The Body Mass Index, Blood Glucose Level and the Quality of Life of Diabetes Mellitus Type 2 Patients in Primary Health Care: Cross-Sectional Study

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ABSTRACT

Obesity is a risk factor for DM. Quality of life is one of the parameters for evaluating the current clinical output of diabetes mellitus patients. Research has been conducted to determine BMI's relationship with blood sugar levels and improve DM patients' quality of life in primary care. This cross-sectional study was conducted on 120 DM patients at J1PHC, Bantul. Inclusion criteria were: Adult patients, both men or women aged 18 years or older, diagnosed with DM who were treated at the J1PHC Bantul during the study period and were willing to participate in the study. Retrieval of primary data exposure to cigarette smoke and quality of life is done through interviews. Secondary demographic data, history of illness, diagnosis, laboratory data, and treatment history were taken from medical records. The Chi-square test was used to determine the relationship between BMI with the QALY of DM patients. The results showed that BMI, fasting blood sugar levels, and quality of life of DM patients in the community was categorized as very good. Normal BMI and fasting blood sugar usually have a higher chance of having a better quality of life. Based on this study's results, it can be concluded that the QALY of DM patients in J1PHC is excellent. Men, educated graduated from elementary school, healthy BMI, and normal fasting sugar levels are associated with improved QALY in DM patients in J1PHC.

Keywords: the quality of life, Diabetes mellitus, body mass index, Primary Health Care, Cross-sectional

1. BACKGROUND

Health-related quality of life (HRQL) is a concept often used as the basis for evaluating surveillance programs for the treatment of acute and chronic diseases, including diabetes mellitus (DM) [1][2]. Although measuring patients' quality of life is subjective, HRQL has been used to evaluate therapeutic management's cost-effectiveness [3]. Assessment of DM patients' quality of life in primary care in Indonesia is currently not a priority, even though the patient's quality of life data can be used to measure successful treatment and evaluation of DM patients' management at Primary health care[4]. In contrast to Indonesia, the QLY assessment as one of the outcome parameters for handling DM and as a basis for policymaking in primary care has been done in many Asian and Southeast Asian countries such as Malaysia and Singapore[5]. The patient's quality of life reflects the success of therapy and supports successful disease management[6]. The study of DM patients' quality of life in primary care is vital because DM is a chronic disease, with the incidence, prevalence, cost of care, and complications increasing from year to year with unsatisfactory life quality for patients [7].

The Integrated Health Center Disease Surveillance Report (IHCDSR) and the Yogyakarta Health Office-Hospital Information System (YHOHIS) report in 2014 show that DM is the 4th most common disease in DIY [8]. Of the five districts or cities in DIY, Bantul Regency has the highest DM prevalence. In Bantul Regency, type 2 diabetes mellitus is currently the 4th largest disease in the PHC, so that type 2 diabetes is one of the priorities of public health problems in the district. Bantul, including in Jetis 1 PHC (J1PHC) [9]. Akrom et al. reported that 44.4% of DM patients at risk of metabolic syndrome who underwent treatment at the J1PHC experienced hypercreatininemia [10]. In Southeast Asia, the prevalence of DM from 2000-2030 is estimated to increase to 161%. The number of

sufferers in 2030 expected to be 58.1 million people, where more than 25% have HRQALY less than the average [11]. In Indonesia, DM patients in 2000 as many as 8.4 million people and is estimated to reach 21.3 million people in 2030. Expecting 20% -30% of DM patients with uncontrolled blood sugar [12].

Type 2 diabetes mellitus has clinical, economic, socio-cultural and psychological impacts on patients and their families. This condition inhibits daily activities, thereby reducing the quality of life (QOL) of patients. [4][7][15]. Many measuring instruments have been developed to measure the quality of life. One method of measuring QOL is the SF-36 questionnaire. Factors that play a role in the failure to control blood glucose in DM patients are obesity (BMI), lifestyle changes, and noncompliance in drug-using [18].

Measurement of the quality of life score of diabetic patients uses the SF-36 instrument because the SF-36 is a generalized standardized questionnaire [16]. One example of the measurement results is a decrease in the quality of life score of diabetes patients associated with abnormal blood sugar levels [17].

The central obesity factor influences the risk of developing type 2 diabetes in the elderly [13]. Excessive fat deposits increase the risk of insulin resistance which results in an increase in blood sugar levels in patients with diabetes mellitus. The previous study showed a significant association between BMI and the occurrence of type 2 diabetes. High BMI had a two times greater risk of developing type 2 diabetes than low BMI [14]. Uncontrolled blood glucose levels lead to disease complications. Patients with type 2 diabetes experience a prevalence of diabetes complications of 63.1%, so that the quality of life decreases due to complex problems [8]. DM patients with obesity are thought to be more at risk of experiencing abnormal blood sugar conditions and experiencing a decreased quality of life [19][20]. Based on this background, this study's problem is How is the relationship between BMI with blood sugar level and the quality of life of type 2 DM patients in JIPHC Bantul.

2. METHOD

2.1. Research Design

The design was an analytic observational study with a cross-sectional design on DM patients treated at J1PHC Bantul, Yogyakarta. The research was conducted at the J1PHC in Bantul, Yogyakarta, during June and September 2018.

2.2. Subject and Research Materials

The study respondents were all affordable populations who met the inclusion and exclusion criteria as many as 120 people. The study population was type 2 diabetes mellitus in J1PHC Bantul Yogyakarta. The research subjects were type 2 diabetes patients who were treated at J1PHC Bantul,

Yogyakarta. All accessible populations will then be sorted to find research subjects who meet the inclusion and exclusion criteria. The inclusion criteria for these subjects were: (i) Adult patients, male and female, 18 years or older. (ii) Diabetic patients treated at J1PHC Bantul during the research period. (iii) Willing to follow the course of the research. The exclusion criteria for the subjects were: (i) DM patients with hearing loss, (ii) pregnant women, (iii) diabetic patients with kidney problems, and comorbidities (such as tuberculosis, HIV AIDS disease, coronary heart disease, heart failure, endocrine disorders. chronic musculoskeletal conditions, and mental illness).

The number of samples was determined using the Lemeshow formula. The standard deviation from type I error = 1.96, the standard deviation from type II error is 0.84, with a minimum odds ratio that is considered significant is 2.8 [21]. The proportion of exposure is0.5, and the dependent variable rate is 0.5. The number of samples involved was 120 patients.

The questionnaire instrument used in this study. Questionnaire for the characteristics of the subject so that the primary data of the patient are obtained in the form of demographic data, education, marital status, and occupation. In addition, the questionnaire also contains questions about smoking habits and exercise habits. The questionnaire for respondent characteristics can be seen in the attachment. (ii) Questionnaire SF36. The SF36 questionnaire is used to assess the quality of life of patients with type 2 diabetes. The Indonesian version of the SF-36 questionnaire has been validated. The SF-36 is an instrument that has been used in various countries. The questionnaire is used as the gold standard in assessing the quality of life. This instrument consists of 36 short questions, including physical aspects, emotional aspects, social aspects, physical health aspects, psychological health aspects, pain aspects, fatigue aspects, and general health aspects. The physical component consists of bodily function, physical role, pain, and general health, while the mental part consists of the role of emotion, vitality, social function, and mental health. This questionnaire contains 36 questions where the assessment is carried out in 3 stages, namely scoring, the average of each domain, and grouping components based on domains. The mean score range is 0-100, with a normative average score of 5060. The SF-36 questionnaire has been tested for validation and reliability testing. The validation and reliability test results show that the SF-36 questionnaire is valid and reliable so that it can be used to measure the quality of life. The Indonesian version of the SF-36 questionnaire on hypertension patients in Yogyakarta have been tested, with the results of the test is valid and reliable [22][23]. The method of scoring the quality of life can be done by calculating the first step to find the numerical value obtained from the answer key to the questionnaire by defining it into levels 0-100 in each answer, called the score. The second step is to calculate the average rating of each group from 8 domain scales. (iii)

Forms are used to collect medical record data or update patient status

2.3. Types and Sources of Data

The types of data in this study are primary and secondary data. Primary data were obtained through interviews using structured and observational questionnaires or laboratory examinations, while secondary data were taken from medical records. Primary data includes life habits (sports or physical activity, adherence to taking medication, quality of life, type of work, educational history, marital status). Another primary data is blood sugar levels obtained through laboratory examinations. Secondary data includes a diagnosis of DM in medical records, a history of illness, a history of treatment in the last three months, and clinical manifestations.

2.4. Research variable And Data Collection

The independent variables in this study are BMI and demographic characteristics. The dependent variables are blood sugar levels and the quality of life of type 2 DM patients.

The research procedure is divided into three stages, namely: (i) The preparation stage. The first activity carried out is arranging permits at the Bantul regional development planning agency (BAPPEDA), after which it collects secondary data. Actions to manage secondary data include an overview of the health center, visit numbers, diabetes incidence rates from medical records and other sources, protocols on how to fill out questionnaires, data collection forms, and supporting infrastructure.

The preliminary test was conducted for data collectors, using questionnaires and data collection forms prepared. (ii) The Implementation stage: Subject recruitment data were taken for positive patients diagnosed with diabetes by doctors at the J1PHC in Bantul, Yogyakarta, which was included in the inclusion criteria. Prospective subjects who matched the inclusion criteria have then explained the aims and benefits of the study. Patients who agreed to be subjected were asked to provide a sign of patient consent to participate in surveys in which the patient signed the informed consent sheet. Patients who have signed informed consent are then subjected to interviews with patients. Simultaneously, researchers fill out data recording sheets, health assessment sheets (patient demographic data), and data collection forms containing diagnosis, laboratory results, blood pressure measured by a doctor, and listed drugs in the recipe. Furthermore, interviews were conducted for physical activity, lifestyle, medical history, pain perceptions, and quality of life questionnaires. (iii) The final stage. Data processing, report preparation, and results dissemination.

2.5. Data Analysis

Data were analyzed statistically using software, the free version of the statistic computer. Univariate analysis was used to describe the frequency distribution (proportion) of patient characteristics based on demographics. We used the Chi-Square test to determine the relationship between BMI with the status of blood sugar levels and the patient's quality of life status.

2.6. Research Ethical Implications

Ethics submissions are made by researchers before researchers conduct research to obtain ethical approval. Researchers pay attention to the principles applied in research during the course of the research: (i) Beneficence, the analysis that will be carried out by the researcher does not have the risk of detrimental to the research subject (ii) Respect for human dignity, including the right to voluntarily participate in research after receiving a complete explanation beforehand, the subject has the right to cancel research participation without prejudice to any rights of the subject.

3. RESULTS AND DISCUSSION

3.1. Characteristics of Respondents

There were 120 diabetes patients at primary health care Jetis 1 Bantul who were involved in the study. The features of the test subjects are presented in Tables 1 and 2. From the data in Table 1, it can be seen that most of the Respondents were women, over 45 years old, and primary education. Most of the respondents use BPJS, follow a carbohydrate diet, and avoid cigarette smoke exposure but are not regularly exercise.

Table 1. Demographic characteristics, lifestyle, and quality of life of DM patients at J1PHC, Yogyakarta

Characteristics		Frequency (%)
Sex	Male	49 (32%)
Marital status	Marriage	153(100%)
Age group	≤45 year	12(7.85%)
	46-64 year	112(73.20%)
	≥65 year	29(18.95%)
Education	Elementary school	90(58.8)
	Yunior height school	21(13.7%)
	Senior height school	25 (16.3%)
	University	17(11.1%)
Job	government employees	22 (14.4%)
	entrepreneur	29(18.9

		5%)
	Farmer - laborer	33 (21.56%)
	No job	69 (45.09%)
Health assurance	BPJS	124(81%)
Exercise habit	Yes	61(39.9)
Smoking exposure	Yes	26 (17%)
Diet calorie	Yes	131(85.6)
Qaly	Pretty good	8(5.23%)
	Good	64(41.83%)
	Very good	81(52.94%)

The clinical characteristics of DM patients at Jetis I Bantul are presented in Table 2; table 2 shows that comorbidities accompany most DM patients (59.48%) in PHC. Hypertension was the most common comorbid disease, namely in 57 patients (29.2%), followed by hypertension & dyslipidemic in 18 patients (9.2%).

3.2. Clinical Characteristics

An overview of the clinical conditions of DM patients at J1PHC Bantul is presented in Table 2. From Table 2, it is known that the mean age of the patients was 57.39 years. The mean levels of random blood glucose are 261.70 ± 121.15 mg/dL, and for fasting blood glucose levels is 167.43 ± 10.23 mg/dl. Other clinical parameters were within normal limits. The adherence score is 22.44 ± 2.99, according to the compliance criteria. The mean score of quality of life of patients = 73.81 ± 12.40 corresponds to the category of good quality of life (score range 51-75). The mean score of patients' perceptions of DM showed a good fit because it was lower than 40.

Table 2. Description of clinical conditions of DM patients at J1PHC

Clinical Characteristic	Mean±SD	Minimum-maximum
Age (year)	57.39±8.27	34-83
Body weight (kg)	56.60±12.10	35-90
Body height (cm)	154.62±15.83	140-180
Body mass index	22.90±2.00	15-33
Systolic blood pressure	139.64±20.52	106.00-199.00
Diastolic blood pressure	80.69±11.28	50.00-124.00
Fasting blood glucose (mg/dl)	167.43±10.23	40-330
Random blood glucose (mg/dl)	261.70±121.15*	82-637
Complaint /adherence score	22.44±2.99	0-25
QALY score	73.81±12.40	0-100

A. . Bivariate Analysis of Factors Associated with the quality of life of type 2 DM patients in J1PHC Bantul

The analysis of the relationship between demographic factors, clinical outcomes, number of anti-DM drugs & comorbidities, level of adherence, physical activity, and perceptions of disease with patient quality of life are presented in Table 3.

Table 3. Factors related to the quality of life of DM patients at J1PHC Bantul, DIY

Parameter	QALY Status		OR (CI95%;p)
	Very good	Moderat	
Age ≤ 60 year	58(71.6)/23(28.4)	44(61.1)/28(38.9)	1.61(0.82-3.16;0.17)
Sex:Male	32(39.5)/49(60.5)	17(23.6)/55(76.4)	2.11 (1.10-4.27;0.04)*
Education >elementary school	40(49.4)/41(50.6)	23(31.9)/49(68.1)	2.10(1.08-4.02;0.03)*
Government employee	37(45.7)/44(54.3)	22(30.6)/50(69.4)	1.91(1.02 – 3.72;0.04)*
Exercise 60 menut/week	39(48.1)/42(51.9)	27(37.5)/45(62.5)	1.55(0.81-2.95;0.184)
No smoker	68(84)/13(16)	59(81.9)/13(18.1)	1.20 (0.50 – 2.61; 0.74)
BMI≤25	61(80.3)/15(19.7)	45(65.2)/24(34.8)	2.17 (1.02-4.60;0.04)*
Fasting blood glucose normal	73 (90.1)/8 (9.9)	49 (68.1)/23 (31.9)	4.28 (1.77-10.35; 0.001)*
Random blood glucose normal	34(42)/47(58)	26(36.1)/46(63.9)	1.28(0.67-2.46;0.46)
Systolic blood pressure	45(55.6)/36(44.4)	36(50)/36(50)	1.25(0.66-2.36;0.49)
Diastolic blood pressure	68(84)/13(16)	60(83.3)/12(16.7)	1.05(044-2.47;0.92)

From Table 3, it can be identified factors that are associated with an excellent quality of life in DM patients at the J1PHC. Male, having a higher education than elementary school and working status increases the chances of having an excellent quality of life in respondents (p <0.05). Biological factors, namely body mass index <or equal to 25, were associated with an excellent quality of life with OR = 2.17 (CI: 1.02 -4.60; p: 0.04). The fasting blood sugar levels are associated with respondents' excellent quality of life with ORs 4.28 (95% CI: 1.77-10.35; p = 0.001).

3.3. Discussion

Based on the research results in Tables 1, 2, and 3, it is known that the quality of life of DM patients at J1PHC, Bantul DIY is in a proper category. This study's results differ from previous studies' results, which show that the quality of life of DM patients is lower. Quality of life is the achievement of an ideal human being or as desired [8]. The HRQOL definition contains several domains and develops according to needs. Generally, in the interpretation of HRQOL, it comprises six domains, namely physical health, psychological condition, level of independence, social relations, a description of the environment and function, or spiritual atmosphere. Still, some of the latest HRQOL definitions contain a more significant number of domains [17]. Based on the results of univariate analysis, it is known that most of the levels of Patient adherence to anti-DM drug therapy are very adherence [24].

About 17% of respondents active smokers and more than 50% of respondents already have comorbidities. The bivariate analysis results showed no difference in smokers' quality of life and non-smokers in DM patients. This study's results differ from the effects of previous studies, which show that cigarette exposure is associated with decreased quality of life. Based on the results, it is known that there are several comorbidities in type 2 DM patients at J1PHC, Bantul. Hypertension is the most comorbid disease, followed by hypertension with dyslipidemia. The absence of comorbidities had the potential to improve the quality of life of DM patients at J1PHC, although it was not statistically significant. The results of this study are following the results of previous studies. Secondhand smoke exposure and the presence of morbidity are associated with decreased quality of life[25].

Male, more than elementary school education, civil servant-private employment status, non-obese, and regular blood sugar is associated with good quality of life. The results of this study are consistent with the previous research [18][26]. Some researchers have shown that. Male patients and regular blood sugar status have a higher quality of life [27] [28]. Obesity with

Diabetes mellitus is associated with the risk of cardiovascular events and CKD [25][29][30].

4. CONCLUSION

The quality of life of DM patients at J1PHC is in the proper category. Male DM patients, graduated from elementary school, normal blood sugar status, and non-obese BMI has a better quality of life in DM patients at J1PHC. Non-obese BMI status and regular blood sugar status were associated with excellent quality of life of DM Patients in J1PHC.

AUTHORS' CONTRIBUTIONS

RTM was involved in designing and collecting data, YSW was engaged in composing research designs, collecting data, and writing publication drafts. MM was involved in data analysis and drafting; AA, TH, and S contributed equally to the research design, the implementation of data collection, data processing, and analysis, writing draft publications, and proofreading.

ACKNOWLEDGMENTS

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