faced with more severe dementia need day care service for safekeeping of patients while they do other daily tasks. Day care program plays an important role in extending the time during which care can be provided within the family. This is usually the step before institutionalization of a patient and serves as a respite for the caregiver who cannot leave the patient alone at home (Phillipson & Jones 2011, Phillipson & Jones 2012). This is a "help-seeking" behavior that is important to recognize (and offer) to caregivers who need it. Besides providing accommodation for patients with dementia, day care service can also provide additional psychiatric support for caregivers in a form of a day care hospital for stress (Matić et al. 2018). Number and capacity of existing day care services should be improved to make this service available to higher number of patients/caregivers who need it.

One of limitations of our work is a cross-sectional design resulting in an inability to establish causal relationship between investigated parameters. Caregivers whose patients did not receive their diagnosis from psychiatry of neurology specialists, or were institutionalized, or were cared for by non-family members were not included in our study. Our results thus cannot be generalized to these caregiver groups. Also, our study investigated a cohort of urban caregivers from Croatian capital town and results might not be generalizable to rural areas or other regions. This prompts the need for future regional/national or multinational studies that would provide wider insights into caregiver HRQoL and burden in these particular contexts. These studies are highly needed to establish more individualized interventions aimed at ameliorating caregiving burden and improving HRQoL.

CONCLUSION

Caregivers family members of patients with dementia have higher HRQoL than reported in Croatian population in several domains (psychical functioning, role physical, general health, social functioning and role emotional). Nevertheless, lower HRQoL is associated with higher caregiver burden in these subjects. Neuropsychiatric symptoms and need for day care services also consistently reflect on HRQoL. Interventions including psychological support and learning of skills necessary to tackle specific individual problems may help in improvement of caregiver HRQoL.

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Contribution of individual authors:

Jelena Lucijanić, Miroslav Hanževački & Vesna Jureša designed the study, collected the data, interpreted the results, searched the literature, drafted the manuscript and critically revised the manuscript upon completion.

Marko Lucijanić helped in the study design, statistically analyzed the data, interpreted the results, helped in drafting of the manuscript and critically revised the manuscript upon completion.

Ksenija Baždarić & Hrvoje Maleković searched the literature, provided advice on data analysis, helped in interpretation of the results and critically revised the manuscript upon completion.

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