ORIGINAL ARTICLE

Health-Related Quality of Life in Young Adults with Hypertension: A Comparative Cross-Sectional Study in Malaysia

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ABSTRACT

INTRODUCTION: Hypertension in young adults is associated with a prolonged disease course and elevated lifetime cardiovascular risk, significantly affecting quality of life (QoL). Despite its growing prevalence and potential to affect multiple QoL dimensions, this relationship remains understudied in Malaysia. This study aimed to compare QoL between normotensive (NT) and hypertensive (HTN) young adults. **MATERIALS AND METHODS:** A cross-sectional study involving 124 participants (64 NT and 60 HTN) aged 18-39 years. QoL was assessed using the validated WHOQOL-BREF questionnaire across four domains: physical health, psychological well-being, social relationships, and environmental satisfaction. Body mass index, waist-to-hip ratio, and sociodemographic data were also collected. **RESULTS:** The HTN group demonstrated significantly lower scores than the NT group in physical health (67.5±14.5 vs 73.67±15.5, p=0.024) and in environmental domains (71.0±12.4 vs 75.5±11.3, p=0.037). Waist-to-hip ratio was the only consistent factor across all QoL domains, showing significant negative associations with physical health (B=-33.920, p=0.025), psychological well-being (B=-27.444, p=0.049), social relationships (B=-35.662, p=0.048), and the environmental domain (B=-38.132, p = 0.001). Body mass index was negatively associated with physical health (B=-0.495, p=0.045), and employment status was significantly associated with psychological well-being (B=-7.931, p=0.022). **CONCLUSION:** Hypertension management in young adults should extend beyond blood pressure control to encompass broader QoL considerations, particularly addressing central obesity and psychosocial determinants of health.

Keywords
Hypertension, Employment status, Quality of life, Waist-to-hip ratio, Young adults

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INTRODUCTION

Hypertension affects approximately 1.3 billion adults globally and is a leading risk factor for cardiovascular diseases (CVD), including heart failure, coronary artery disease, and stroke.[1] While traditionally considered a condition mainly affecting older adults, emerging evidence has shown that even young adults are increasingly at risk.[2] The latest 10-year risk prediction model estimates that 28.5 million young adults in the United States without a history of cardiovascular or kidney disease are at high risk of hypertension.[3] In Asia, the prevalence of hypertension among adolescents and younger adults is increasing, signalling early-onset cardiovascular risk and a growing long-term health burden.[4] In Malaysia, the Young-Onset Hypertension (YOH) study reported a consistent prevalence of YOH over the past decade, with 17.7% in 2006, 17.0% in 2011, and 18.4% in 2015.[5] Multiple factors contribute to this rise, including sedentary lifestyles, poor diets, biological sex differences, global obesity increase, and healthcare disparities across socioeconomic groups.[2] In addition to these risks, young

adults often have limited awareness of hypertension, its health consequences, and therapeutic management strategies.[6] Existing research predominantly examines elderly populations, resulting in a notable gap in knowledge regarding how hypertension affects younger age groups.[7]

Health-related quality of life (HRQoL) plays a crucial role in young adulthood, a period marked by significant transitions, including enrolling in university, gaining independence in living arrangements, and establishing a career.[8] QoL is a multidimensional concept encompassing physical health, psychological state, level of independence, social relationships, and relationships with relevant environmental features.[9] Previous research has reported mixed findings, with some studies demonstrating substantial negative effects of hypertension on QoL, while others suggest minimal impact.[10] These inconsistencies may be due to variations in measurement tools, population characteristics, or the severity of hypertension.[10] The World Health Organisation Quality of Life-Brief version (WHOQOL-BREF) instrument provides a comprehensive assessment of QoL across four domains, including physical health, psychological well-being, social relationships, and environment.[11] This validated tool is widely used across populations and conditions, suitable for examining QoL differences between HTN and NT individuals. Thus, this study aimed to compare QoL across all four WHOQOL-BREF domains between young adults with NT and HTN and to identify factors associated with QoL.

MATERIALS AND METHODS

Study design and participants

A cross-sectional study was conducted at the Cardiology Department of Hospital Canselor Tuanku Muhriz in Kuala Lumpur. Participants were recruited through community advertisements in the Klang Valley, and those who responded visited the department for all assessments. A trained research assistant screened respondents for eligibility and obtained written informed consent prior to enrolment. Eligible individuals were young adults aged 18 to 39 years who were either diagnosed with essential hypertension with systolic blood pressure (SBP) of 140 mmHg or greater and/or a diastolic blood pressure (DBP) of 90 mmHg or greater,[2] or were currently taking antihypertensive medication. Exclusion criteria were pregnancy, secondary hypertension, and major comorbidities such as cancer, heart failure, end-stage renal disease, and Type 2 Diabetes Mellitus, all identified through self-report on a structured screening checklist.

Demographic and physical activity

Demographic data included age, gender, education level, marital status, and current employment status. Physical activity levels were assessed using the validated Malay Version of the International Physical Activity Questionnaire -Short Form (IPAQ-SF)[12], which classifies participants into low, moderate, or high activity categories based on metabolic equivalent (MET) scores.

Cardiometabolic markers

High-density lipoprotein cholesterol (HDL-C), low-density lipoprotein cholesterol (LDL-C), and C-reactive protein (CRP) were analysed. CRP was measured to assess systemic inflammation, and haemoglobin A1c (HbA1c) was measured to indicate long-term glycaemic control and diabetes risk. All blood samples were collected prospectively at the study visit following an 8-10 hour overnight fast.

Anthropometric and blood pressure measurement

Anthropometric measurements, including SBP, DBP, body mass index (BMI), and waist-to-hip ratio (WHR), were taken by a single trained research assistant. Blood pressure was measured using a calibrated OMRON Automatic Blood Pressure Monitor (HEM-7156T-A) in accordance with standardised protocols outlined in the Malaysian Clinical Practice Guidelines: Management of Hypertension (2018). Participants were instructed to rest for at least five minutes before measurement to ensure accuracy.[13] Three consecutive measurements were taken, and the average of the last two was recorded for the final analysis. BMI was calculated as weight in kilograms divided by height in meters squared (kg/m^2), while WHR was calculated as waist circumference divided by hip circumference.

WHOQOL-BREF assessment

The participants' QoL was assessed using the validated Malay version of the WHOQOL-BREF, with excellent internal consistency (Cronbach's alpha = 0.89).[14] This instrument includes 26 items that provide a comprehensive evaluation of participants' perceived well-being across various life domains. The questionnaire comprises two global items assessing participants' overall QoL and general health satisfaction. The remaining 24 items are systematically organised into four other core domains: physical health (7 items), psychological well-being (6 items), social relationships (3 items), and environmental factors (8 items). Responses were recorded on a 5-point Likert scale, allowing participants to indicate their levels of agreement or satisfaction with their current life situation. Domain scores were calculated by computing the mean of all items within each domain and then multiplying the result by four. These scores were transformed into a standardised 0-100 scale to facilitate interpretation and ensure comparability with the original WHOQOL-100 instrument.[9]

Statistical analysis

A total of 124 participants (60 HTN, 64 NT) were recruited based on the sample size determined by the parent study's primary outcome. Sample size calculation was performed using G*Power 3.1, referencing Galderisi et al. (2010), with a significance level of α=0.05 and a power of 80%.[15] Statistical analyses used SPSS 28.0. Descriptive statistics used means ± SD for continuous data and frequencies and percentages for categorical data. Independent t-tests compared WHOQOL-BREF scores between HTN and NT groups, chi-square tests assessed categorical associations, and multiple linear regression identified QoL factors. Significance was set at $p<0.05$. Risk factors included gender, education, marital status, employment, CRP, HbA1c, BMI, and WHR.

RESULTS

Participant characteristics

The demographic and clinical characteristics are presented in Table I. The HTN group was significantly older ($p<0.001$) and predominantly male ($p=0.010$). Compared with the NT group, the HTN group had lower rates of tertiary education ($p=0.011$), higher rates of marriage ($p<0.001$), and higher employment rates ($p=0.005$). Cardiometabolic markers revealed lower HDL-C ($p=0.002$), higher CRP ($p=0.011$), and higher HbA1c ($p=0.020$) in the HTN group, as well as higher BMI ($p<0.001$) and WHR ($p<0.001$).

Table I: Demographic and Clinical Characteristics of Participants

Demographic	Hypertensive (HTN) (n = 60)	Normotensive (NT) (n = 64)	p-value
Age, (mean ± SD)	31.5±4.2	28.4±4.2	<0.001*
Gender, n (%)			0.010*
Male	40 (66.7)	28 (43.8)	
Female	20 (33.3)	36 (56.2)	
Education level, n (%)			0.011*
Secondary	20 (33.3)	9 (14.1)	
Tertiary	40 (66.7)	55 (85.9)	
Marital status, n (%)			<0.001*
Not married	21 (35.0)	41 (64.1)	
Married	39 (65.0)	23 (35.9)	
Employment status, n (%)			0.005*
Unemployed	7 (11.7)	21 (32.8)	
Employed	53 (88.3)	43 (67.2)	
Physical activity level, n (%)			0.429
Low	16 (26.7)	24 (37.5)	
Moderate	25 (41.7)	22 (34.4)	
High	19 (31.7)	18 (28.1)	
Smoking status, n (%)			0.518
Yes	11 (18.3)	9 (14.1)	
No	49 (81.7)	55 (85.9)	
Cardiometabolic markers, (mean±SD)			
HDL-C, mmol/L	1.2±0.3	1.4±0.4	0.002*
LDL-C, mmol/L	3.4±1.0	3.1±0.9	0.167
CRP, mg/L	6.6±7.5	3.5±5.6	0.011*
HbA1c, NGSP (%)	5.5±1.6	5.0±0.9	0.020*
Anthropometric (mean±SD)			
BMI, kg/m²	30.8±5.6	25.1±5.1	<0.001*
WHR	0.90±0.1	0.84±0.1	<0.001*
Duration of hypertension, years	3.2±2.7	-	-

BMI, Body mass index; CRP, C-reactive protein; HbA1c, Haemoglobin A1c; HDL-C, High-density lipoprotein cholesterol; LDL-C, Low-density lipoprotein cholesterol; WHR, Waist-to-hip ratio.
*Statistically significant, $p<0.05$

Comparison of WHOQOL-BREF domain scores

Table II presents WHOQOL-BREF domain scores for both groups. The HTN group scored significantly lower than the NT group on physical health ($p=0.024$) and on environmental domains ($p=0.037$). No significant differences were observed in psychological ($p=0.925$), social relationships ($p=0.443$), or overall QoL scores ($p=0.669$). Both groups scored highest in the environmental domain.

Table II: Comparison of WHOQOL-BREF Domain Scores Between HTN and NT groups.

Domain	Hypertensive (HTN) (n = 60)	Normotensive (NT) (n = 64)	p-value
Physical Health	67.5±14.5	73.67±15.5	0.024*
Psychological	67.98±14.5	68.2±14.4	0.925
Social Relationships	68.8±20.0	71.2±15.6	0.443
Environment	71.0±12.4	75.5±11.3	0.037*
Overall QoL	68.3±21.0	66.7±18.9	0.669

QoL, Quality of Life. Values are presented as mean ± SD.
*Statistically significant, p<0.05

Factors associated with HRQoL

Multiple linear regression analysis was performed to identify factors associated with each QoL domain (Table III). WHR was the only consistent predictor across all QoL domains, showing significant negative associations with physical health (B=-33.920, 95% CI:-63.464, -4.377, p=0.025), psychological well-being (B= -27.444, 95% CI: -54.781, -0.106, p=0.049), social relationships (B=-35.662, 95% CI:-71.003, -0.322, p=0.048) and environmental domain (B=-38.132, 95% CI:-60.700, -15.563, p=0.001). BMI was associated with physical health (B=-0.495, 95% CI:-0.978, -0.012, p=0.045), while employment status was associated with psychological well-being (B=-7.931, 95% CI:-14.690, -1.172, p=0.022). Gender, marital status, CRP, and HbA1c were not significant predictors of QoL in any domain. Figure 1 illustrates the consistent negative association between WHR and all QoL domains.

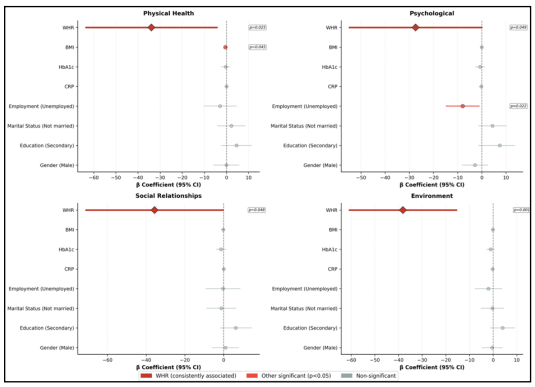

Figure 1: Forest plots of multivariable linear regression showing associations between anthropometric, metabolic, and sociodemographic factors and quality of life domains. Values represent β coefficients with 95% confidence intervals

DISCUSSION

Key Findings

This study yielded several noteworthy findings. WHR, rather than BMI, demonstrated a consistent association with HRQoL across all four WHOQOL-BREF domains, suggesting that central adiposity has a broader impact on well-being than total body mass. Furthermore, hypertension primarily affected the physical health and environmental domains in this young adult cohort, unlike older populations, where psychological and social domains tend to be more affected. Additionally, employment status was independently associated with psychological QoL, underscoring the critical role of occupational engagement in the mental health of young adults with hypertension.

In demographic analysis, significant differences were observed between the HTN and NT groups in age and gender. Although the age difference was statistically significant, both groups fell within the 18-39 year age range, qualifying them as young adults according to the 2024 European Society of Cardiology (ESC) Guidelines for the Management of Elevated Blood Pressure and Hypertension.[2] To the best of our knowledge, this is the first study to investigate HRQoL among young adults with hypertension in Malaysia. The predominance of males in the HTN group is consistent with findings from the Malaysian hypertension prevalence study, which reported that males are nearly twice as likely to have hypertension compared to females.[5] Men, who are often the primary earners, tend to face greater work-related stress and have higher smoking rates, raising their risk of hypertension.[16] In this study, one-third of the HTN group had only secondary-level education, whereas the NT group was predominantly composed of university graduates. These findings support earlier research indicating that lower levels of education are typically associated with a limited understanding of health information and decision-making.[17,18] Meanwhile, higher education is associated with lower risk and better health outcomes.[18-25] Greater educational attainment may be associated with a decreased risk of hypertension, potentially attributable to improved health literacy and awareness of blood pressure regulation techniques.[24]

Marital status was also significantly associated with hypertension status, with the majority in the HTN group being married. This finding is consistent with earlier results from the MyCoSS study on Malaysian adults, which reported that most hypertensive individuals are married, a trend also observed in other countries.[18,20,21,26]

Table III: Multiple Linear Regression Analysis for Factors Associated with Domains of Quality of Life.

Variable (Reference)	Physical Health			Psychological			Social Relationships			Environment		
	B	95% CI	p-value	B	95% CI	p-value	B	95% CI	p-value	B	95% CI	p-value
Gender (Male)	-0.084	-5.661, 5.493	0.976	-2.819	-7.980, 2.342	0.282	0.949	-5.722, 7.621	0.779	-0.447	-4.708, 3.813	0.836
Level of Education (Secondary)	4.517	-2.121,11.154	0.180	7.426	-1.284, 13.568	0.218	6.284	-1.656, 14.224	0.120	3.992	-1.078,9.063	0.122
Marital Status (Not married)	2.170	-4.027, 8.367	0.489	4.434	-1.300, 10.168	0.128	-1.184	-8.597,6.229	0.752	-0.362	-5.095,4.372	0.880
Employment status (Unemployed)	-2.933	-10.238, 4.371	0.428	-7.931	-14.690, -1.172	0.022*	-0.306	-9.044, 8.432	0.945	-2.012	-7.592,3.568	0.477
CRP, mg/L	-0.024	-0.447, 0.398	0.909	-0.259	-0.650, 0.132	0.193	0.068	-0.438, 0.573	0.791	-0.225	-0.547,0.098	0.171
HbA1c, %	-0.373	-2.371, 1.624	0.712	-0.734	-2.582, 1.115	0.433	-1.352	-3.741, 1.037	0.265	-1.088	-2.614,0.438	0.161
BMI, kg/m²	-0.495	-0.978, -0.012	0.045*	-0.068	-0.515, 0.379	0.763	-0.240	-0.818, 0.338	0.413	-0.140	-0.509,0.229	0.455
WHR	-33.920	-63.464, -4.377	0.025*	-27.444	-54.781, -0.106	0.049*	-35.662	-71.003, -0.322	0.048*	-38.132	-60.700, -15.563	0.001*

BMI, Body mass index; CRP, C-reactive protein; HbA1c, Haemoglobin A1c; WHR, Waist-to-hip ratio.
*Statistically significant, $p<0.05$
Multicollinearity was assessed prior to each regression model using Variance Inflation Factors (VIF). All VIF < 5.0; no significant interactions detected. R^2: Physical Health = 0.106; Psychological = 0.137; Social Relationships = 0.063; Environment = 0.156

A 2025 study from China found that, in women, factors like age and financial status may influence how marital status relates to hypertension.[27] In India, an individual's hypertension status was consistently related to their spouse's condition across various socio-demographic groups.[28] On the other hand, in our study, most NT participants were not married. This variation could be attributed to the sampling method, as the NT group likely included recent graduates who had just started working and were not yet married.

HDL-C levels were significantly higher in the NT group than in the HTN group, consistent with its inverse relationship with hypertension.[29,30] Although our study did not include measurements of high-sensitivity CRP, standard CRP levels were significantly elevated among participants with hypertension. Elevated CRP levels may contribute to hypertension by reducing nitric oxide production, upregulating vasoconstrictors, and impairing blood vessel relaxation.[31] HbA1c, a biomarker of long-term glycaemic control, was also significantly higher in the HTN group. This finding is consistent with the understanding that higher levels of this biomarker can increase cardiovascular risks, including hypertension. The BiomarCaRE prospective cohort study, conducted across Europe, investigated the association between HbA1c levels and cardiovascular outcomes in 36,180 participants. It found that both cardiovascular disease and overall mortality rates rose as HbA1c levels increased among individuals without diabetes.[32] Similarly, a study from the China Health and Nutrition Survey (CHNS) observed a positive relationship between HbA1c and hypertension incidence in 4,074 participants. [33]

Comparison of HRQoL between HTN and NT

This study explored HRQoL differences between NT and HTN groups, finding that both scored highest in the environmental domain, consistent with earlier research on hypertensive individuals.[34,35] This domain includes financial resources, personal freedom, safety, health, social care (access and quality), home environment, learning and leisure opportunities, and physical aspects of surroundings.[11] Most participants likely resided in the Klang Valley, an urban area characterised by good safety, healthcare, social services, leisure facilities, and transportation. Healthcare accessibility varies considerably by location, with urban centres such as the Klang Valley benefiting from higher physician density per capita.[16] A study in Malaysia shows urban residents benefit from well-maintained facilities like public transportation, parking, and health services, which enhance QoL needs.[36]

A significant difference was found in average scores, with the HTN group scoring lower than the NT group. This indicates that those with normal blood pressure might have better access to or satisfaction with health-supporting resources. Conversely, hypertensive individuals may face limited recreational access due to fewer exercise programs, exercise limits, medication side effects such as fatigue and dizziness, or fear of adverse events. A study found that hypertensive individuals had fewer leisure

opportunities and lower QoL, as evidenced by their mean QoL scores.[35] The International Society of Hypertension (2024) recommends initiating lifestyle modifications, including increased physical activity (≥150 min/week of moderate aerobic activity [brisk walking, cycling, or swimming]) and resistance training 2-3 times/week, early in life as a primary strategy to prevent and control hypertension.[37]

Meanwhile, the physical health domain has the lowest HRQoL score in the HTN group, consistent with previous research findings.[21,34,38,39] Although some earlier studies reported that elderly populations tend to have the lowest physical health scores in this domain, a study assessing HRQoL among young adults on the rural west coast of Peninsular Malaysia reported similar results, indicating that young adults may also experience reduced physical health scores.[38] Hypertension can negatively impact physical health through several factors, including medication use, pain, work limitations, sleep disturbances, and reduced energy levels.[11] A study on patients' experiences with hypertension found that most report symptoms and challenges in daily activities.[40] There is also evidence of a bidirectional association between hypertension and insomnia, with hypertension predicting higher insomnia risk (OR =1.20, 95% CI: 1.08-1.32) and vice versa (OR =1.11, 95% CI: 1.07-1.16).[41] Furthermore, insufficient sleep increases prehypertension risk,[42] and hypertensive individuals often experience poor sleep, affecting their QoL, especially physically.[34] Inadequate sleep triggers sympathetic activation that impairs cardiovascular regulation by preventing normal nighttime blood pressure drops or causing nocturnal increases.[37] These findings are especially important for young adults in Malaysia, as some young workers do shift work, leading to irregular sleep patterns and an elevated risk of hypertension.[43]

Interestingly, we found no significant differences between NT and HTN in psychological and social domains. Both had average scores, implying that hypertension may have a smaller effect on HRQoL in young adults. This finding aligns with the understanding that hypertension initially presents as an asymptomatic condition in younger populations.[44] The asymptomatic nature of early-stage hypertension means that young adults often do not experience noticeable physical symptoms that would directly affect their psychological well-being or social functioning. In Malaysia, almost 29.2% of people suffer from high blood pressure, but about 11.9% are unaware of their condition. This lack of awareness is particularly prevalent among younger age groups, especially those aged 18 to 39.[45] Consequently, their HRQoL in these areas tends to be similar to that of normotensive individuals.

Factors associated with HRQoL between HTN and NT

Regression analysis indicated that WHR was negatively associated with HRQoL across all four domains. WHR is a measure of central or abdominal obesity that reflects visceral fat accumulation.[46] In contrast, BMI showed a specific association only with physical health. This finding is consistent with a previous study of Filipinos, which reported that WHR was more strongly associated with decreased HRQoL than BMI.[47] Similarly, a multicity study from China found that abdominal obesity had a greater impact on physical health compared with mental health.[48] In Malaysia, the prevalence of abdominal obesity among adults has increased significantly from 2011 to 2023, raising major public health concerns that can impact overall QoL.[45] The Ministry of Health's Clinical Practice Guidelines recommend annual screening for BMI and waist circumference, using culturally appropriate cut-off values for the Malaysian population.[49] This differential pattern between BMI and WHR reinforces the importance of body fat distribution over total body mass. Central obesity appears to have broader implications for HRQoL, while peripheral or overall obesity primarily affects physical capabilities.

The significant association between employment status and psychological domain scores confirms that occupational engagement is important for mental health. This finding is consistent with previous research indicating that unemployment can significantly reduce QoL.[17,18,38] The association between unemployment and lower psychological well-being may reflect the loss of role identity, social interaction, and sense of purpose that employment provides.[18,38] That this association was

confined to the psychological domain suggests that employment primarily influences mental health rather than all aspects of life.

Nevertheless, several limitations should be acknowledged. The cross-sectional design prevents establishing a causal relationship between hypertension and HRQoL. The lack of sociodemographic matching between groups means residual confounding cannot be excluded despite regression adjustment, and future studies should consider a matched or propensity-score design. Although the sample size was sufficient for the primary analyses, it may not have had adequate power to detect minor effects. Additionally, self-reported questionnaire data carry an inherent risk of response bias, and potential confounders, including dietary habits, stress levels, and sleep quality, were not assessed. Considering early hypertension onset and its impact on HRQoL, comprehensive cardiovascular evaluations, including advanced imaging modalities such as echocardiography and carotid ultrasound, should be considered to detect subclinical damage and enable timely intervention before complications arise.

CONCLUSION

This study demonstrates that hypertension reduces HRQoL in young adults, particularly in the physical health and environmental domains. It emphasises the need for hypertension management strategies that address not only blood pressure control but also broader HRQoL concerns. Current evidence suggests community-based physical activity programmes, workplace wellness initiatives, WHR-targeted dietary and exercise counselling, and health literacy campaigns within routine care are associated with better HRQoL outcomes in young adults with hypertension. Longitudinal studies are needed to confirm the causal direction of these associations.

INSTITUTIONAL REVIEW BOARD (ETHIC COMMITTEE)

This study was approved by the Research Ethics Committee of the National University of Malaysia (JEP-2023-510).

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