

## Neglected workforce: pharmacists and their health-related quality of life

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**Abstract:** Background: pharmacists remain on the frontline of public health around the globe and their performance directly impacts patients' safety. So far, to our knowledge, no European study has been dedicated to their health-related quality of life (HQoL). Therefore, the primary aim of our study was to evaluate HQoL of Polish pharmacists utilizing the SF-36 health survey with regard to anthropometric and lifestyle-related variables.

**Methods:** A total sample screened consisted of 1412 respondents, yet 765 pharmacists (mean age 40, 86.3% females) finally participated in the study. HQoL was assessed with the Medical Outcomes Study 36-Item Short Form Health Survey (SF-36).

**Results:** The lowest median scores were noted for general health (GH, 50.0) and vitality (V, 60.0) domains. No gender differences regarding physical and mental summary scores were found. Significant difference of HQoL was found among the assessed age groups in several domains, especially physical functioning (PF) and GH ( $p < 0.001$ ) scores, and especially in the group of 51–60-year-old-respondents. Correlations were found between PF ( $r = -0.29$ ,  $p < 0.001$ ), GH ( $r = -0.25$ ,  $p < 0.001$ ) and age as well PF ( $r = -0.27$ ,  $p < 0.001$ ), GH ( $r = -0.21$ ,  $p < 0.001$ ) and BMI. Self-assessed dietary habits were correlated with PF ( $r = 0.22$ ,  $p < 0.001$ ), mental health ( $r = 0.25$ ,  $p < 0.001$ ), GH ( $r = 0.27$ ,  $p < 0.001$ ) and V ( $r = 0.30$ ,  $p < 0.001$ ) scores.

**Conclusions:** The analysis indicates that pharmacists tend to have similar mental and physical burden according to SF-36, with age, BMI and dietary habits as predominant factors influencing their HQoL. The study presents unique values for future comparative analyses related, for instance, to the influence of the ongoing pandemic on HQoL of health-care providers.

**Keywords:** health-related quality of life, pharmacists, SF-36, health survey.

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## Background

Quality of life (QoL) is an individual construct, includes subjective evaluations, and can be defined differently. The concept of health-related quality of life (HQoL) has evolved since the 1980s to comprise those aspects of overall quality of life that can be certainly shown to affect either physical or mental health [1]. The Short Form Health Survey (SF-36) is a patient-reported questionnaire standardized and introduced in the late 1980s [2–5]. It intends to assess those health-related aspects of QoL, yielding two summary measures, physical and mental health [4]. The versatility of the SF-36 survey enables to assess the impact of various medical procedures on a patient's well-being [6], but it has also been successfully applied to measure the health-related quality of life of general population, including healthy individuals [7–8].

Pharmacists, similarly to other healthcare workers, are widely perceived to face a significant work-related stress, exhaustion, disengagement from work and diminished quality of life. Notably, job satisfaction among pharmacists promotes their performance and has a positive impact on patients [9], and especially patients' safety [10]. Consequently, several studies have been dedicated to various factors impacting their QoL as well as tools to measure work-related dimensions of well-being. In a national survey of the American pharmacists, for instance, a great number of respondents (68%) reported job-related stress [10]. Yet, the majority of studies have utilized author-made questionnaires and focused only on psychological and social QoL rather than general health status [10–15]. This tendency seems to be an oversimplification of the pharmacists' QoL as it largely ignores the physical burden imposed by their job, such as, for example, the high risk of developing varicose veins as a consequence of standing position for long hours [16].

In Poland (2018), there were more than thirty four thousand of pharmacists according to the Polish Central Registry of Pharmacists, in comparison to around eighteen thousand of laboratory diagnosticians, one hundred and ninety thousand medical doctors and around two hundred and ninety thousand nurses (according to national registries). However, to our knowledge, no prior studies have examined HQoL of this group of healthcare workers. Therefore, the primary aim of the study was to evaluate the health-related quality of life of Polish pharmacists utilizing the Medical Outcomes Study 36-Item Short Form Health Survey (SF-36) with regard to anthropometric and lifestyle-related variables.

## Materials and Methods

### *Study sample, recruitment and data collection*

A cross-sectional study was undertaken in a population of Polish pharmacists with a valid licensure. The self-administered version of the SF-36 health survey was available and stored online (Jagiellonian University Medical College domain “*ankieta.cm-uj.krakow.pl*”). Information about the questionnaire was published online — the Internet site of the Pharmacists’ Chamber of Lesser Poland and official nationwide portal *e-farmacja.pl* (with over twenty four thousand registered users), and was also included into the newsletters’ of the abovementioned bodies, to collect as many responses as possible. The questionnaire was anonymously and voluntarily self-administered. All respondents agreed to participate in the study. The study sample was recruited between May and October 2018.

### *Ethics approval*

The study protocol was approved by the Jagiellonian University Bioethics Committee (protocol number — 1072/6120/197/2017).

### *The SF-36 health survey*

The questionnaire included general information and a Polish translation of SF-36 [17] consistent with the Medical Outcomes Study 36-Item Short Form Health Survey (RAND-SF-36) [18]. General information was collected on the date of birth (used to calculate age), sex, tobacco and alcohol use, sleep time, physical activity, self-assessed nutrition knowledge and self-assessed dietary habits as well as voluntary information regarding weight, height (used to calculate body mass index, BMI) and waist circumference (WC). The abovementioned adjoining general information consists of the items from the Dietary Habits and Nutrition Beliefs Questionnaire [19], a validated questionnaire for Polish population.

The SF-36 data were separated into two major domains — physical component score (PCS) and mental component score (MCS). The PCS was divided into four domains: 1) physical functioning (PF, 10 items) that describes limitations of basic physical activities (e.g. walking) due to health impairment; 2) role-physical (RP, 4 items) concerned with difficulties in performing work or daily activities due to poor physical health; 3) bodily pain (BP, 2 items) that describes presence of pain and limitations imposed by it; 4) general health (GH, 5 items) based on subjective evaluation of respondent’s health. The MCS was divided into: 1) vitality (VT, 4 items) that describes presence of energy and fatigue; 2) social functioning (SF, 2 items) that

describes limitations in social activities due to health problems; 3) role-emotional (RE, 3 items) that describes difficulties with performing work or daily activities due to emotional problems; 4) mental health (MH, 5 items) that describes the presence of nervousness or depressiveness. The raw score of each of the eight SF-36 dimensions was derived by summing the item scores and converted to a value for the dimension from 0 (worst possible health state) to 100 (best possible health state) [4, 18].

The SF-36 has performed well in tests of content, construct and criterion validity [4, 20–22], including the Polish version of the survey [23]. The internal consistency of the SF-36 items was assessed by Cronbach's  $\alpha$  coefficients since the questionnaire was administered only once, making the examination of the test-retest internal consistency impossible. A Cronbach's  $\alpha$  value of 0.7 or higher was considered to be sufficient to demonstrate internal consistency [4, 18].

### *Statistical analysis*

Sample size was calculated based on the Chebyshev approximation formula: with 99% level of confidence, 5% margin of error and 34 573 registered pharmacists in May 2018 in Poland, at least 653 respondents were needed for the study. In the preliminary analysis performed with Microsoft Excel for Mac 2011 software (version 14.7.2 Microsoft Corporation, Jagiellonian University license) 646 respondents were excluded from the initial sample of 1412 respondents due to the significantly missing data of the SF-36 answers [4].

Statistical analysis was performed with Statistica 13.3 software (TIBCO Software Inc., Palo Alto, California, USA; Jagiellonian University license). All the distributions were evaluated for normality with Shapiro–Wilk test. The distribution of all analyzed scores did not meet the criteria of normality and non-parametric tests were applied. Respondents were divided into age groups based on the decade of life (below 30, 31–40, 41–50, 51–60, plus 60) as well as BMI groups (underweight: BMI <18.5; normal weight: BMI = 18.5–24.9; pre-obese: BMI = 25.0–29.9 and obese: BMI >30.0) for the quantitative analysis. The Spearman's rank correlation coefficients ( $r$ ) were calculated between all SF-36 domains and BMI, waist circumference, age, sleep time during weekdays and weekends (both with 1–3 ranked values), recreational physical activity and physical activity at work (both with 1–3 ranked values), self-assessed nutrition knowledge and self-assessed dietary habits (both with 1–4 ranked values). The results of all tests were only considered statistically significant when P-values were below 0.05.

The presentation of results was made according to the STROBE statements [24].

## Results

The sample included 765 pharmacists. The overall characteristics of the analyzed group are given in Table 1. The majority of respondents were females (86.3%), which has been representative for this health-care profession in Poland. The majority of pharmacists (93.7%) were current non-smokers with BMI levels below 25 kg/m<sup>2</sup> (65.4%). Only the minority of respondents reported no alcohol consumption (21.2%). The majority of respondents also reported 7–8 hours of sleep time (74% and 69.2% on weekdays and during weekends, respectively) and moderate physical activity (42.2%) at work as well as recreational physical activity (47.1%).

**Table 1.** Sample characteristics by socio-demographic and lifestyle variables.

Number of subjects	765 (100%)
<b>Gender (%)</b>	
Females	660 (86.3)
Males	105 (13.7)
Median age (IQR)	40 (32–50)
<b>Alcohol intake (%)</b>	
Yes	603 (78.8)
No	162 (21.2)
<b>Current smoking</b>	
Yes	48 (6.3)
No	717 (93.7)
<b>History of smoking</b>	
Yes	202 (26.4)
No	563 (73.6)
<b>Sleep time on weekdays (hours/day)</b>	
≤6	191 (25.0)
7–8	566 (74.0)
≥9	8 (1.0)
<b>Sleep time on weekends (hours/day)</b>	
≤6	47 (6.1)
7–8	529 (69.2)
≥9	189 (24.7)
<b>Recreational physical activity<sup>1</sup></b>	
Low	254 (33.2)
Moderate	360 (47.1)
High	151 (19.7)
<b>Physical activity at work<sup>2</sup></b>	
Low	213 (27.8)
Moderate	323 (42.2)
High	229 (30.0)

**Table 1.** Cont.

Number of subjects	765 (100%)
<b>Self-assessed nutrition knowledge</b>	
Unsatisfactory	57 (7.5)
Satisfactory	278 (36.3)
Good	372 (48.6)
Very good	58 (7.6)
<b>Self-assessed dietary habits</b>	
Very poor	12 (1.6)
Poor	200 (26.1)
Good	520 (68)
Very good	33 (4.3)

<sup>1</sup> Recreational physical activity was categorized as follows: low — mostly sedentary, watching TV, reading newspapers/book, light house works, walking for 1–2 h a week; moderate — walking, cycling, exercise, gardening, or other light intensity physical activity for 2–3 h a week; higher — cycling, running, gardening, or other sport activities that require physical activity for more than 3 h a week;

<sup>2</sup> Physical activity at work was categorized as follows: low — with over 70% of sitting time; moderate — with 50/50 standing-to-sitting ratio; high — with over 70% of standing time.

The general health domain had the lowest median score (50.0), while role-physical and role-emotional domains had the highest median scores (100.0). Detailed scores are summarized in Table 2. Evaluation of internal consistency showed that Cronbach's coefficients ranged from 0.75 to 0.82 across the eight SF-36 dimensions (Table 3). The Spearman's rank correlation analysis showed higher correlations between the physical and mental summary scores and domains inside than those between the summary scores and domains outside. The strongest correlations were noted between MH, V and MCS as well as GH and PCS (Table 3).

**Table 2.** Descriptive statistics of SF-36 eight domains and two summary scores (n = 765).

Analyzed domain	Median	Mean ± SD
<i>Physical component score</i>	70.4	68.0 ± 7.3
Physical functioning	95.0	92.9 ± 11.7
Role-physical	100.0	85.8 ± 30.6
Bodily pain	60.0	60.5 ± 21.7
General health	50.0	47.5 ± 8.3
<i>Mental component score</i>	69.6	67.4 ± 15.7
Vitality	60.0	58.6 ± 19.1
Role-emotional	100.0	83.7 ± 31.1
Social functioning	87.5	80.2 ± 21.1
Mental health	68.0	68.4 ± 16.0

**Table 3.** Cronbach's  $\alpha$  statistics and the Spearman's rank correlation analysis of the SF-36 data.

Domain	Cronbach's $\alpha$	Correlation	
		PCS	MCS
PF	0.79	0.73	0.30
RP	0.80	0.54	0.35
BP	0.82	0.45	0.42
GH	0.79	0.76	0.39
V	0.75	0.39	0.87
SF	0.75	0.38	0.72
RE	0.78	0.21	0.57
MH	0.76	0.33	0.89

BP — bodily pain, GH — general health, RE — role-emotional, PF — physical functioning, RP — role-physical, SF — social, V — vitality

Several interesting trends related to anthropometric and lifestyle-related variables were also noted. There were no gender differences regarding PCS and MCS (Table 4). The analysis revealed significant difference in HQoL among the assessed age groups in several domains, especially PF and GH ( $p < 0.001$ ) scores, and especially in the group of 51–60-year-old-respondents. Detailed results are summarized in Table 5. In addi-

**Table 4.** Comparison of HQoL according to SF-36 with respect to gender ( $n = 765$ ).

Analyzed domain	Males ( $n = 105$ )		Females ( $n = 660$ )		p-value
	Median	Mean $\pm$ SD	Median	Mean $\pm$ SD	
<b>Physical component score</b>	70.4	68.6 $\pm$ 8.0	68.5	67.9 $\pm$ 7.1	0.115
Physical functioning	100.0	93.9 $\pm$ 12.8	95.0	92.7 $\pm$ 11.5	0.117
Role-physical	100.0	85.2 $\pm$ 32.5	100.0	85.9 $\pm$ 30.4	0.822
Bodily pain	70.0	61.3 $\pm$ 21.6	60.0	60.3 $\pm$ 21.7	0.325
General health	50.0	47.1 $\pm$ 8.9	50.0	47.6 $\pm$ 8.2	0.531
<b>Mental component score</b>	71.4	69.0 $\pm$ 15.4	69.6	67.1 $\pm$ 15.7	0.192
Vitality	65.0	59.6 $\pm$ 18.9	60.0	58.5 $\pm$ 19.1	0.601
Role-emotional	100.0	84.8 $\pm$ 32.4	100.0	83.6 $\pm$ 30.9	0.349
Social functioning	87.5	83.3 $\pm$ 21.1	87.5	79.5 $\pm$ 21.0	<b>0.034</b>
Mental health	72.0	70.1 $\pm$ 15.6	68.0	68.1 $\pm$ 16.1	0.244

$p$  — significance level of the Mann-Whitney U test.

Table 5. Comparison of HQoL according to SF-36 with respect to age<sup>1</sup>.

Analyzed domain	Group 1 (≤30; n = 132)		Group 2 (31–40; n = 275)		Group 3 (41–50; n = 169)		Group 4 (51–60; n = 133)		Group 5 (>60; n = 55)		p-value					
	Me	Mean (SD)	Me	Mean (SD)	Me	Mean (SD)	Me	Mean (SD)	Me	Mean (SD)	All	1 vs.2	2 vs.3	3 vs.4	4 vs.5	5 vs.1
<b>Physical component score</b>	70.4	69.2 (5.8)	70.4	69.6 (5.8)	70.4	68.7 (6.3)	64.8	63.5 (9.3)	68.5	65.9 (9.1)	<0.001	0.589	0.083	<0.001	0.054	0.013
Physical functioning	100.0	95.0 (8.6)	100.0	95.7 (7.6)	95.0	94.2 (9.0)	90.0	86.1 (16.5)	90.0	86.4 (18.0)	<0.001	0.443	0.015	<0.001	0.965	<0.001
Role-physical	100.0	84.3 (31.3)	100.0	85.5 (31.6)	100.0	90.5 (24.5)	100.0	80.3 (35.2)	100.0	90.0 (27.9)	0.035	0.493	0.338	0.045	0.133	0.248
Bodily pain	60.0	59.0 (22.5)	60.0	60.8 (20.9)	70.0	63.6 (20.6)	60.0	57.0 (24.4)	60.0	61.3 (18.9)	0.282	0.663	0.175	0.043	0.432	0.815
General health	50.0	49.1 (8.1)	50.0	49.4 (8.0)	50.0	47.4 (8.5)	45.0	42.7 (7.5)	45.0	46.2 (7.4)	<0.001	0.719	0.015	<0.001	0.008	0.029
<b>Mental component score</b>	67.9	64.9 (16.5)	69.6	67.2 (15.6)	71.4	69.2 (15.1)	67.9	66.0 (16.0)	73.2	71.9 (13.7)	0.231	0.281	0.181	0.069	0.026	0.018
Vitality	60.0	55.3 (18.9)	60.0	57.8 (19.5)	65.0	62.0 (17.6)	60.0	57.5 (19.9)	70.0	63.9 (17.6)	0.007	0.231	0.022	0.067	0.056	0.006
Role-emotional	100.0	82.1 (31.7)	100.0	82.7 (31.5)	100.0	86.0 (29.5)	100.0	80.7 (34.1)	100.0	93.3 (22.6)	0.040	0.891	0.313	0.299	0.046	0.047
Social functioning	87.5	78.0 (23.2)	87.5	82.0 (20.4)	87.5	82.0 (20.4)	75.0	75.8 (21.3)	87.5	83.0 (20.5)	0.014	0.093	0.797	0.007	0.025	0.106
Mental health	68.0	66.7 (16.7)	72.0	68.3 (15.8)	72.0	69.0 (16.2)	68.0	67.8 (15.6)	72.0	72.1 (15.6)	0.529	0.444	0.757	0.402	0.116	0.131

Me — Median; <sup>1</sup> One respondent refused to give information regarding his date of birth used to calculate age (n = 764); p — significance level of the Kruskal–Wallis (for “All”) and the Mann–Whitney U (for pair comparisons) tests.

Table 6. Comparison of HQoL according to SF-36 with respect to BMI<sup>1</sup>.

Analyzed domain	Group 1 (underweight; n = 38)		Group 2 (normal weight; n = 462)		Group 3 (overweight; n = 192)		Group 4 (obesity; n = 50)		p-value				
	Median	Mean ± SD	Median	Mean ± SD	Median	Mean ± SD	Median	Mean ± SD	All	1 vs. 2	2 vs. 3	3 vs. 4	4 vs. 2
<b>Physical component score</b>	71.3	70.4 ± 4.8	70.4	69.2 ± 6.1	68.5	66.6 ± 13.7	64.8	61.6 ± 10.7	<0.001	0.268	<0.001	0.001	<0.001
Physical functioning	100.0	96.2 ± 7.3	100.0	94.8 ± 8.8	95.0	91.0 ± 13.2	87.5	81.5 ± 20.7	<0.001	0.479	<0.001	<0.001	<0.001
Role-physical	100.0	87.5 ± 27.1	100.0	87.6 ± 29.3	100.0	83.1 ± 32.6	100.0	75.5 ± 38.3	<b>0.025</b>	0.679	0.140	0.325	0.064
Bodily pain	70.0	59.2 ± 24.5	70.0	61.7 ± 20.7	70.0	59.3 ± 23.0	60.0	52.6 ± 23.0	0.093	0.790	0.476	0.064	<b>0.013</b>
General health	50.0	50.5 ± 7.6	50.0	48.6 ± 8.1	45.0	45.8 ± 8.0	42.5	42.2 ± 9.2	<0.001	0.141	<0.001	<b>0.018</b>	<0.001
<b>Mental component score</b>	67.0	61.8 ± 18.0	71.4	68.4 ± 15.0	67.9	67.5 ± 14.7	58.9	60.5 ± 20.4	<b>0.013</b>	<b>0.042</b>	0.366	<b>0.027</b>	<b>0.008</b>
Vitality	60.0	54.3 ± 19.5	65.0	60.1 ± 18.2	60.0	58.2 ± 18.9	50.0	49.4 ± 24.6	<b>0.006</b>	0.064	0.286	<b>0.016</b>	<b>0.002</b>
Role-emotional	100.0	73.7 ± 38.9	100.0	84.8 ± 29.2	100.0	83.5 ± 33.1	100.0	79.3 ± 34.9	0.178	0.152	0.859	0.361	0.373
Social functioning	81.3	71.1 ± 26.7	87.5	81.5 ± 20.0	87.5	79.6 ± 20.3	75.0	72.3 ± 26.8	<b>0.020</b>	<b>0.022</b>	0.250	0.144	<b>0.039</b>
Mental health	68.0	63.5 ± 17.5	68.0	68.8 ± 15.6	72.0	69.2 ± 15.0	62.0	63.4 ± 20.5	0.076	0.096	0.891	<b>0.044</b>	<b>0.049</b>

<sup>1</sup> Information regarding weight and height (used to calculate BMI, body mass index) was given voluntarily (n = 742); p — significance level of the Kruskal–Wallis (for “All”) and the Mann–Whitney U (for pair comparisons) tests.

tion, the Spearman's rank correlation was calculated between age and SF-36 domains. The following correlations were found: PF ( $r = -0.29$ ,  $p < 0.001$ ), GH ( $r = -0.25$ ,  $p < 0.001$ ), V ( $r = 0.11$ ,  $p = 0.003$ ) and PCS ( $r = -0.23$ ,  $p < 0.001$ ) scores. The Kruskal–Wallis test also revealed significant difference in both summary scores and BMI as well as most of domains (Table 6). BMI was increasing with age ( $r = 0.32$ ,  $p < 0.001$ ) and was weakly correlated with PF ( $r = -0.27$ ,  $p < 0.001$ ), GH ( $r = -0.21$ ,  $p < 0.001$ ) and PCS ( $r = -0.22$ ,  $p < 0.001$ ) scores. Since BMI was also correlated with WC ( $r = 0.74$ ,  $p < 0.001$ ) among our respondents, we also analyzed correlations between WC and HQoL scores (Table 7). The Spearman's rank correlation analysis showed correlations, yet weak, between WC and PF ( $r = -0.27$ ,  $p < 0.001$ ), GH ( $r = -0.19$ ,  $p < 0.001$ ) and PCS ( $r = -0.21$ ,  $p < 0.001$ ) scores.

**Table 7.** Comparison of HQoL according to SF-36 with respect to waist circumference (WC)<sup>1</sup>.

Analyzed domain	Central obesity (n = 264)		Non-obese (n = 352)		p-value
	Median	Mean ± SD	Median	Mean ± SD	
<b>Physical health summary</b>	68.5	66.0 ± 8,7	71.4	69.4 ± 5.8	<b>&lt;0.001</b>
Physical functioning	95.0	89.5 ± 15.0	100	95.3 ± 7.6	<b>&lt;0.001</b>
Role-physical	100	84.0 ± 33.3	100	86.8 ± 29.0	0.746
Bodily pain	60.0	59.8 ± 22.9	70.0	61.5 ± 20.7	0.345
General Health	45.0	45.7 ± 8.3	50.0	48.6 ± 8.4	<b>&lt;0.001</b>
<b>Mental health summary</b>	68.5	66.7 ± 16.7	71.4	68.5 ± 15.2	0.216
Vitality	60.0	57.5 ± 20.7	65.0	60.5 ± 17.6	0.166
Role-emotional	100	83.1 ± 32.6	100	84.5 ± 29.7	0.807
Social functioning	67.5	78.0 ± 22.1	87.5	81.8 ± 20.6	<b>0.034</b>
Mental health	70.0	68.5 ± 17.1	72.0	68.8 ± 15.6	0.848

<sup>1</sup> Information regarding waist circumference was given voluntarily (n = 616); <sup>2</sup> central obesity was defined as WC either  $\geq 94$  for males or  $\geq 80$  for females; p — significance level of the Mann–Whitney U test.

What is more, the Kruskal–Wallis test revealed significant difference ( $p < 0.05$ ) in physical activity at work and MCS score as well as V and MH domains, yet the Spearman's rank correlation analysis showed very weak correlations. Significant difference ( $p < 0.01$ ) in recreational physical activity and both summary scores and all domains' scores, excluding BP and RE ( $p = 0.05$  and  $p = 0.78$ , respectively) was found, while the correlation analysis showed only weak correlations with PF ( $r = 0.21$ ,  $p < 0.001$ ), V ( $r = 0.23$ ,  $p < 0.001$ ), PCS ( $r = 0.24$ ,  $p < 0.001$ ) scores and very weak with GH and MCS (both  $r = 0.18$ ,  $p < 0.001$ ) scores. Interestingly, recreational physical activity was also correlated with self-assessed dietary habits ( $r = 0.29$ ,  $p < 0.001$ ) and nutrition knowledge ( $r = 0.22$ ,  $p < 0.001$ ). The Kruskal–Wallis test also revealed significant difference ( $p < 0.005$ ) in self-assessed nutrition knowledge and both summary

scores and PF, GH, V, SF and MH domains, while the correlation analysis showed only weak correlations with PF ( $r = 0.22$ ,  $p < 0.001$ ), V ( $r = 0.19$ ,  $p < 0.001$ ) and PCS ( $r = 0.24$ ,  $p < 0.001$ ) scores. Significant difference ( $p < 0.005$ ) in self-assessed dietary habits and both summary scores of SF-36 (PCS, MCS) and all domains (except BP) was found, while the correlation analysis showed only weak correlations with PF ( $r = 0.22$ ,  $p < 0.001$ ), MH ( $r = 0.25$ ,  $p < 0.001$ ), GH ( $r = 0.27$ ,  $p < 0.001$ ), V ( $r = 0.30$ ,  $p < 0.001$ ), PCS ( $r = 0.27$ ,  $p < 0.001$ ) and MCS ( $r = 0.29$ ,  $p < 0.001$ ) scores. Significant difference was also found between sleep time on weekdays as well as weekends ( $p = 0.009$  and  $p = 0.031$ , respectively) and SF score, yet with very weak correlations ( $r = -0.09$ ,  $p = 0.019$  and  $r = -0.08$ ,  $p = 0.036$ , respectively).

## Discussion

The data present values for the eight dimensions and two summary scores of the SF-36 health survey from a random sample of Polish pharmacists. The SF-36 instrument has several advantages, including standard criteria for scoring and transforming the raw responses to ensure accurate group comparisons and it has been found suitable for use in a variety of populations [4, 18, 22, 25]. Results showed evidence of acceptable validity and internal consistency for the SF-36 in the sample, corresponding with the existing findings [4, 22, 25]. Yet, uneven number of men and women might have made the statistical analysis less valid, however, such proportions are representative for this group of health-care providers in Poland and Europe [26]. The method of enrolling respondents and a low response rate might lead to self-reporting bias [27], which we are aware of as authors. At the same time, since this is the first study assessing quality of life of Eastern European pharmacists, it still presents unique values for the SF-36 survey for a representative sample ideal for future comparative analyses related to for instance, the influence of the ongoing COVID-19 pandemic on HQoL.

No normative published data of the general population could be found for a Polish version of SF-36 [17] and as a result we could not perform any reliable comparative analysis. However, in comparison with other European populations, both summary scores of Polish pharmacists were higher in comparison with, for example, Norwegian [28] and Irish [29] general population normative data. However, in comparison to British normative data, with occupation taken into account, our scores of separate domains were comparable or lower (RP, BP, GH, MH domains). In general, there were no gender differences regarding PCS and MCS, however SF score was significantly different among male pharmacists (Table 4). Thus, our results contrast with the findings of Jenkinson *et al.*, who reported that women had poorer health scores than men in all but the general health dimension [7]. Our analysis revealed that an increasing age was associated with a modest decline in PF and GH domains as well as

the PCS score. The lowest median and mean scores for both summary scores and most of the domains (except for V and MH) were noted not for the oldest respondents, but in the age group of 51 to 60 year-olds. We suppose this could be attributed to the fact that the eldest respondents were very close or past the retirement age (60 for females and 65 for males in Poland). Consequently, this group was built up of individuals that had postponed their retirement, possibly due to high HQoL and high job satisfaction. Lau *et al.* found that both job satisfaction and career satisfaction increased with age, and lower job satisfaction of younger generation of pharmacists might stem from unmet work-balance expectations [30]. This tendency has been reflected in other studies, too [31]. Thus, deterioration of HQoL among older pharmacists might result mainly from physical aging. Yet, it should be noted that respondents were not asked whether they had been diagnosed with a chronic conditions nor were there any use of medicines at the time of the survey recorded. Instead, we analyzed anthropometric and lifestyle-related variables, including sleep time. Interestingly, sleep duration was negatively correlated, yet very weakly, with SF score only. Both excessive and insufficient sleep duration has been associated with altered HQoL [32] and obesity [33], however the majority of our respondents maintained healthy sleep time routine, i.e., 7–8 hours. And no correlation was found between sleep time and BMI in our sample of pharmacists. BMI is known not only to deteriorate HQoL [34–35] but also to increase risk of chronic non-communicable diseases [36]. Our results showed that obese participants reported significantly worse HQoL in both summary scores of SF-36 and most of the domains (except for RP and RE) compared with normal weight participants. The correlation analysis confirmed an inverse relationship only between PF, GH and PCS scores, which was in accordance with other studies pointing to the significant impact of BMI on the PCS score [37–39]. However, BMI could contribute to HQoL impairment or might be a consequence of diminished HQoL. The physical summary score was also negatively correlated with an increased waist circumference and positively correlated with an increased physical activity, better self-assessed nutrition knowledge and dietary habits. Thus, all strategies seeking to improve dietary and lifestyle habits should have positive impact on pharmacists' HQoL.

HQoL of health-care providers has been recently subjected to significant analysis, not only due to the ongoing pandemic. Yet, pharmacists, who represent the most accessible and the third largest healthcare professional group in the world [26], have not been so thoroughly analyzed compared to medical doctors or nurses. The SF-36 analysis of Italian doctors, nurses and health technologists, for instance, revealed that respondents differed with general population in most domains. Medical workers prevailed in physical and mental health domains, while having lower scores in vitality, social functioning and role emotional. The authors suggested that high self-perception of physical health might stem from the fact that doctors deal with serious ailments of their patients on daily basis, thus rating their own health more favorably [40]. How-

ever, the same mechanism seems inapplicable to pharmacists since general health perception according to SF-36 was relatively low in our sample. Low GH score (the lowest median score of all PCS domains) might indicate low self-perception of physical well-being among sampled pharmacists. Therefore, we believe that limiting pharmacists' HQoL to psychological factors only, such as job related stress, and neglecting the physical health dimension [11, 41] does not constitute an optimal approach, although the data regarding factors influencing mental well-being of pharmacists have been vastly available. According to American survey 57% of the respondents considered quitting their job at least once per year, and 20% believed that stress imposed by their job affected negatively their mental health, social life, work performance, well-being and physical health [14]. A study of pharmacists from Northern Ireland indicated that as many as 30% of communal and 50% of hospital pharmacists reported being often or frequently in stress. Frequent interruptions, shortage of staff and excessive workload were listed as the main stressors [12]. Similarly, a survey of American pharmacists pointed out to the problem of high workload. Authors found correlation between high job satisfaction and self-perceived completeness of patients' review (treated as a measurement of job performance). They also implied that burn-out negatively impacted the efficacy of their work. Although the authors did not examine QoL directly, their findings might suggest that the lower QoL could negatively impact work outcomes of pharmacists [41]. Still, none of the studies have utilized the SF-36 (or any other generic) questionnaire to measure mental well-being among pharmacists. The mental health summary score in our sample was only positively correlated with recreational physical activity and dietary habits. And indeed, physical activity together with healthy eating habits are known to provide mental health benefits [42]. It is also worth mentioning that the highest mental summary score was reported by the eldest respondents, while the lowest median score of the mental health domain was reported by the youngest and 51 to 60 year-old-respondents. Thus, we believe that poorer mental health, especially among younger generations of pharmacists, is an important issue and should be appropriately handled.

## **Conclusions**

To the authors' knowledge this is the first study assessing quality of life of European pharmacists using a validated, reliable, generic HQoL questionnaire. Our analysis indicates that this group of health-care providers tends to have similar mental and physical burden, with age, BMI and dietary habits as predominant factors influencing their HQoL. We do believe that our research might raise awareness about pharmacists' HQoL, and subsequently lead to an implementation of effective countermeasures.

## Declarations

Funding: None.

Conflicts of interest/Competing interests: None.

Ethics approval: The study protocol was approved by the Jagiellonian University Bioethics Committee (protocol number – 1072/6120/197/2017).

Consent to participate: All respondents agreed to participate in the study.

Availability of data and material: The data from the study will be deposited in the Jagiellonian University repository upon the acceptance of the manuscript and will be publicly available.

## Authors' contributions

M.K.Ł., K.G. contributed to the study conception and design. Material preparation, data collection and analysis were performed by M.K.Ł. and P.P. All authors participated in the interpretation of the data. The first draft of the manuscript was written by P.P. and all authors commented on subsequent versions of the manuscript. All authors read and approved the final version of the manuscript.

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