







Correlation between Biopsychosocial Factors and Quality of Life in Individuals with Hypertension: A Cross-Sectional Study In Indonesia

Arlinda Sari Wahyuni^{1,*} , Kiking Ritarwan² , Putri Chairani Eyanoer¹ , Kevin Ardinata³, Muhammad Ari Irawan³, Amanda Laura³, Kyrie Hanna³, Mirachel Mirachel³ and Dara Meutia Miftadini Chalid³ 

¹Department of Community Medicine, Faculty of Medicine, University of North Sumatra, Medan, Sumatera Utara, Indonesia

²Department of Neurology, Faculty of Medicine, University of North Sumatra, Medan, Sumatera Utara, Indonesia

³Faculty of Medicine, University of North Sumatra, Medan, Sumatera Utara, Indonesia

Abstract:

Background: The quality of life for those with a medical history of chronic illnesses such as hypertension is influenced by various factors. In addition to physical health, the biopsychosocial model underscores that hypertension arises from a multifaceted interplay of biological, psychological, and social elements. This study aims to determine the correlation between biopsychosocial factors and the quality of life of hypertensive individuals.

Methods: A total of 204 participants who met the inclusion criteria at Medan City Health Center were included in this study. Modified PSS-10, MSPSS, Bortner Rating Scale, and WHOQOL-BREF questionnaires were used to support variable assessment. Variables were tested with chi-square and logistic regression analyses to assess the association between biopsychosocial factors such as age, education level, occupation, income, social support, stress level, and others on the quality of life of hypertensive patients.

Results: The majority of respondents had a good quality of life (52.5%). There was an association between sports activities (0.004), stress level (0.013), social support (0.023), education level (p=0.045), and income (p=0.036) with quality of life. Patients with income >3,000,000 (OR 2.9; CI 95%), moderate stress level (OR 2.7; CI 95%), working as an employee (OR 2.7; CI 95%), high social support (OR 2.2; CI 95%) and exercise >3x a week/1>50 minutes a week (OR 2.1; CI 95%) had better quality of life.

Conclusion: Stress levels, income, social support, exercise activities, and occupation contribute to an improved quality of life.

Keywords: Biopsychosocial, social support, hypertension, quality of life, stress levels.

© 2025 The Author(s). Published by Bentham Open.

This is an open access article distributed under the terms of the Creative Commons Attribution 4.0 International Public License (CC-BY 4.0), a copy of which is available at: <https://creativecommons.org/licenses/by/4.0/legalcode>. This license permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

*Address correspondence to this author at the Department of Community Medicine, Faculty of Medicine, University of North Sumatra, Medan, Sumatera Utara, Indonesia; E-mail: arlinda@usu.ac.id

Cite as: Wahyuni A, Ritarwan K, Eyanoer P, Ardinata K, Irawan M, Laura A, Hanna K, Mirachel M, Chalid D. Correlation between Biopsychosocial Factors and Quality of Life in Individuals with Hypertension: A Cross-Sectional Study In Indonesia. Open Public Health J, 2025; 18: e18749445367472. <http://dx.doi.org/10.2174/0118749445367472250206101527>



Received: November 04, 2024

Revised: November 29, 2024

Accepted: December 09, 2024

Published: February 13, 2025



Send Orders for Reprints to
reprints@benthamscience.net

1. INTRODUCTION

Hypertension or high blood pressure is a common health issue worldwide, including in Indonesia. According

to the World Health Organisation (WHO), more than one billion people worldwide suffered from hypertension in 2020, and this number is likely to continue growing for the

next decades [1]. According to data from the Indonesian Ministry of Health, the prevalence of hypertension in the country seems to be on the rise year after year. Factors such as lifestyle changes, unhealthy diet, stress, and lack of physical activity contribute to the increase in hypertension cases [2].

As defined by the World Health Organization (WHO), quality of life is an individual's perception of their circumstances, shaped by their cultural and value systems. This perception is further contextualized by the individual's personal goals, aspirations, and concerns [3]. This clearly indicates that the parameters of quality of life are determined by perceptions of physical health, psychological aspects, level of independence, and social relationships [4, 5]. Patients with hypertension are often associated with lower health-related quality of life than healthy people [6, 7]. However, aside from medical conditions, several other studies have found other factor variables that affect the quality of life of the hypertension population [8, 9]. While it is well-known that lifestyle contributes to hypertension outcomes, there is less clarity on how factors from other domains (such as emotional, socio-economic, and cultural aspects) potentially determine hypertension outcomes, which impact quality of life.

In 1977, George Engel introduced a new idea in the treatment of medical disorders with the biopsychosocial concept. The approach emphasizes that the interaction of biological, psychological (which includes thoughts, emotions, and behaviors), and social (e.g., socioeconomic, socioenvironmental, and cultural) factors play an important role in health and illness. Therefore, health and disease are not only related to the physical medical aspects alone but involve a combination of all three factors [10, 11]. Traditional understanding of hypertension is often limited to physical factors alone, such as genetics,

diet, and exercise habits. However, the biopsychosocial approach emphasizes that hypertension is the result of a complex interaction between biological, psychological, and social factors [12-14].

The goal of hypertension management is not only to control blood pressure within normal limits but also to enhance the quality of life of sufferers. Consequently, it is essential to discuss the relationship between biopsychosocial factors and quality of life in hypertensive patients. The main objective of our study was to ascertain the association between biopsychosocial factors and quality of life in hypertensive patients at Medan City Health Center. The specific objectives of our study were to describe the characteristics of the majority of respondents, which were observed based on age, gender, ethnicity, marital status, education level, employment status, income, body mass index, smoking habit, family history of hypertension, duration of hypertension, hypertension medication consumption, comorbidities, salt intake pattern, exercise activities, personality type, stress level, social support, and quality of life in hypertensive patients at Medan City Health Center. Additionally, it was interested in finding the relationship between biopsychosocial characteristics and quality of life in this population.

2. METHODS

2.1. Participants

Our study utilized a non-probability sampling technique adopting purposive sampling, resulting in a sample of 204 individuals with hypertension from Medan City Health Center who met the inclusion criteria: (1) diagnosed with hypertension; (2) consented to complete the research questionnaire and sign the informed consent form. The respondents' characteristics are listed in Table 1.

Table 1. Characteristics of Respondents.

Characteristics	(n = 204)	(%)
Age		
18 - 41 years	25	12,3
42 - 65 years	179	87,7
Gender		
Male	61	29,9
Women	143	70,1
Nationality		
Sumatra	128	62,7
Outside Sumatra	76	37,3
Marital Status		
Not married	8	3,9
Married	196	96,1
Education Level		
Not in school - Elementary school graduate	41	20,1
Junior/high school graduate/equivalent	115	56,4
Bachelor/Diploma Graduates	48	23,5
Jobs		
Not working	63	30,9

(Table 1) contd....

Characteristics	(n = 204)	(%)
Housewife	41	20,1
Employee	100	49
Income		
IDR < 1.000.000	109	53,4
IDR 1.000.000 - 3.000.000	57	28,0
IDR ≥ 3.000.000	38	18,6
Body Mass Index		
≤23 (Normal)	55	27
23-24,9 (Overweight)	35	17,1
≥ 25 (Obese)	114	55,9
Blood Pressure		
Normal-High	4	2
Grade 1 Hypertension	143	70,1
Grade 2 Hypertension	57	27,9
Smoking Habit		
No smoking	171	83,8
Smoking	33	16,2
Family History of Hypertension		
No history of hypertension	114	55,9
History of Hypertension	90	44,1
Duration of Hypertension		
1 - 10 years	184	90,2
≥ 10 years	20	9,8
Consumption of Hypertension Medication		
No	86	42,2
Yes	118	57,8
Non-compliant	46	39,0
Compliant	72	61,0
Comorbidities		
No	133	65,2
Yes	71	34,8
Salt Intake Pattern		
<1 teaspoon	96	47,1
≥ 1 teaspoon	108	52,9
Sports Activities		
<3x a week/<150 minutes a week	149	73,0
≥ 3x a week/ >150 minutes a week	55	27,0
Personality Type		
Type A	118	57,8
Type B	86	42,2
Stress Level		
Low stress	53	26,0
Moderate stress	119	58,3
High stress	32	15,7
Social Support		
Low	41	20,1
High	163	79,9
Quality of Life		
Bad	97	47,5
Good	107	52,5

2.2. Data Collection and Ethical Considerations

Primary data was collected by questionnaires filled out directly by respondents. The questionnaire used to assess patients' quality of life in our study was the WHOQOL-

BREF, which includes biological, psychological, and social variables. A more detailed assessment of psychological variables was conducted using a modified Perceived Stress Scale (PSS-10) questionnaire to assess stress levels, a

modified Bortner Rating Scale questionnaire to assess personality type, and a modified Multidimensional Scale of Perceived Social Support (MSPSS) questionnaire to evaluate the status of social support in patients [Suppl. Material].

The implementation of the research has considered ethical aspects such as *voluntary, informed consent, confidentiality, potential for harm, and results communication*. Our research has also been approved by the North Sumatra University Research Ethics Commission (NO.701/KEPK/USU/2024).

2.3. Research Instruments

The instrument to assess the quality of life was developed based on WHO recommendations, namely WHOQOL-BREF, consisting of 26 items and assessed on a 5-point Likert scale, then divided into five domains, namely physical health, psychological, social relationships, environment, and quality of life. Scoring for each question from 1-5 according to the measurement scale response, the higher the score obtained, the better the respondent's quality of life. The questionnaire was valid with Cronbach's α coefficient ($r=0.89 - 0.95$) and reliable ($0.66-0.87$) [15].

Stress levels were assessed using the Perceived Stress Scale (PSS-10), which consists of 10 questions designed to evaluate the stress experienced by the research subject in the past month. The PSS score ranges from 0 to 40. A higher score signifies an elevated stress level. Scoring interpretations consist of low (0-13), moderate (14-26), and severe stress (≥ 26) [16]. According to the Greek study, the results of $df = 35$ and r count = 0.4 ($p < 0.05$), and the scale reliability of the *Perceived Stress Scale* was 0.82 [17].

Assessment of personality type using the Bortner questionnaire: this scale consists of 24 pairs of items, and each item consists of two statements. The responses were then summed and categorized into type A and type B personalities. Personality type A includes individuals who are ambitious, impatient, hardworking, multitasking, and uncomfortable with delay and uncertainty. In contrast, type B personalities include people who live with lower stress levels and generally work consistently, enjoying their achievements without feeling distressed if the results are not as expected [18]. Personality interpretation with scores 29-56 Personality Type A, Score = 0-28 Personality Type B. Item validity coefficients moved between 0.307 to 0.493. The alpha reliability coefficient of the Personality Type A and B Scale is 0.763, so the results of the scale are valid and reliable [19].

A more detailed assessment of social support was conducted using the Multidimensional Scale of Perceived Social Support (MSPSS) questionnaire. This measuring tool employs a Likert Scale with seven response alternatives, ranging from one (strongly disagree) to seven

(strongly agree). Scores ranging from 12 to 35 indicate low social support, 36 to 60 indicate moderate social support, and scores between 61 and 84 indicate great social support. Consequently, these three classifications can be consolidated into two categories: low social support (12-48) and high social support (49-84) [20].

2.4. Statistical Analysis

The research variables were analyzed descriptively to obtain an overview of the frequency distribution of respondents. The subsequent phase involved bivariate analysis to assess the impact of independent variables on the dependent variable. Chi-square tests were employed in our analysis to assess the influence of biopsychosocial factors on the quality of life of patients with hypertension. Additionally, multivariable analysis will be conducted utilizing logistic regression.

3. RESULTS

Correlation analysis between biopsychosocial factors and quality of life found a significant relationship between quality of life and education level ($p=0.045$), income ($p=0.036$), sports activities ($p=0.004$), stress level ($p=0.013$), and social support (0.023) Table 2.

Based on the 18 biopsychosocial variables studied, 10 variables were found to be candidates for logistic regression models and multivariate analysis, with the condition that $p < 0.25$, namely age, ethnicity, education level, occupation, income, body mass index, smoking habits, sports activities, stress levels, and social support. Multivariate logistic regression tests were applied to identify the most prevalent biopsychosocial factors that influence the quality of life of hypertensive patients.

Out of the ten biopsychosocial factors, five factors were with a p -value less than 0.05. These factors include the stress level factor (p -value = 0.02), the occupation factor (p -value = 0.02), the income factor (p -value = 0.02), the sports activities factor (p -value = 0.02), and the social support factor (p -value = 0.03) Table 3. Respondents with moderate stress levels had an odds ratio that was 2.6 times greater for having a better quality of life than respondents with high stress levels. Furthermore, respondents who worked as housewives had an odds ratio of 2.7 times higher to have a good quality of life compared to those who did not work. Respondents with an income exceeding Rp.3,000,000 demonstrated a 2.9-fold higher likelihood of having a good quality of life compared to those with an income below Rp.500,000. In addition, people who exercise $>3x$ a week / <150 minutes a week have an odds ratio of 2.1 greater to have a quality of life that is classified as good compared to respondents who exercise $<3x$ a week / <150 minutes a week. In addition, respondents with high social support had an odds ratio that was 2.2 times greater for having a good quality of life than those with low social support. These results were then made into a logistic regression model as follows:

Table 2. Relationship between Biopsychosocial Factors and Quality of Life of Hypertension Patients.

Characteristics	Good Quality of Life		Bad Quality Of Life		p-value
	N = 204	%	N = 204	%	
Age					0.217
18 - 41 years	16	15,0	9	9,3	
42 - 65 years	91	85	88	90,7	
Gender					0.999
Male	32	29,9	29	29,9	
Women	75	70,1	68	70,1	
Nationality					0.159
Sumatra	72	67,3	56	57,7	
Outside Sumatra	35	32,7	41	42,3	
Marital Status					0.887
Not married	4	3,7	4	4,1	
Married	103	96,3	93	95,9	
Education Level					0.045
Unschool - Elementary school graduate	15	14	26	26,8	
Junior/high school graduate	62	57,9	53	54,6	
Bachelor/Diploma Graduates	30	28	18	18,6	
Jobs					0.151
Not working	27	25,2	36	37,1	
Housewife	25	23,4	16	16,5	
Employee	55	51,4	45	46,4	
Income					0.036
IDR < 1.000.000	49	45,8	60	61,8	
IDR 1.000.000 - 3.000.000	32	29,9	25	25,8	
IDR ≥ 3.000.000	26	24,3	12	12,4	
Body Mass Index					0.029
< 23 (Normal)	47	30,5	8	27	
23-24.9 (Overweight)	29	18,8	6	17,1	
≥ 25 (Overweight - Obese)	78	50,6	36	55,9	
Smoking Habit					0.101
No smoking	94	87,9	77	79,4	
Smoking	13	12,1	20	20,6	
Family History of Hypertension					0.533
No history of hypertension	62	57,9	52	53,6	
History of Hypertension	45	42,1	45	46,4	
Duration of Hypertension					0.482
1 - 10 years	98	91,6	86	88,7	
≥ 10 years	9	8,4	11	11,3	
Consumption of Hypertension Medication					0.550
Yes	64	59,8	54	55,7	
No	43	40,2	43	44,3	
Comorbidities					0.605
Yes	39	36,4	32	33	
No	68	63,6	65	67	
Salt Intake Pattern					0.921
<1 teaspoon	50	46,7	46	47,4	
≥ 1 teaspoon	57	53,3	51	52,6	
Sports Activities					0.004
< 3x a week/ < 150 minutes a week	69	64,5	80	82,5	
≥ 3x a week/ > 150 minutes a week	38	35,5	17	17,5	
Personality Type					0.753
Type A	63	58,9	55	56,7	
Type B	44	41,1	42	43,3	

(Table 2) contd.....

Characteristics	Good Quality of Life		Bad Quality Of Life		p-value
	N = 204	%	N = 204	%	
Stress Level					0.013
Low stress	37	34,6	16	16,5	
Moderate stress	56	52,3	63	64,9	
High stress	14	13,1	18	18,6	
Social Support					0.023
Low	15	14	26	26,8	
High	92	86	71	73,2	

Table 3. Biopsychosocial Factors that Most Affect the Quality of Life of Hypertension Patients.

Variable Characteristics	B	Standard Error	p-value	OR	95% CI
Sports Activities					
≥ 3 times / 150 minutes in a week	0,784	0,360	0,02	2,190	1-4,4
Income					
IDR 1,000,000 - 3,000,000	0,631	0,394	0,10	1,879	0,8-4
> IDR 3,000,000	1,066	0,481	0,02	2,903	1,1-7,4
Stress Level					
Medium	0,959	0,502	0,05	2,610	0,9-6,9
High	0,082	0,422	0,84	1,086	0,4-2,4
Jobs					
Housewife	0,998	0,442	0,02	2,713	1,1-6,4
Employees & Others	0,039	0,401	0,92	1,040	0,4-2,2
Social support					
High Social Support	0,805	0,382	0,03	2,237	1-4,7
Constant	-1,615	0,549	0,03	0,199	

Linear Regression Modelling

$$\ln \left(\frac{P(y-1)}{1-P(y-1)} \right) = \alpha + \beta_1 X_1(1) + \beta_2 X_2(1) + \beta_3 X_3(2) + \beta_4 X_4 + \beta_5 X_5$$

$$\ln \left(\frac{P(y-1)}{1-P(y-1)} \right) = -1,615 + 0,959 X_1(1) + 0,998 X_2(1) + 1,066 X_3(2) + 0,784 X_4 + 0,805 X_5.$$

4. DISCUSSION

Our study proved that the quality of life of patients with hypertension is determined by five biopsychosocial factors, namely stress level, occupational, income, physical activity, and social support. Our results showed that stress levels were associated with quality of life (p-value 0.02). Our findings are consistent with a prior study that demonstrated the substantial influence of stress on quality of life and the management of hypertension [21, 22]. Biological systems, including the sympathetic adrenomedullary circuit and the hypothalamic-pituitary-adrenal axis, are involved in the body's reaction to stress [23]. Long-term pressure and stress also impact many physiological systems, such as metabolic pathways and the immune system, causing impaired function and cellular aging [24]. Increased stress levels are associated with decreased performance and impaired quality of life [25]. Some studies reported a positive correlation between hypertension and significant psychological distress, where this significant psychological distress increases the risk of

hypertension and cerebrovascular disease and vice versa [26, 27]. Furthermore, several medical and mental conditions, including depression, metabolic syndrome, and cardiovascular disease, are also at risk due to high levels of stress [28].

Occupation is one of the factors that significantly affect the quality of life [29]. Occupation with higher job strain is linked to greater rates of hypertension, particularly among young white adults [30]. Our results showed that occupation had an impact on quality of life, with a p-value of 0.024. This aligns with previous research, which states that an individual's job has a significant role and influence in improving a person's quality of life [31, 32]. Our study proves that housewives have a better quality of life with an Odds Ratio of 2.7. Housewives may have some beneficial effects on health, in contrast to workers with inflexible work schedules, long working hours, and a lack of accessible childcare facilities for those with young children, dissatisfaction may be imminent, and quality of life may be negatively affected [33]. Working women, unlike working males, experiencing job pressure exhibited a higher prevalence of hypertension compared to individuals with relaxed psychosocial work characteristics [34].

Higher levels of physical exercise are strongly linked to happier and more contented lives in young, middle-aged, and older adults [35, 36]. Our study found those with hypertension who exercised more than three times a

week or for less than 150 minutes a week were found to have a favourable quality of life 2.1 times more frequently. People who engage in physical activity or exercise report feeling better or healthier, and the effects in our study occurred across the life span [37]. Accordingly, a meta-analysis and systematic review carried out on college students revealed that physical activity has a favorable correlation with both emotional and physical well-being, among other dimensions of quality of life [38]. Another study found that physical activity during leisure time positively impacts people's quality of life, especially in improving subjective vitality and reducing stress symptoms [39]. Engaging in physical activity can prevent the emergence of diseases, particularly non-communicable diseases, make the body fitter and healthier, and prevent the onset of depression to improve quality of life [40].

Income has a significant impact on life quality [41, 42]. With a p-value of 0.027 and an odds ratio of 2.9, our study found a relationship between hypertension patients' income and quality of life. **These results align with prior research conducted in Iran that shows income variable, which is socio-economic status, was identified as the primary factor influencing the quality of life due to its impact on health behaviors, access to healthcare services, opportunities for acquiring health-related information, and resources available for engaging in physical activities [43].** In the socioeconomic factor, the statistical test results showed that respondents with income below the regional minimum wage (below IDR 3.000.000) had a lower total score of the physical health component compared to respondents with income above the regional minimum wage. Respondents with high income tend to have better mean scores in the physical health component than low-income respondents due to easy access to medical care when there is a decline in physical health, which allows them to remain active [44].

A previous study that examined 600 hypertensive patients in China who were selected by RCT and examined several variables such as gender, marital status, latest education, income, and several others showed that the income variable significantly influenced the quality of life in terms of mental health [45]. Hypertensive patients with higher incomes tend to have better mental health compared to those with lower incomes. Access to mental health resources, the ability to manage stress, and financial freedom to obtain necessary treatment may support a better quality of life for patients with higher incomes [46].

Social support was significantly correlated with quality of life in our study, with a p-value of 0.035 and an odds ratio of 2.2. It aligns with the findings of a previous study, which reported a p-value of 0.003 and a 95% confidence interval (CI) of 1.53 for the correlation. With the support of the closest people, such as family, a patient's psychology can be positively affected to be more enthusiastic about living life and related disease therapy, thereby improving the patient's quality of life [47]. Other studies have shown that those who received support from friends or family members (caring about their illness and reminding them about treatment) showed better treatment adherence than those who did not

receive social support [48]. High social support leads to pleasure, a better sense of life, and satisfaction [49].

CONCLUSION

Five biopsychosocial factors influence the quality of life of hypertensive patients, including social support, stress level, employment status, income, and exercise. Our findings are expected to be considered in the care and health management of hypertensive patients by prioritizing the most influential biopsychosocial factors. By addressing biopsychosocial factors, practitioners can apply comprehensive care tailored to specific community needs. Good stress management and social support are expected to be achieved through the role of family and relatives in obtaining a better quality of life. Since our study was conducted in a primary health facility, further research with a larger sample in other health facilities and other variables that can be assessed is recommended to be carried out in order to obtain more comprehensive results.

AUTHORS' CONTRIBUTION

The authors confirm their contribution to the paper as follows: study conception and design: AW, KR, PE; data collection: KA, AL, KH; analysis and interpretation of results: MI, MM; draft manuscript: DC. All authors reviewed the results and approved the final version of the manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The study was approved by the North Sumatra University Research Ethics Commission (NO.701/KEPK/USU/2024).

HUMAN AND ANIMAL RIGHTS

No animals were used in this research. All procedures performed in studies involving human participants were in accordance with the ethical standards of institutional and/or research committees and with the 1975 Declaration of Helsinki, as revised in 2013.

CONSENT FOR PUBLICATION:

Informed consent was obtained from the participants.

STANDARDS OF REPORTING

STROBE guidelines and methodology were followed.

AVAILABILITY OF DATA AND MATERIAL

All data generated or analyzed during this study are included in this published article.

FUNDING

This study is funded by the Directorate of Research, Technology, and Community Service and the Institute for Research and Community Service (DRTPM) of the Ministry of Education and Culture for the fiscal year 2024 through the Universitas Sumatera Utara Fundamental Research Programme grant, number 28/UN5.4.10.S/PPM/KP-DRTPM/2024.

CONFLICT OF INTEREST

The authors have no conflicts of interest to disclose financial or otherwise.

ACKNOWLEDGEMENTS

The authors would like to thank Universitas Sumatera Utara for supporting this study.

SUPPLEMENTARY MATERIAL

Supplementary material is available on the publisher's website along with the published article.

REFERENCES

- [1] Global report on hypertension. Geneva, Switzerland: World Health Organization (WHO) 2023; pp. 1-6.
- [2] Kemenkes RI. National guidelines for medical services for the management of adult hypertension. Kementerian Kesehatan, RI: Ministry of Health of the Republic of Indonesia 2021; pp. 1-85.
- [3] The WHOQOL Group. WHO Quality of Life Scale (WHOQOL). *Psychol Med* 1998; 28(3): 551-8. PMID: 9626712
- [4] Quality of Life. Irtelli F, Durbano F, Taukeni SG, Eds. Rijeka: IntechOpen 2020; 1: p. : 77627. <http://dx.doi.org/10.5772/intechopen.77627>
- [5] Cai T, Verze P, Bjerklund Johansen TE. The quality of life definition: Where are we going? *Uro* 2021; 1(1): 14-22. <http://dx.doi.org/10.3390/uro1010003>
- [6] Snarska K, Choraży M, Szczepański M, Wojewódzka-Żeleznikowicz M, Ładny JR. Quality of life of patients with arterial hypertension. *Medicina (Kaunas)* 2020; 56(9): 459. <http://dx.doi.org/10.3390/medicina56090459> PMID: 32916933
- [7] Gu R, Zhang D, Jin X, et al. The self-perceptions of aging were an important factor associated with the quality of life in Chinese elderly with hypertension. *Psychogeriatrics* 2019; 19(4): 391-8. <http://dx.doi.org/10.1111/psyg.12400> PMID: 30786326
- [8] Silva GO, Andrade-Lima A, Germano-Soares AH, Junior D de L, Rodrigues SLC, Ritti-Dias RM, et al. Factors associated with quality of life in patients with systemic arterial hypertension. *Int J Cardiovasc Sci* 2020; 33(2): 133-42. <http://dx.doi.org/10.5935/2359-4802.20190092>
- [9] Crepaldi M, Gianni J, Brugnera A, et al. Predictors of psychological well-being and quality of life in patients with hypertension: A longitudinal study. *Healthcare (Basel)* 2024; 12(6): 621. <http://dx.doi.org/10.3390/healthcare12060621> PMID: 38540585
- [10] Vögele C. Behavioral medicine. *International Encyclopedia of the Social & Behavioral Sciences* 2015; 463-9. <http://dx.doi.org/10.1016/B978-0-08-097086-8.14060-7>
- [11] Syed S, Syed S, Bhardwaj K. The role of the bio-psychosocial model in public health. *J Med Res* 2020; 6(5): 252-4. <http://dx.doi.org/10.31254/jmr.2020.6517>
- [12] Xiao X, Song H, Sang T, Wu Z, Xie Y, Yang Q. Analysis of real-world implementation of the biopsychosocial approach to healthcare: Evidence from a combination of qualitative and quantitative methods. *Front Psychiatry* 2021; 12: 725596. <http://dx.doi.org/10.3389/fpsy.2021.725596> PMID: 34764895
- [13] Lehman BJ, David DM, Gruber JA. Rethinking the biopsychosocial model of health: Understanding health as a dynamic system. *Soc Personal Psychol Compass* 2017; 11(8): e12328. <http://dx.doi.org/10.1111/spc3.12328>
- [14] Bolton D, Gillett G. The biopsychosocial model of health and disease: New philosophical and scientific developments. *New Philosoph Sci Develop* 2019; 1: 1-149. <http://dx.doi.org/10.1007/978-3-030-11899-0>
- [15] Salim O, Sudharma NI, Kusumaratna RK, Hidayat A. Validity and reliability of world health organization quality of Life-BREF to assess the quality of life in the elderly. *Australa J Age* 2007; 26(1): 27-38. <http://dx.doi.org/10.1111/j.1741-6612.2007.00249.x>
- [16] Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. *J Health Soc Behav* 1983; 24(4): 385-96. <http://dx.doi.org/10.2307/2136404> PMID: 6668417
- [17] Andreou E, Alexopoulos EC, Lionis C, et al. Perceived Stress Scale: Reliability and validity study in Greece. *Int J Environ Res Publ Heal* 2011; 8(8): 3287-98. <http://dx.doi.org/10.3390/ijerph8083287> PMID: 21909307
- [18] Hisam A, Rahman MU, Mashhadi SF, Raza G. Type A and Type B personality among Undergraduate Medical Students: Need for psychosocial rehabilitation. *Pak J Med Sci* 2014; 30(6): 1304-7. PMID: 25674128
- [19] Hardhadhali M, Suparmi S. Enterpreneurial motivation students reviewed from adversity quotient and type A and B personality. *PSIKODIMENSIA* 2019; 18(1): 19-27. <http://dx.doi.org/10.24167/psidim.v18i1.1713>
- [20] Sulistiani W, Fajrianti I, Kristiana IF. Validation of the Indonesian version of the multidimensional scale of perceived social support (MSPSS): A rasch model approach. *J Psikol* 2022; 21(1): 89-103. <http://dx.doi.org/10.14710/jp.21.1.89-103>
- [21] Golbidi S, Frisbee JC, Laher I. Chronic stress impacts the cardiovascular system: Animal models and clinical outcomes. *Am J Physiol Heart Circ Physiol* 2015; 308(12): H1476-98. <http://dx.doi.org/10.1152/ajpheart.00859.2014> PMID: 25888514
- [22] Manihuruk SE, Melaniani S, Indriani D, Suraya AS. Stress and quality of life in hypertension sufferers: A systematic review. *Indones J Glob Heal Res* 2019; 2(4): 37-48.
- [23] Sobotka PA, Mahfoud F, Schlaich MP, Hoppe UC, Böhm M, Krum H. Sympatho-renal axis in chronic disease. *Clin Res Cardiol* 2011; 100(12): 1049-57. <http://dx.doi.org/10.1007/s00392-011-0335-y> PMID: 21688196
- [24] Shchaslyvyi AY, Antonenko SV, Telegeev GD. Comprehensive review of chronic stress pathways and the efficacy of behavioral stress reduction programs (BSRPs) in managing diseases. *Int J Environ Res Public Health* 2024; 21(8): 1077. <http://dx.doi.org/10.3390/ijerph21081077> PMID: 39200687
- [25] Di Mario S, Rollo E, Gabellini S, Filomeno L. How stress and burnout impact the quality of life amongst healthcare students: An integrative review of the literature. *Teach Learn Nurs* 2024; 19(4): 315-23. <http://dx.doi.org/10.1016/j.teln.2024.04.009>
- [26] Turana Y, Teng kawan J, Chia YC, et al. Mental health problems and hypertension in the elderly: Review from the HOPE Asia Network. *J Clin Hypertens (Greenwich)* 2021; 23(3): 504-12. <http://dx.doi.org/10.1111/jch.14121> PMID: 33283971
- [27] Guidi J, Lucente M, Piolanti A, Roncuzzi R, Rafanelli C, Sonino N. Allostatic overload in patients with essential hypertension. *Psychoneuroendocrinology* 2020; 113: 104545. <http://dx.doi.org/10.1016/j.psyneuen.2019.104545> PMID: 31862612
- [28] Parsaei R, Roohafza H, Feizi A, Sadeghi M, Sarrafzadegan N. How different stressors affect quality of life: An application of multilevel latent class analysis on a large sample of industrial employees. *Risk Manag Healthc Poli* 2020; 13: 1261-70. <http://dx.doi.org/10.2147/RMHP.S256800> PMID: 32903876
- [29] Chhetri R, Bista B, Pandeya P, Khanal SP, Neupane A. Health related quality of life of hypertensive patients attending a tertiary level hospital in Kathmandu. *J Manmo Memor Insti Heal Sci* 2023; 8(1): 11-27. <http://dx.doi.org/10.3126/jmmihs.v8i1.57267>
- [30] Schwartz SR, Magit AE, Rosenfeld RM, et al. Clinical practice guideline. *Otolaryngol. Head Neck Surg* 2017; 156(1_Suppl): S1-S29. <http://dx.doi.org/10.1177/0194599816671491> PMID: 28045591
- [31] Mamman R, Grewal J, Garrone JN, Schmidt J. Biopsychosocial factors of quality of life in individuals with moderate to severe traumatic brain injury: A scoping review. *Qual Life Res* 2024;

- 33(4): 877-901.
<http://dx.doi.org/10.1007/s11136-023-03511-0> PMID: 37925675
- [32] Batista AR, Silva S, Lencastre L, Guerra MP. Biopsychosocial correlates of quality of life in multiple sclerosis patients. *Int J Environ Res Public Health* 2022; 19(21): 14431.
<http://dx.doi.org/10.3390/ijerph192114431> PMID: 36361311
- [33] Uwannah N, Ayodele K, Nwakanma C, Starris-Onyema P, Udo N. Quality of life among employed and unemployed women in remo community: An empirical assessment. *Commun Pract J Commun Pract Heal Visit Assoc* 2023; 20: 368.
- [34] Rosenthal T, Alter A. Occupational stress and hypertension. *J Am Soc Hypertens* 2012; 6(1): 2-22.
<http://dx.doi.org/10.1016/j.jash.2011.09.002> PMID: 22024667
- [35] An HY, Chen W, Wang CW, Yang HF, Huang WT, Fan SY. The relationships between physical activity and life satisfaction and happiness among young, middle-aged, and older adults. *Int J Environ Res Public Health* 2020; 17(13): 4817.
<http://dx.doi.org/10.3390/ijerph17134817> PMID: 32635457
- [36] Granero-Jiménez J, López-Rodríguez MM, Dobarrio-Sanz I, Cortés-Rodríguez AE. Influence of physical exercise on psychological well-being of young adults: A quantitative study. *Int J Environ Res Public Health* 2022; 19(7): 4282.
<http://dx.doi.org/10.3390/ijerph19074282> PMID: 35409963
- [37] Roychowdhury D. Using physical activity to enhance health outcomes across the life span. *J Funct Morphol Kinesiol* 2020; 5(1): 2.
<http://dx.doi.org/10.3390/jfmk5010002> PMID: 33467218
- [38] Craike M, Bourke M, Hilland TA, *et al.* Correlates of physical activity among disadvantaged groups: A systematic review. *Am J Prev Med* 2019; 57(5): 700-15.
<http://dx.doi.org/10.1016/j.amepre.2019.06.021> PMID: 31630762
- [39] Cheng M, Lei X, Zhu C, *et al.* The association between poor sleep quality and anxiety and depression symptoms in Chinese patients with coronary heart disease. *Psychol Health Med* 2022; 27(6): 1347-56.
<http://dx.doi.org/10.1080/13548506.2021.1874440> PMID: 33506709
- [40] Palit ID, Kandou GD, Kaunang WJP. The relationship between physical activity and quality of life in the elderly in salurang village, South Central Tabukan district, Sangihe Islands Regency. *KESMAS* 2021; 10(6): 68.
http://dx.doi.org/10.4103/jehp.jehp_421_20
- [41] Nutakor JA, Zhou L, Larnyo E, Addai-Danso S, Tripura D. Socioeconomic status and quality of life: An assessment of the mediating effect of social capital. *Healthcare* 2023; 11(5): 749.
<http://dx.doi.org/10.3390/healthcare11050749> PMID: 36900754
- [42] Schultz WM, Kelli HM, Lisko JC, *et al.* Socioeconomic status and cardiovascular outcomes. *Circulation* 2018; 137(20): 2166-78.
<http://dx.doi.org/10.1161/CIRCULATIONAHA.117.029652> PMID: 29760227
- [43] Kazemi Karyani A, Rezaei S, Karami Matin B, Amini S. Poor health-related quality of life in Iran: Decomposition analysis of affecting factors. *Int J Hum Rights Healthc* 2019; 12(1): 28-37.
<http://dx.doi.org/10.1108/IJHRH-05-2018-0036>
- [44] Melani F, Hasrat KT, Widyasti BA, Suhadi R. 119 / 5.000 Evaluation of the quality of life of hypertensive respondents aged 40-75 years using the SF-36 instrument in Kalasan sub-district, Sleman, Yogyakarta. *Indones J Clin Pharm* 2017; 6(3): 200-9.
<http://dx.doi.org/10.15416/ijcp.2017.6.3.200>
- [45] Xiao M, Zhang F, Xiao N, Bu X, Tang X, Long Q. Health-related quality of life of hypertension patients: A population-based cross-sectional study in Chongqing, China. *Int J Environ Res Public Health* 2019; 16(13): 2348.
<http://dx.doi.org/10.3390/ijerph16132348> PMID: 31277210
- [46] Razon N, Hessler D, Bibbins-Domingo K, Gottlieb L. How hypertension guidelines address social determinants of health. *Med Care* 2021; 59(12): 1122-9.
<http://dx.doi.org/10.1097/MLR.0000000000001649> PMID: 34779795
- [47] Alshahrani AM. Quality of life and social support: Perspectives of Saudi Arabian stroke survivors. *Sci Prog* 2020; 103(3): 0036850420947603.
<http://dx.doi.org/10.1177/0036850420947603> PMID: 32811355
- [48] Shen B, Guan T, Du X, Pei C, Zhao J, Liu Y. Medication adherence and perceived social support of hypertensive patients in China: A community-based survey study. *Patient Prefer Adherence* 2022; 16: 1257-68.
<http://dx.doi.org/10.2147/PPA.S363148> PMID: 35610983
- [49] Chollou KM, Shirzadi S, Pourrazavi S, Babazadeh T, Ranjbaran S. The role of perceived social support on quality of life in people with cardiovascular diseases. *Ethiop J Health Sci* 2022; 32(5): 1019-26.
<http://dx.doi.org/10.4314/ejhs.v32i5.17> PMID: 36262697

DISCLAIMER: The above article has been published, as is, ahead-of-print, to provide early visibility but is not the final version. Major publication processes like copyediting, proofing, typesetting and further review are still to be done and may lead to changes in the final published version, if it is eventually published. All legal disclaimers that apply to the final published article also apply to this ahead-of-print version.