



# Association between Blood Pressure and Quality of Life of Patients with Diabetes Mellitus Type 2 in the Bogor City Indonesia

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## Abstract

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**BACKGROUND:** Quality of life (QoL) related to health is an important aspect in the treatment of diabetes mellitus (DM).

**AIM:** This study aims to find a relationship between blood pressure and QoL of patients with DM Type 2 by controlling other variables.

**METHODS:** This is a cross-sectional study of DM patients in Bogor City who were community-based participants with inclusion and exclusion criteria. The QoL data were collected using DM QoL modification questionnaire. Statistical analyses were performed using logistic regression.

**RESULTS:** The result of the study conducted on 144 people with DM, more than half of the patients had hypertension (68.1%), adults aged 25–60 years (69.4%), women (79.9%), low education with <12 years of education year (62.5%), not working formally (66.0%), married (77.8%), and getting treatment (75.7%). The QoL of patients is balanced between good and poor QoL (50%). Based on the results of the bivariate test, blood pressure, education, and marital status had a significant relationship to QoL ( $p < 0.05$ ). Based on multivariate test results, the OR value for blood pressure does not increase or decrease by more than 10% in the full model or partially, this indicates that the effect of pressure on QoL is relatively stable (OR = 0.293).

**CONCLUSION:** DM patients who are not hypertensive can be a protective factor against poor QoL. The multivariate final model shows that the variable that greatly influences the QoL is education (OR = 3.63). Blood pressure, education, and married have a significant relationship to the QoL of patients with DM ( $p < 0.05$ ). Age, sex, occupation, and therapy were not statistically related ( $p > 0.05$ ).

## Introduction

In 2014, according to the WHO, there were 422 million adults over the age of 18 who lived with diabetes mellitus (DM) [1]. The prevalence of DM in Indonesia tends to increase, from 5.7% in 2007 to 6.9% in 2013, and increase again to 8.5% and 10.9% in 2018 [2], [3], [4], [5]. Indonesia is the 4<sup>th</sup> country with the highest prevalence of DM in the world. The WHO data estimates that the number of people with DM Type 2 in Indonesia will increase significantly to 21.3 million by the next 2030 [6].

From 2011 until now in the Bogor City a cohort study of Non-Communicable Diseases has been conducted by the National Institute of Health Research and Development, Ministry of Health RI. The results of the initial screening cohort study in 2011 found 174 (3.1%) DM patients who had been diagnosed by health workers from 5680 residents, and for 4 years there were 795 DM incidents [7]. Based on these data

it can be seen that the prevalence of DM patients increases every year in Indonesia and the relationship between blood pressure and quality of life (QoL) of patients with DM Type 2 has not been known in Bogor City in 2018.

A study from Daher *et al.* (2015) states that hypertension is factor that affects physical function directly so that it will affect the QoL of people with type 2 DM [8]. Other studies from Yiming also mentioned that hypertension is one of the factors that influence the QoL of people with type 2 DM [9], [10].

Based on previous studies, further study is needed to see the effect of blood pressure and QoL of people with type 2 DM and many studies of the QoL of people with DM carried out in hospital settings, whereas in this study was carried out in community settings by visiting patients' homes directly. This study aims to find a relationship between blood pressure and QoL of people with DM type 2 by controlling other variables such as age, sex, married, education, employment, and therapy for DM performed.

## Methods

The study design in this study is cross-sectional. The population is all DM patients who have become community-based participants in the NCDs Cohort Study, with inclusion criteria namely DM patients who have been diagnosed by doctors with DM Type 2 from 2011 to 2017 as the results of a cohort study, aged >25 years and willing to follow study and fulfill exclusion criteria, i.e., DM patients who cannot communicate verbally or have disabilities, women who are pregnant and patients who are hospitalized.

The sampling technique was done by Systematic Random Sampling and the results of 114 samples were obtained. The variable in this study is blood pressure, age, sex, education, occupation, marital status, therapy, and QoL. Instruments for measuring blood pressure using sphygmomanometer and for measuring QoL using a modified DM QoL questionnaire with 30 items of questions [9] and other variables using a structured questionnaire.

Data collection was carried out using interview techniques directly in the respondent's house. Data collectors were carried out by trained researchers and enumerators after the perception was done between data collectors. Data analysis was performed by univariate, bivariate analysis with Chi-square and simple logistic regression and multivariate analysis using multiple logistic regression with significance level at 5%. Data processing was carried out with the help of Statistical Product and Service Solutions (SPSS) programs. This study has received Ethical Approval from the National Institute of Health Research and Development Commission for Health Research Ethics with Number LB.02.01/2/KE.224/2018.

## Results

This study was carried out among 144 DM patients who met the inclusion criteria during the period 2011–2017 in Bogor City, the description of the study subjects can be seen in Table 1.

Table 1 shows that of the 114 people who were research subjects, 2/3 had hypertension, most of them were adults (25–60 years old), female, had low education ( $\leq$ SMA) and 2/3 had DM (Table 1). Understanding of the QoL in this study is perception or subjective views of DM patients on perceived satisfaction, both to physical abilities (daily activities, rest and sleep), psychological (self-image of body image and appearance), social relationships (social support and sexual activity), and environment (health environment, opportunities for information and skills, recreation opportunities and free time). To determine the QoL of people with DM whether

**Table 1: Characteristic distribution of DM type 2 patients in Bogor city in 2018**

Variable	n	Percentage
Blood pressure		
Not hypertension	46	31.9
Hypertension	98	68.1
Age		
Adult age (25–60 years)	100	69.4
Elderly (> 60 years)	44	30.6
Sex		
Male	29	20.1
Female	115	79.9
Education		
$\geq$ High school (High)	54	37.5
$\leq$ High school (Low)	90	62.5
Occupation		
Working	49	34.0
Not working	95	66.0
Existence of Spouse		
Yes	112	77.8
No	32	22.2
Therapy		
Getting treatment	109	75.7
Not getting treatment	35	24.3
QoL		
Good	72	50.0
Not good	72	50.0
Total	144	100

QoL: Quality of life

good or not good is range of answer score question is 30–150, with using a median as a cut off 114.5 obtained 50% good and 50% not good.

The results of bivariate analysis showed that the variables that were significantly related ( $p < 0.05$ ) to the QoL of people with DM type 2 were blood pressure (OR = 0.35), education (OR = 3.42), and the presence of spouse (OR = 2.73) while other variables were not related statistically ( $p > 0.05$ ) (Table 2).

The results of the assessment of QoL showed, 58.2% of patients with DM who had hypertension, and 32.6% of those without hypertension had good QoL. Half of study subjects who were in the adult age category and 47% with female sex, had a good QoL. QoL based on education shows 68.5% with the category of higher education having a good QoL.

Assessment of QoL for occupational categories, 95 people with DM who working, 59.2% of them have a good QoL. There was spouse of 112 respondents, 55.4% of them with good QoL. We also found DM patients who received treatment, 53.2% of them had good QoL, and only 40% of people with DM who did not get treatment that had good QoL (Table 2).

In Table 3, we can see the effect of independent variables with non-adjusted and adjusted variables. In the full model the highest influence was education ( $p < 0.05$ , OR: 3.662) while the blood pressure is protective factor ( $p < 0.05$ , OR = 0.293).

The final model of multivariate analysis of QoL, logistic regression equation model was obtained to determine the factors that most influence QoL. From several stages that were passed in the backward model that issues one by one the variables that were considered less influential start from the smallest influence. From the final results of logistic regression, the variables with the highest influence on QoL were obtained from education (OR = 3.63, CI: 1.69–7.78)

**Table 2: Analysis of the relationship of blood pressure and confounding variables to the quality of life of patients with DM type 2 in Bogor city**

Variable	Quality of life				Total n = 144	p-value	OR (95%CI)	
	Good		Not Good					
	n = 72	%	n = 72	%				
Blood pressure								
Not hypertension	15	32.6	31	67.4	46	100	0.005	0.35 (0.18–0.73)
Hypertension	57	58.2	41	41.8	98	100		
Age								
Adult age (25–60 years)	52	52.0	48	48.0	100	100	0.470	1.3 (0.64–2.65)
Elderly (>60 years)	20	45.5	24	54.5	44	100		
Sex								
Male	18	62.1	11	37.9	29	100	0.149	1.85 (0.80–4.26)
Female	54	47.0	61	53.0	115	100		
Education								
≥High school (High)	37	68.5	17	31.5	54	100	0.001	3.42 (1.67–6.98)
≤High school (Low)	35	38.9	55	61.1	90	100		
Occupation								
Working	29	59.2	20	40.8	49	100	0.115	1.75 (0.87–3.52)
Not working	43	45.3	52	54.7	95	100		
Existence of spouse								
Yes	62	55.4	50	44.6	112	100	0.019	2.73 (1.18–6.29)
No	10	31.2	22	61.8	32	100		
Therapy								
Getting treatment	58	53.2	51	46.8	109	100	0.176	1.71 (0.79–3.70)
Not getting treatment	14	40.0	21	60.0	35	100		

**Table 3: Multivariate analysis of the relationship of blood pressure to the QoL of patients with DM type 2 in Bogor city in 2018**

Variable	Full model		Without age		Without sex		Without occupation		Without therapy	
	p	OR	p	OR	p	OR	p	OR	p	OR
Blood pressure	0.003	0.293	0.003	0.294	0.004	0.298	0.003	0.292	0.002	0.282
Age	0.875	0.935	-	-	-	-	-	-	-	-
Sex	0.747	0.842	0.770	0.86	-	-	-	-	-	-
Spouse	0.051	2.618	0.050	2.57	0.052	2.51	0.043	2.58	0.035	2.66
Education	0.001	3.662	0.001	3.62	0.001	3.58	0.001	3.73	0.001	3.63
Occupation	0.400	1.426	0.404	1.42	0.434	1.36	-	-	-	-
Therapy	0.292	1.612	0.292	1.61	0.302	1.59	0.319	1.56	-	-

and the blood pressure is protective factor (OR = 0.282, CI: 0.13–0.63) (Table 4).

**Table 4: Multivariate final model**

Variable	B	SE	Wald	P value	OR	95% CI
Blood pressure	-1.264	0.412	9.393	0.002	0.282	0.13–0.63
Existence of spouse	0.977	0.463	4.446	0.035	2.66	1.07–6.59
Education	1.289	0.390	10.937	0.001	3.63	1.69–7.78
Constant	-0.148	0.392	0.142	0.706	0.862	

## Discussion

The QoL of DM patients in this study has a balanced number between DM patients with good and poor QoL. Statistically, the variables of blood pressure, education and the existence of spouse have a significant relationship to the QoL.

The starting point for healthy living with DM is an early diagnosis, the longer a person lives with undiagnosed and untreated DM, the worse the health outcome. For those diagnosed with DM, a series of interventions can reduce the risk of bad DM, regardless of what type of DM they may have. These interventions include blood pressure control, blood glucose, through a combination of diet, physical activity and, if necessary treatment, to facilitate early treatment [1].

Our study shows that most people with DM have hypertension. The majority of DM patients are female. This is in line with several other studies that show that women suffer the most from DM [11], [12], [13], [14]. Most study subjects have low education and do not work. Our study also shows that generally people with DM have grown up and married. This result is in line with several other studies on DM [15], [16], [17]. People who know they are sick, most of them will surely seek treatment, this is precisely what causes most of the study respondents to get DM treatment [13], [18].

In general, the QoL of DM patients in our study is balanced, between the QoL of good and poor. Different results were reported in several other studies, where DM patients tend to have a poor QoL [16], [19]. This might occur because of differences in the study locus. The study we conducted is community-based, where our sample is not at a health facility to undergo treatment, in contrast to several studies that base study on patients who are undergoing DM care at health care facilities [17], [20].

In bivariate analysis, we found variables of blood pressure, education and the existence of spouse had a significant relationship to QoL while age, sex, occupation, and therapy variables were not statistically related, the results of other studies that assessed demographic variables on the QoL of DM patients also reported the same thing [15], [17], [21].

Hypertension occurs in more than two-thirds of patients with DM type 2 [22], [23]. Multivariate analysis of the effect of pressure on QoL, OR value of blood pressure did not decrease or increase by more than 10%, this indicates that the influence of blood pressure on QoL is relatively stable (Table 3). DM patients who do not suffer from hypertension are protective factors against poor QoL. This means that DM patients who do not suffer from hypertension will have a greater possibility of obtaining a good QoL. Other studies also show consistent results, where DM patients who have hypertension tend to have a poor QoL [23], [24].

Treating hypertension in diabetic patients can reduce mortality, stroke risk, and cardiovascular disease events [25], [26]. Treating hypertension provides a similar relative risk reduction in patients with or without DM, but carries a greater absolute risk in patients with DM due to a greater initial risk [25], [27]. A number of other studies also show a close relationship between DM and hypertension [28]. DM causes difficult hypertension to be treated, on the other hand, high blood pressure makes the impact of DM more dangerous. Patients with DM type 2 have a prevalence of high blood pressure compared to ordinary DM patients [28], [29]. Blood pressure control is one of the interventions that can reduce the risk of bad DM [30].

The results of our study show a strong relationship between education and the QoL of people with DM. The final model of multivariate analysis of QoL shows that the most influential variable in QoL is education. People with DM who have a low level of education tend to have a poor QoL. Education, in this case, is related to knowledge, patients who are highly educated can develop coping mechanisms and a good understanding of information. Other studies also show similar things where a good QoL in people with DM tends to be found in patients with higher levels of education [16], [21]. Education is an important factor in understanding disease, self-care, and controlling blood sugar, including controlling blood pressure. High levels of education were positively related to the QoL of people with DM [23], [31]. So that the education factor is one of the factors that can affect the QoL of a DM patient [14], [15], [32].

The existence of a spouse can have a positive impact on the treatment of DM, partner support with adherence in undergoing the treatment process in DM patients significantly improves the QoL for people with DM [17], [33]. Other study shows that DM patients who married tend to have a better QoL than not having a spouse [21], [32], [33]. The form of attention from a partner will improve the self-care of DM Type 2 patients who can reduce the risk of complications. Partner support such as reminding and monitoring food according to recommendations, helping in terms of treatment, and providing information is one of the things that affect the high QoL of patients with DM Type 2.

This study has limitations because this is a cross-sectional study, so it cannot determine causal relationships. Longitudinal studies are needed to assess the natural history of DM, disease complications, and QoL to draw strong conclusions about the causal pathways of this association.

The QoL of DM patients in this study was almost balanced between DM patients with good and bad QoL. Statistically, the variables of blood pressure, education, and the presence of a partner have a significant relationship with the QoL of DM patients.

## Author's Contribution

NS is main contributor. OSS, IYS, FDP, and ASH are member contributor. Conceptualization: NS. Data collection: NS, OSS, IYS. Formal analysis: NS, ASH. Methodology: NS, OSS, IYS. Writing-original draft: NS, ASH. Writing-review & editing: NS, OSS, IYS, FDP, ASH. All authors approved the final version of the manuscript.

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