ORIGINAL PAPER

Health-related Quality of Life Among Comorbidity Patients With Type 2 Diabetes Mellitus and Hypertension

Tran Thi Ly[1], Duong Hoang Thanh[2], Pham Hong Ha[3], Nguyen Hong Viet[4], Nguyen Phuong Hoa[5], Tran Hoa[6]

[1]Faculty of Medicine, University of Medicine and Pharmacy, Vietnam National University, Hanoi, Vietnam

[2]Department of Family Medicine, Can Tho University of Medicine and Pharmacy, Can Tho, Vietnam

[3]Financial planning department, Department of Health, Thai Binh, Vietnam

[4]Director of Thai Binh Traditional Medicine Hospital, Thai Binh, Vietnam

[5]Department of Family Medicine, Hanoi Medical University, Hanoi, Vietnam

[6]Department of Internal Medicine, University of Medicine and Pharmacy at Ho Chi Minh City, Ho Chi Minh City, Vietnam

Corresponding author:
Tran Thi Ly. Faculty of Medicine, University of Medicine and Pharmacy, Vi-etnam National University, Hanoi, Vietnam. E-mail: ly13021984@gmail.com. ORCID ID: http//www.orcid.org/ 0009-0003-5846-983X

ABSTRACT

Background: Evaluating the Health-Related Quality of Life (HRQoL) in patients with hypertension and diabetes is vital for improving treatment adherence and outcomes. **Objective:** This study assessed HRQoL and its influencing factors among patients with both type 2 diabetes mellitus and hypertension at Can Tho Hospital, Vietnam. **Methods:** A cross-sectional study was performed on 310 outpatients at the polyclinic, using the Short Form-36 Health Survey (SF-36) between July 2021 and July 2022. **Results:** The average HRQoL score among patients was 50.56 ± 21.73. Normal HRQoL was observed in 68.7% of patients, 16.8% had good HRQoL, and 14.5% had poor HRQoL. Lower HRQoL was more common in older patients, females, those with lower education levels, unemployed individuals, insulin users, and those with complications. Significant factors affecting HRQoL included age, occupation, education, and treatment outcomes. **Conclusion:** Patients with complications and those on insulin therapy should be closely monitored to maintain their overall health and HRQoL.

Keywords: Health-Related Quality of Life, SF-36, Comorbid conditions, Hypertension and diabetes, Vietnam.

1. BACKGROUND

Diabetes is a long-term condition that arises when the pancreas fails to produce sufficient in-sulin or when the body cannot use the insulin it makes effectively. Insulin is a hormone responsi-ble for controlling blood sugar levels. In 2019, diabetes directly caused 1.5 million deaths, with 48% of these occurring in individuals under 70 years old. According to the International Diabetes Federation (IDF), 451 million adults globally had diabetes, with this number expected to rise to 693 million by 2045 (1-3).

Hypertension, or high blood pressure, occurs when the pressure in the blood vessels is elevat-ed (140/90 mmHg or higher). It is estimated that 1.28 billion adults aged 30-79 worldwide have hypertension, with most (two-thirds) residing in low- and mid-dle-income countries. Nearly 46% of adults with hypertension are unaware of their condition, and less than half (42%) receive a di-agnosis and treatment. Only 1 in 5 adults (21%) with hypertension have it under con-trol. Hypertension is a major contributor to premature death globally, and one of the global health targets is to reduce its preva-lence by 33% between 2010 and 2030 (4-6).

Vietnam is one of the countries in the Western Pacific Region with the fastest-increasing rate of diabetes globally, with more than 200 million adults living with diabetes. Accord-ing to Inter-national Dia-betes Federation, nearly 4 million adults lived with diabetes, equivalent to 6.1% of the age-adjusted comparative prevalence of dia-betes (7). The pooled prevalence of measured hyper-tension in Vietnam was 21.1% (95% confidence interval = 18.5-23.7) based on 10 studies and 18.4% (95% confidence interval = 15.2-21.8) based on 3 national surveys (8).

Hypertension and diabetes are critical public-health challenges worldwide. Pre-vention, detection, treatment, and control of these conditions should be prioritized. Comorbidity patients with hypertension and diabetes need long-term adherence to treatment, and they experience many dif-ficulties in terms of work, social, economic,

physical, and psychological well-being. These affect the outcome of treatment. Therefore, clinicians should carefully consider their psychology and quality of life (9–12).

2. OBJECTIVE

Health-related quality of life (HRQoL) is a multidimensional concept that persists in an in-dividual's perception of physical, emotional, and social well-being. This study aimed to evaluate the HRQoL and some related factors among comorbid patients with hypertension and diabetes at clinics in Vietnam. This information is necessary to improve HRQoL and treatment efficiency for patients.

3. MATERIAL AND METHODS

Participants

Patients with comorbidities, specifically those diagnosed with type II diabetes mellitus and hypertension for at least six months, who consented to participate and were able to complete the questionnaire, were selected and invited to join the study. Patients not meeting these criteria were excluded. The study was conducted in the medicine department of Can Tho Heart Hospital, Vietnam, between July 2021 and July 2022.

Sample size and technique

The sample size was calculated using the formula to calculate the sample size for a cross-sectional survey.

$$n = \frac{Z_{1-\alpha/2}^2}{d^2} p(1-p)$$

Where:

-$Z_{1-\alpha/2}$ = 1.96 (confidence factor with 95% confidence, with α = 0.05)

-p =0.57 was good HRQoL rate among comorbidity patients according to national surveys.8

-d= 0.05 (Acceptable error)

310 comorbidity patients with type 2 diabetes mellitus and hypertension were recruited. All patients who met the criteria were selected for the study.

Measurements and instruments

The questionnaire was tested for validity by the expert panel and was piloted on 10 patients before the investigation. This questionnaire consisted of three sections:

The first section was sociodemographic variables of participants: including gender, age, occupational, marital status, and family economy.

The second section was the treatment history of diabetes and hypertension: including smoking, alco-hol drinking, physical activity, disease duration, comorbidities, complications, clinical and subclinical symptoms, duration of treatment, drug side effects, and treatment adherence).

The third section was HRQoL measurement: The Short Form 36 (SF-36) health survey was employed to assess patients' health-related quality of life (HRQoL). This survey is commonly used in clinical settings, research, health policy reviews, and general population studies. The SF-36 evaluates eight health dimensions: physical functioning, limitations in physical activities due to health issues, bodily pain, general health perceptions, vitality (energy and fatigue), social functioning, restrictions in social activities due to physical or emotional problems, and overall mental health. The first four dimensions contribute to the physical health score, while the last four form the mental health score. Scores on the SF-36 range from 0 to 100, with higher scores reflecting better quality of life. HRQoL levels were categorized as follows: Poor quality of life for scores between 0 and 24, Normal quality of life for scores between 25 and 74, and Good quality of life for scores between 75 and 100 (13).

Data management

The software Excel was used for data entry. The Statistical Package for Social Sciences (SPSS) version 18.0 was used to analyze data. Descriptive statistics were used to summarize the patients' characteristics. Compare the mean difference of two non-normally distributed groups using the Mann–Whitney statistic and the mean difference of more than two non-normally analyzed groups using the Kruskal-Wallis statistics. Significance was considered at a p-value < 0.05.

4. RESULTS

The sociodemographic characteristics of participants

According to Table 1, 86 (27.7%) participants were male, and 224 (72.3%) were female. The mean age score was 62.8 ± 8.9. There were 8 (2.6%) participants who had primary school or lower, 103 (33.2%) participants had secondary school, and 199 (64.2%) participants had high school or higher. Regarding family economics, there was 7 (2.3%) of participants were poor, 22 (7.1%) of participants were near poor, and 281 (90.6%)

Sociodemographic characteristics		Frequency (n)	Percent (%)
Age (years)	< 50	19	6.1
	50–60	106	34.2
	61–70	131	42.3
	>70	54	17.4
Gender	Male	86	27.7
	Female	224	72.3
Educational level	Primary school or lower	8	2.6
	Secondary school	103	33.2
	High school or higher	199	64.2
Family economic	Poor	7	2.3
	Near poor	22	7.1
	Not poor	281	90.6
Marital status	Married	15	4.8
	Not married	253	81.6
	Others	42	13.6
Mean age (± SD)		62.8 ± 8.9	

Table 1. The sociodemographic characteristics of participants (n=310)

Clinical characteristics		Frequency (n)	Percent (%)
Duration of diseases (year)	< 5	148	47.7
	5 – 10	80	25.8
	>10	82	26.5
Complications	Yes	104	33.5
	No	206	66.5
Comorbidities	Yes	304	98.1
	No	6	1.9
BMI	Underweight (< 23)	16	5.2
	Normal (23–25)	227	73.2
	Overweight (> 25)	67	21.6
Insulin treatment	Yes	58	18.7
	No	252	81.3
Objective of hypertension treatment	Positive	87	28.1
	Negative	223	71.9
Objective of diabetes treatment	Positive	102	32.9
	Negative	208	67.1

Table 2. The clinical characteristics of participants (n=310)

Concepts	Mean ± SD	Median
Physical health		
Physical functioning	61.8 ± 26.1	65.0
Limitations in physical activities	32.2 ± 33.3	50.0
Bodily pain	60.6 ± 29.8	66.3
General health	32.9 ± 23.4	25.0
Mental health		
Social functioning	59.9 ± 26.9	50.0
Limitations in social activities	58.5 ± 40.2	66.7
Vitality	52.8 ± 21.5	60.0
General mental health	45.6 ± 26.3	40.0

Table 3. The HRQoL score of patients (n=310)

of participants were not poor. There were 15 (4.8%) participants who were married, 253 (81.6%) participants were not married, and 42 (13.6%) participants were others.

The clinical characteristics of participants

From Table 2, there were 148 (47.7%) participants had a duration of diseases under 5 years, 80 (25.8%) participants had a duration of diseases from 5 to 10 years, and 82 (26.5%) participants had a duration of diseases over 10 years. 104 (33.5%) participants had complications, and 206 (66.5%) had no complications. 304 (98.1%) participants had comorbidities, and 6 (1.9%) had no comorbidi-ties. There were 16 (5.2%) participants who were underweight, 227 (73.2%) participants who were normal, and 67 (21.6%) participants who were over-weight. 58 (18.7%) of participants used insulin, and 252 (81.3%) participants did not use insulin. 87 (28.1%) of participants had the objective of hypertension treat-ment was positive, and 102 (32.9%) of participants had the objective of diabetes treatment was positive.

The health-related quality of life scores of patients

According to Table 3, the mean scores of the four physical health domains ranged from 32.2 to 61.8 points. The highest mean score was Physical function-ing (61.8 ± 26.1), and the lowest was Limitations in physical activities (32.2 ± 33.3). The mean scores of the four mental health domains ranged from 45.6 to 59.9

points. The highest mean score was Social func-tioning (59.9 ± 26.9), and the lowest mean score was General mental health (45.6 ± 26.3).

The average HRQoL score in patients was 50.56, with a median of 47.84. The physical health com-ponent had an average score of 46.88 (median: 45.12), while the mental health component aver-aged 54.24, with a median of 54.19.

According to Figure 2, 16.8% of patients had good HRQoL (this rate in physical health was 9.4%, and in mental health was 26.8%). 68.7% of patients had normal HRQoL (this rate in physical health was 71%, and in mental health was 60%). 14.5% of patients had poor HRQoL (this rate in physical health was 19.6%, and in mental health was 13.2%).

The HRQoL among patients and some related factors

According to Table 4, there were 5 factors related to physical functioning, the patients with older age, lower education, were female, had complications, and used insulin was more likely to have lower HRQoL (p<0.05). There were three factors related to limita-tions in physical activities, the patients with younger age, high education, and no insulin treatment were more likely to have higher HRQoL (p<0.05).

According to Table 5, there were three factors re-lated to bodily pain; the patients with older age, lower education, and unemployed were more likely to have lower HRQoL (p<0.05). There were three factors related to general health, the patients with younger age, were male and had the objective of hypertension treatment were more likely to have higher HRQoL (p<0.05).
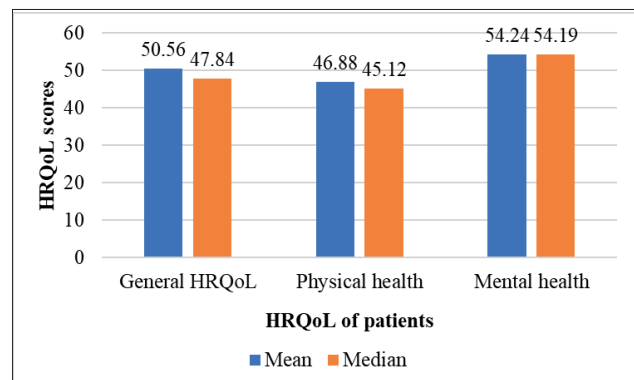

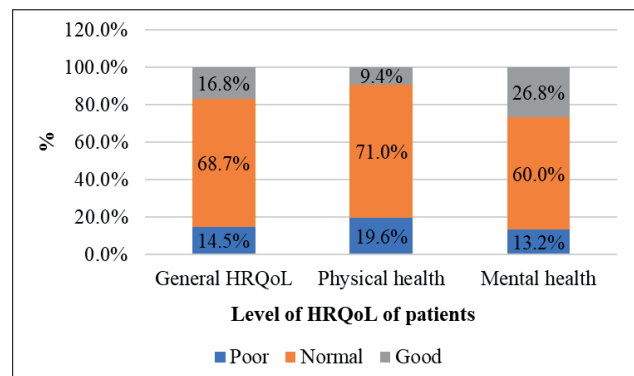Figure 1. The HRQoL scores among patients (n= 310)

Figure 2. The level of HRQoL among patients (n= 310)

Characteristics		Frequency (n)	Physical functioning		Limitations in physical activities	
			Mean ± SD	p	Mean ± SD	p
Age groups (year)	< 50	19	79.74± 24.63		44.74 ± 32.89	
	50–60	106	70.14 ± 21.84	< 0.001	34.62 ± 31.75	0.018
	61–70	131	59.59 ± 25.25		33.02 ± 35.66	
	> 70	54	44.58 ± 26.07		20.83 ± 28.21	
Gender	Male	86	71.92 ± 24.63	< 0.001	36.28 ± 33.82	0.164
	Female	224	57.94 ± 25.62		30.58 ± 33.10	
Educational level	Primary school or lower	8	52.84 ± 25.47		25.0 ± 37.80	
	Secondary school	103	63.13 ± 26.33	< 0.001	25.0 ± 29.50	0.023
	High school or higher	199	66.41 ± 24.84		36.16 ± 34.52	
Complications	Yes	104	56.13 ± 26.59	0.008	29.04 ± 35.90	0.009
	No	206	64.89 ± 25.39		33.74 ± 31.95	
Insulin treatment	Yes	58	56.66 ± 27.10	0.009	25.00 ± 29.99	0.08
	No	252	63.00 ± 25.74		33.81 ± 33.91	

Table 4. The HRQoL of physical health related to characteristics of patients (n=310)

Characteristics		Frequency (n)	Bodily pain		General health	
			Mean ± SD	p	Mean ± SD	p
Age groups (year)	< 50	19	76,18 ± 35,05		43,22 ± 21,85	
	50–60	106	64,06 ± 29,73	0.021	34,55 ± 21,86	0.006
	61–70	131	58,02 ± 29,72		33,48 ± 25,35	
	> 70	54	54,77 ± 28,10		24,65 ± 20,09	
Gender	Male	86	65,93 ± 29,98	0.057	38,42 ± 25,49	0.03
	Female	224	58,60 ± 29,54		30,78 ± 22,30	
Occupation	Farmers	29	41,90 ± 27,08		27,44 ± 27,06	
	Workers	19	63,02 ± 30,86		32,46 ± 24,40	
	Staffs	27	74,72 ± 18,31	0.001	43,83 ± 23,30	0.087
	Business	68	57,33 ± 31,41		31,84 ± 21,53	
	Others	167	62,68 ± 29,53		32,57 ± 23,17	
Educational level	Primary school or lower	8	50,94 ± 35,07		32,81± 25,63	
	Secondary school	103	53,03 ± 28,83	0.003	29,09 ± 21,75	0.211
	High school or higher	199	64,95 ± 29,35		34,88 ± 24,06	
Objective of hyperten-sion treatment	Positive	84	63,59 ± 28,68	0.281	39,18 ± 26,58	0.013
	Negative	223	59,48 ± 30,21		30,45 ± 21,67	

Table 5. The HRQoL of physical health related to characteristics of patients (n=310)

According to Table 6, there were three factors related to social functioning; the patients with lower education who used insulin and had no objective of hypertension treatment were more likely to have lower HRQoL (p<0.05). There were two factors related to limitations in social activities; the male patients with the objective of hypertension treatment were more likely to have higher HRQoL (p<0.05).

According to Table 7, there were 5 factors related to vitality, the patients with older age, unemployed, lower education, used insulin, and had no objective of hypertension treatment were more likely to have lower HRQoL (p<0.05). There were two factors related to General mental health; the younger and working patients were more likely to have higher HRQoL (p<0.05).

5. DISCUSSION

The mean age score of patients in this study was 62,8 ± 8,9. It was lower than the study in Vietnam, with a mean age score of patients was 67.1 ± 8.5, (12) and higher than in Australia, with a mean age score of 55.8 ± 11.1. (14) 2.6% of participants had primary school or lower, secondary school 33.2%, and high

school or higher 64.2%. Low education will limit the ability to absorb necessary information about patients' diseases, causing negative impacts on the treatment and monitoring of the disease. High education helps patients have better self-monitoring knowledge and more effective treatment adherence. Self-care, including blood sugar monitoring, dietary modification, regular foot exams, and routine eye exams, has significantly reduced the frequency and progression of disease-related complications (15).

Our study brought that the mean score of HRQoL in patients was 50.56, of which the physical health score was 46.88, and the mental was 54.24. The physical health score in this study was similar to the study in Colombia (55.3 points), (16) but it was lower than the study in America (68.0 points) , (11) Malaysia (73.15 points), (17) and China (70.12 points) (18). The mental health score in this study was lower than the study in Singapore (84.2 points) (19). This can be explained by the fact that most patients in our study were elderly, had a long duration of diseases, used insulin, and had complications and comorbidity hypertension and diabetes, affecting the patient's mobility. On the other

Characteristics		Frequency (n)	Social functioning		Limitations in social activities	
			Mean ± SD	p	Mean ± SD	p
Gender	Male	86	63.52 ± 29.47	0.141	66.67 ± 37.92	0.027
	Female	224	58.59 ± 25.77		55.34 ± 40.69	
Educational level	Primary school or lower	8	59.38 ± 23.86	0.025	66.67 ± 35.64	0.09
	Secondary school	103	54.13 ± 26.63		51.46 ± 39.27	
	High school or higher	199	63.0 ± 26.76		61.79 ± 40.55	
Insulin treatment	Yes	58	53.6 ± 25.97	0.045	55.17 ± 41.21	0.475
	No	252	61.41 ± 26.94		59.25 ± 40.02	
Objective of hypertension treatment	Positive	84	65.37 ± 26.94	0.023	68.54 ± 38.54	0.005
	Negative	223	57.85 ± 26.64		54.56 ± 40.24	

Table 6. The HRQoL of mental health related to characteristics of patients (n=310)

Characteristics		Frequency (n)	Vitality		General mental health	
			Mean ± SD	p	Mean ± SD	p
Age groups (year)	< 50	19	58.68 ± 20.40	0.019	57.89 ± 23.11	0.026
	50-60	106	57.22 ± 21.48		48.19 ± 25.83	
	61-70	131	50.96 ± 21.24		44.79 ± 26.04	
	> 70	54	46.85 ± 20.67		38.15 ± 17.06	
Occupation	Farmers	29	41.21 ± 19.98	0.008	35.03 ± 26.16	0.017
	Workers	19	52.68 ± 19.36		48.42 ± 27.77	
	Staffs	27	62.42 ± 20.12		58.22 ± 24.36	
	Business	68	52.46 ± 22.42		45.59 ± 25.89	
	Others	167	53.52 ± 21.08		45.08 ± 26.00	
Educational level	Primary school or lower	8	42.05 ± 19.46	0.024	45.50 ± 28.04	0.065
	Secondary school	103	49.20 ± 21.17		40.23 ± 24.28	
	High school or higher	199	55.16 ± 21.40		48.38 ± 26.89	
Insulin treatment	Yes	58	46.59 ± 22.30	0.009	41.72 ± 22.19	0.366
	No	252	54.30 ± 21.05		46.49 ± 27.09	
Objective of hypertension treatment	Positive	84	57.31 ± 21.94	0.017	50.48 ± 26.75	0.074
	Negative	223	51.12 ± 21.07		43.70 ± 25.90	

Table 7. The HRQoL of mental health related to characteristics of patients (n=310)

hand, the study also showed that 14.5% of patients had poor HRQoL (this rate in physical health was 19.6%, and in mental health was 13.2%). It was lower than the study in China, with over 24% of patients having poor HRQoL (20).

The factors that had a positive effect on the HRQoL of patients included: higher education, younger age, patients were male, had a job, not used insulin, and control of diseases, accordingly the patients who were above subjects were more likely to have higher HRQoL (p<0.05). The research results of Mohammad R showed that patients under 50 years of age had higher HRQoL (21). The study of Papazafiropoulou AK and Kresimir Gabric also showed that age-related to HRQoL of patients (22–24). Aldona Mikailiukstiene's research showed that higher education patients had higher HRQoL (25). The study of Svedbo Engström Maria in Sweden on 4948 diabetic patients showed that patients with better blood sugar control often had better HRQoL (26, 27). The patients with well-controlled blood pressure also had higher HRQoL (28,29). Some studies in Vietnam and other countries also showed that patients were male had higher HRQoL than females (12,30–32). Because of the difference in biological characteristics between the sexes, females were often more concerned and worried about their health than males, thus creating a difference in HRQoL between the two sexes.

The factors that had a negative effect on the HRQoL of patients included: lower education, older age, patients were female, unemployed, used insulin, and had a complication; accordingly, the patients who were above subjects were more likely to have lower HRQoL (p<0.05). This can be explained as follows, some side effects when using injectable insulin such as discomfort, pain, hypoglycemia, muscular dystrophy, and weight gain; these factors also contributed to decrease HRQoL of patients (33). In addition, patients with complications often have symptoms such as intermittent claudication, chest pain, or shortness of breath, significantly affecting the patient's daily activities. Aldona Mikailiukstiene's study also showed that complications of lower extremity peripheral artery disease reduced the HRQoL score of patients with type 2 diabetes in many health components, especially those in the mental health field (25). In this study, we found that the patients with older age had lower HRQoL scores than others. This result was consistent with the psychophysiological characteristics of people, the older the age, the lower the physical and mental health. Meng Xiao's study on 567 hypertensive patients in Zhongqing, China, a study by Hoang Van Minh and Monika, also provided similar results (9, 34, 35).

Strengths and limitations

Our research indicates that the health-related quality of life (HRQoL) of patients with both diabetes and

hypertension can be influenced by several factors, including demographic aspects (such as age, gender, occupation, and education) and clinical factors (such as insulin therapy, blood sugar and pressure control, and complications). Educational counseling programs can support patients in better understanding their health and treatment, which, in turn, may enhance their adherence and foster a more positive outlook toward managing diabetes and hypertension. Additionally, providing interventions to minimize complications and medical side effects, along with offering psychological support, is key to improving patient HRQoL.

However, the study's findings are limited as it was conducted in a hospital with a small sample size, making it difficult to generalize the results or establish a definitive cause-and-effect relation-ship between HRQoL and related factors. While the SF-36 is a commonly used tool to measure HRQoL, researchers may opt for different assessment tools depending on their objectives, poten-tially leading to varied results.

6. CONCLUSION

The health-related quality of life (HRQoL) in patients with both diabetes and hyperten-sion was closely linked to factors such as gender, age, level of education, the presence of compli-cations from either condition or the treatment approaches used. These factors influenced both the physical and mental aspects of HRQoL. Evaluating patients' quality of life can enhance their overall well-being. Additional large-scale studies are required to confirm these findings in individuals with comorbid diabetes and hypertension.

REFERENCES

1. Institute for Health Metrics and Evaluation. GBD Results. Accessed June 14, 2023. https://vizhub.healthdata.org/gbd-results

2. Steinmetz JD, Bourne RRA, Briant PS, et al. Causes of blindness and vision impairment in 2020 and trends over 30 years, and prevalence of avoidable blindness in relation to VISION 2020: the Right to Sight: an analysis for the Global Burden of Disease Study. The Lancet Global Health. 2021; 9(2): e144-e160. doi:10.1016/S2214-109X(20)30489-7

3. Saran R, Li Y, Robinson B, et al. US Renal Data System 2014 Annual Data Report: Epidemiolo-gy of Kidney Disease in the United States. American Journal of Kidney Diseases. 2015; 66(1): A7. doi:10.1053/j.ajkd.2015.05.001

4. WHO. Guideline for the Pharmacological Treatment of Hypertension in Adults. World Health Or-ganization; 2021. Accessed June 14, 2023. http://www.ncbi.nlm.nih.gov/books/NBK573631/

5. Gad M, Lord J, Chalkidou K, Asare B, Lutterodt MG, Ruiz F. Supporting the Development of Evidence-Informed Policy Options: An Economic Evaluation of Hypertension Management in Ghana. Value in Health. 2020; 23(2): 171-179. doi:10.1016/j.jval.2019.09.2749

6. Keasley J, Oyebode O, Shantikumar S, et al. A systematic review of the burden of hypertension, access to services and patient views of hypertension in humanitarian crisis settings. BMJ Glob Health. 2020; 5(11): e002440. doi:10.1136/bmjgh-2020-002440

7. International Diabetes Federation. IDF Diabetes Atlas | Tenth Edition. Accessed April 15, 2023. https://diabetesatlas.org/

8. Meiqari L, Essink D, Wright P, Scheele F. Prevalence of Hypertension in Vietnam: A Systematic Review and Meta-Analysis. Asia Pac J Public Health. 2019; 31(2): 101-112. doi:10.1177/1010539518824810

9. Xiao M, Zhang F, Xiao N, Bu X, Tang X, Long Q. Health-Related Quality of Life of Hyperten-sion Patients: A Population-Based Cross-Sectional Study in Chongqing, China. IJERPH. 2019; 16(13): 2348. doi:10.3390/ijerph16132348

10. Wändell PE. Quality of life of patients with diabetes mellitus An overview of research in primary health care in the Nordic countries. Scandinavian Journal of Primary Health Care. 2005; 23(2): 68-74. doi:10.1080/02813430510015296

11. Lambert GW, Hering D, Esler MD, et al. Health-Related Quality of Life After Renal Denervation in Patients With Treatment-Resistant Hypertension. Hypertension. 2012; 60(6): 1479-1484. doi:10.1161/HYPERTENSIONAHA.112.200865

12. Tran Kien N, Phuong Hoa N, Minh Duc D, Wens J. Health-related quality of life and associated factors among patients with type II diabetes mellitus: A study in the family medicine center (FMC) of Agricultural General Hospital in Hanoi, Vietnam. Health Psychology Open. 2021; 8(1): 205510292199617. doi:10.1177/2055102921996172

13. Ware JE, Sherbourne CD. The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. Med Care. 1992; 30(6): 473-483.

14. Kueh YC, Morris T, Borkoles E, Shee H. Modelling of diabetes knowledge, attitudes, self-management, and quality of life: a cross-sectional study with an Australian sample. Health Qual Life Outcomes. 2015; 13(1): 129. doi:10.1186/s12955-015-0303-8

15. Kassahun T, Gesesew H, Mwanri L, Eshetie T. Diabetes related knowledge, self-care behaviours and adherence to medications among diabetic patients in Southwest Ethiopia: a cross-sectional survey. BMC Endocr Disord. 2016; 16(1): 28. doi:10.1186/s12902-016-0114-x

16. Thommasen HV, Zhang W. Health-related quality of life and type 2 diabetes: A study of people living in the Bella Coola Valley. British Columbia Medical Journal. 2006; 48: 272-278.

17. Khaw WF, Hassan STS, Latiffah AL. Health-related Quality of Life among Hypertensive Patients Compared with General Population Norms. J of Medical Sciences. 2011; 11(2): 84-89. doi:10.3923/jms.2011.84.89

18. Yu Y, Feng L, Shao Y, et al. Quality of life and emotional

change for middle-aged and elderly patients with diabetic retinopathy. Int J Ophthalmol. 2013; 6(1): 71-74. doi:10.3980/j.issn.2222-3959.2013.01.15

19. Ng CLW, Tai ES, Goh SY, Wee HL. Health status of older adults with Type 2 diabetes mellitus after aerobic or resistance training: a randomised trial. Health Qual Life Outcomes. 2011; 9:59. doi:10.1186/1477-7525-9-59

20. Hu F, Niu L, Chen R, Ma Y, Qin X, Hu Z. The association between social capital and quality of life among type 2 diabetes patients in Anhui province, China: a cross-sectional study. BMC Public Health. 2015; 15(1): 786. doi:10.1186/s12889-015-2138-y

21. Abedini MR, Bijari B, Miri Z, Shakhs Emampour F, Abbasi A. The quality of life of the patients with diabetes type 2 using EQ-5D-5 L in Birjand. Health Qual Life Outcomes. 2020; 18(1): 18. doi:10.1186/s12955-020-1277-8

22. Papazafiropoulou AK, Bakomitrou F, Trikallinou A, et al. Diabetes-dependent quality of life (ADDQOL) and affecting factors in patients with diabetes mellitus type 2 in Greece. BMC Res Notes. 2015; 8(1): 786. doi:10.1186/s13104-015-1782-8

23. Gabric K, Matetic A, Vilovic M, et al. Health-related quality of life in type 2 diabetes mellitus patients with different risk for obstructive sleep apnea. PPA. 2018; 12: 765-773. doi:10.2147/PPA.S165203

24. Rafiq M, Saqib SE, Atiq M. Health-Related Quality of Life of Tuberculosis Patients and the Role of Socioeconomic Factors: A Mixed-Method Study. The American Journal of Tropical Medicine and Hygiene. 2022; 106(1): 80-87. doi:10.4269/ajtmh.21-0494

25. Stukas R. Quality of life in relation to social and disease factors in patients with type 2 diabetes in Lithuania. Med Sci Monit. 2013; 19: 165-174. doi:10.12659/MSM.883823

26. Svedbo Engström M, Leksell J, Johansson UB, et al. Health-related quality of life and glycaemic control among adults with type 1 and type 2 diabetes – a nationwide cross-sectional study. Health Qual Life Outcomes. 2019; 17(1): 141. doi:10.1186/s12955-019-1212-z

27. Cochran J, Conn VS. Meta-analysis of Quality of Life Outcomes Following Diabetes Self-management Training. Diabetes Educ. 2008; 34(5): 815-823. doi:10.1177/0145721708323640

28. Klocek M, Kawecka-Jaszcz K. [Quality of life in patients with essential arterial hypertension. Part I: The effect o socio-demographic factors]. Przegl Lek. 2003; 60(2): 92-100.

29. Chobanian AV, Bakris GL, Black HR, et al. Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. Hypertension. 2003; 42(6): 1206-1252. doi:10.1161/01.HYP.0000107251.49515.c2

30. Lindsay G, Inverarity K, McDowell JRS. Quality of Life in People with Type 2 Diabetes in Rela-tion to Deprivation, Gender, and Age in a New Community-Based Model of Care. Nursing Re-search and Practice. 2011; 2011: 1-8. doi:10.1155/2011/613589

31. Al Hayek AA, Robert AA, Al Saeed A, Alzaid AA, Al Sabaan FS. Factors Associated with Health-Related Quality of Life among Saudi Patients with Type 2 Diabetes Mellitus: A Cross-Sectional Survey. Diabetes Metab J. 2014; 38(3): 220. doi:10.4093/dmj.2014.38.3.220

32. Undén AL, Elofsson S, Andréasson A, Hillered E, Eriksson I, Brismar K. Gender differences in self-rated health, quality of life, quality of care, and metabolic control in patients with diabetes. Gender Medicine. 2008; 5(2): 162-180. doi:10.1016/j.genm.2008.05.003

33. Vancampfort D, Mitchell AJ, De Hert M, et al. Type 2 Diabetes in Patients With Mayor Depressive Disorder: A Meta-Analysis of Prevalence Estimates and Predictors: Review: Depression and Diabetes. Depress Anxiety. 2015; 32(10): 763-773. doi:10.1002/da.22387

34. Van Minh H, Byass P, Thi Kim Chuc N, Wall S. Patterns of health status and quality of life among older people in rural Viet Nam. Global Health Action. 2010; 3(1): 2124. doi:10.3402/gha.v3i0.2124

35. Zygmuntowicz M, Owczarek A, Elibol A, Chudek J. Comorbidities and the quality of life in hy-pertensive patients. Pol Arch Med Wewn. 2012; 122(7-8): 333-340.