Community Development and Self-Empowerment Strategies to Improve Quality of life of Diabetes mellitus type 2 Patients

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Abstract. Diabetes mellitus is a major public health problem that affects the quality of life of people all over the globe and is a big contributor to the global health crisis. With the help of the construction of community development and self-empowerment initiatives, the objective of this project was to bring about an improvement in the quality of life for those who are diagnosed with type 2 diabetes. The use of proportionate random sampling resulted in the selection of a total of 269 respondents from the total population of 57,025 individuals in the city of Bekasi. An technique that was quantitative and cross-sectional was used for the study methodology.Both self-empowerment and community development have a significant effect on quality of life, according to the results, which demonstrated that age and community development are two factors that have a significant impact on the degree to which individuals feel empowered. Age did not have a direct influence on the quality of life; however, it did have an indirect influence via the growth of self-empowerment. In addition to having direct benefits, the process of community development also offers indirect benefits that are helpful to the community.These results highlight the need of supporting community empowerment efforts that are geared to the unique requirements of persons of diverse ages in order to enhance the health of people who have type 2 diabetes to a greater extent.

Keywords: quality of life, empowerment, community, and age.

1 Introduction

High blood glucose levels, or hyperglycemia, are a hallmark of diabetes mellitus (DM). Diabetes mellitus is a series of metabolic diseases caused by impaired insulin action or secretion, or both[1]. More than 537 million persons worldwide have diabetes mellitus (DM), according to a 2021 estimate from the International Diabetes Federation (IDF). By 2045, that figure is predicted to rise to 783 million[2].

The prevalence of diabetes mellitus (DM) in Indonesia is on the rise, with the Ministry of Health of the Republic of Indonesia reporting a 6.9% prevalence of DM (age > 15 years) in 2013. Of the 190 million people in the country who are over 15, about 13 million suffer from DM[3]. In 2018, the prevalence of DM among those over 15 years was as high as 8.5%. About

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17 million people suffer from diabetes mellitus (DM) out of an estimated 200 million people over the age of 15[4]. According to the Ministry of Health's Health Research and Development Agency, the prevalence of DM in SKI 2023 was 11.7% among those over the age of 15 based on blood sugar level testing. With an anticipated 210 million persons over the age of 15, there are around 24.5 million people who could develop diabetes mellitus (DM)[5].

Bekasi City has the fifth-highest prevalence of diabetes mellitus (DM) among the regencies and cities in the West Java province, after Cirebon (2.71%), Depok City (2.17%), Semedang (1.77%), Cimahi (1.73%), and Bekasi City (1.71%), according to the 2018 Basic Health Research (Riskesdas)[4]. The prevalence of type 2 diabetes was 42,517 (1.41%) in 2019 and 57,029 (1.84%) in 2020, according to the Bekasi City Health Office's health profile[6].

If not treated promptly and appropriately, Type 2 DM can lead to chronic complications for sufferers, including:

1. The quality of life of people with Type 2 DM can be significantly reduced by cardiovascular disorders such as heart disease and stroke, neuropathy, retinopathy, and nephropathy.
2. Severe complications cause sufferers to lose physical capacity and mobility, making them dependent on others for daily activities.
3. Complications also cause psychosocial disorders, including anxiety, depression, and stress related to managing a chronic disease, as well as fear of premature death.
4. The economic burden of treatment and care for complications exacerbates stress and reduces the social well-being of sufferers and their families.
5. Overall, complications of DM cause a significant decline in quality of life scores for sufferers, both physically, mentally, and socially[7].

The appropriate solution concept for addressing the impact of type 2 diabetes on the quality of life of patients is a form of activity that combines medical services with a self-help approach for patients with type 2 diabetes through community development and self-empowerment strategies.

This is an appropriate approach to addressing the problems of type 2 diabetes, enabling patients to become partners in healing and resolving the problems and risks of diabetes, thereby maintaining their quality of life[8].

This research is expected to ultimately produce a perspective model on self-empowerment for the quality of life of individuals with type 2 diabetes, along with its tools. It can serve as a guide for initiatives to improve community development plans, health promotion, and self-empowerment to improve the quality of life of individuals with type 2 diabetes.

This research can also provide information to the public and primary care physicians so they can identify signs of self-empowerment and improve the quality of life of individuals with type 2 diabetes.

The main problem in this study is the high rate of type 2 diabetes in Bekasi City, which is accompanied by a lack of community development initiatives, health promotion, and self-empowerment to improve the poor quality of life.

2 Methods

2.1 Research methods

This study was conducted in Bekasi City for the following reasons: (1) Bekasi City is adjacent to DKI Jakarta Province, which ranks first in DM prevalence at 3.4%. (2) In Bekasi City, the number of type 2 DM cases has increased significantly, but community development initiatives, health promotion campaigns, and self-empowerment programs to improve the

quality of life of sufferers are still inadequate. (3) Bekasi City residents have similar typologies and lifestyles to DKI Jakarta residents, which may result in an increase in type 2 DM cases in Bekasi City. This study was conducted from December 2023 to June 2024.

This study used a quantitative research methodology with a cross-sectional study design. The instrument used to measure self-empowerment strategy variables was the Diabetes Empowerment Scale-Short Form (DES-SF), while the Diabetes Quality of Life (DQOL) instrument was used to measure the quality of life variables for type 2 DM sufferers. The validity and reliability test of the instrument was conducted in Cipayung sub-district, East Jakarta with 30 respondents with a validity test with an r value ≤ 0.03 and an Alpha Cronbach value ≥ 0.60.

2.2 The Sample and Population.

The 57,029 people over 26 who resided in Bekasi City and were spread over 11 subdistricts made up the study's population. Using the Isaac and Michael formula[9], the sample size was calculated as follows.

:

$$s = \frac{\lambda 2 \, .NPQ}{d2 \, (N-1) + \lambda 2 \, .PQ}$$

$$s = \frac{1.6432 \times 57029 \times 0.5 \times 0.5}{0.052 \times (57029-1) + 1.6432 \times 0.5 \times 0.5}$$

$$s = 268.67 \text{ rounded to } 269 \text{ respondents}$$

2.3 Sampling Techniques

In order to obtain a representative sample, the sampling strategy used in this study was proportional random sampling, which means that the number of subjects selected from each region or stratum was balanced or proportionate to the number of subjects from each region or stratum[10]. Data processing is carried out in the following stages: 1) Editing: At this stage, a re-examination of the data obtained through filling out the questionnaire using a questionnaire; 2) Coding: At this stage, a code is given to each answer in the form of a number, value, or number; 3) Scoring: To facilitate data analysis, the data that has been given a code is assessed by scoring the value that has been determined for each code; 4) Entry: Data that has been given a score/value is then entered into computer software using a computerized application program to calculate the distribution and analyze the data; 5) Cleaning: This is an activity of re-checking the data that has been entered whether there is an error or not.

2.4 Data analysis

In order to assess the direct and indirect influence between variables in the research model, a path analysis approach was used for quantitative data analysis in this study. The following are the steps: 1) The study instrument's validity and reliability tests; 2) The stages of the classical assumption test are as follows: (3) Path Analysis Model Test; 4) Hypothesis Stages and Conclusion Formation; (a) Normality Test using the Kolmogorov-Smirnov (KS) Test, Multicollinearity Test, Heteroscedasticity Test, and Autocorrelation Test

3 Results and Discussions

3.1 Research variable descriptive statistics.

Every independent, dependent, and intervening variable (if any) was subjected to the analysis.

Table 1. Descriptive Statistics of Research Variables

No	Variables	n	Min	Max	Mean	SD
1	Age (X1)	269	25	82	55.05	9,813
2	Community development strategy (X2)	269	1	18	9.16	4,135
3	Self-Empowerment (Y)	269	0	24	15.46	6,008
4	Quality of Life (Z)	269	21	69	48.82	7,238

Table 1 shows the Age variable (X1) has a sample size of 269 respondents, with the youngest age being 26 years and the most being 82 years with a mean age of 55 years and a standard deviation of 9.813 indicating a fairly high variation in the age characteristics of type 2 DM sufferers, such as the age of type 2 DM sufferers who are mostly in the elderly age group which is the most vulnerable population to type 2 diabetes. This is in accordance with the findings of the American Diabetes Association [11] which states that the prevalence of type 2 diabetes increases significantly with age. In addition, the World Health Organization[1] also emphasized that age is one of the main determinants in the development and complications of type 2 diabetes which ultimately impacts the quality of life of sufferers.

The community development strategy variable (X2) had a mean of 9.16 and a standard deviation of 4.135, with a minimum value of 1 and a maximum value of 18. This suggests that the distribution of community-level solutions among individuals with type 2 diabetes is moderate and varied. This is consistent with [12] community empowerment thesis, which holds that controlling chronic illnesses like diabetes requires active community participation in health initiatives. Effective community-based approaches can improve people's freedom in managing their diseases, social support, and information availability[13].

The self-empowerment variable (Y), the first endogenous variable, has a standard deviation of 6.008, an average value of 15.46, and a minimum value of 0 to a maximum of 24. This indicates that type 2 DM patients generally have a moderate to high degree of self-empowerment, however there is a wide range of values among them. This results is consistent with [14] self-efficacy hypothesis, which holds that a person's healthy behavior and self-care decision-making can be enhanced by their increased belief in their capacity to handle health issues.

The primary output variable in this study, the quality of life variable (Z), has a minimum value of 21 and a maximum value of 69. Its average value is 48.82, with a standard deviation of 7.238. This suggests that, on the whole, respondents with type 2 diabetes mellitus have a reasonably decent quality of life, despite the fact that there are notable variations in the conditions across individuals with the disease. This result is consistent with study by [15], which found that comorbidities, age, social support, and the capacity to manage the disease on one's own all had a significant impact on the quality of life for people with type 2 diabetes mellitus. The sufferer's quality of life improves with increasing levels of empowerment and community support.

3.2 Model Testing Results

Assumption tests make ensuring that the data satisfies the fundamental specifications of a linear regression model, allowing for the reliable and legitimate interpretation of the analysis's findings. Normality, heteroscedasticity, multicollinearity, and autocorrelation (if the data is time series) are all covered by these tests.

If the significance value (Sig.) is greater than 0.05, the residual is normally distributed; if it is less than 0.05, the data is not normal. The Kolmogorov-Smirnov test is used for the normality test when the sample size is greater than 50 with decision criteria.

Table 2. Results of the Kolmogorov-Smirnov Normality Test

No	Variables	Sig	Results
1	Age	0.322	Normal
2	Community development strategy	0.06	Normal
3	Quality of Life	0.393	Normal

Table 2 indicates that the data are normally distributed since the p-value of the Kolmogorov-Smirnov test for quality of life, community development tactics, and age variables is >0.05. In the meantime, the self-empowerment variable is not normally distributed, according to the Kolmogorov-Smirnov test (p-value <0.05). The findings of a Skewness/SE normalcy test were then as follows.

Table 3. Results of the Skewness/SE Normality Test

No	Variables	Skewness	SE	Information
1	Self-empowerment	-0.267	0.149	-1.79837607

Based on table 3. above, the results of the skewness/SE normality test can be explained as follows: The Self-Empowerment variable has a Skewness/SE of -1.80 which is still within the tolerance range of -2 to +2. So it is normally distributed.

3.3 Multicollinearity Test

Multicollinearity test to see whether or not there is a high correlation between independent variables in a multiple linear regression model. If there is a high correlation between the independent variables, then the relationship between the independent variables and the dependent variable will be disturbed. Multicollinearity can be seen from the tolerance value and Variance Inflation Factor (VIF). If VIF > 10, then there is a multicollinearity problem between the independent variables and vice versa if VIF < 10, then there is no multicollinearity problem between the independent variables [9].

Table 4. Multicollinearity Test

No	Variables	VIF	Information
1	Age	1,041	No multicollinearity occurs
2	Community Development Strategy	2,486	No multicollinearity occurs
3	Self-Empowerment	1,478	No multicollinearity occurs

Based on Table 4, all independent variables have VIF values below 10, ranging from 1,041 to 2,486. This indicates that there are no symptoms of multicollinearity among the variables in

the regression model used. Thus, the classical assumption of the absence of multicollinearity has been met, and the regression model can proceed to the next stage of analysis.

3.4 Heteroscedasticity Test

To ascertain whether the variance of the residuals varies unequally from one observation to the next, the heteroscedasticity test is employed. A regression model that satisfies the criteria is one in which the residuals' variance, or homoscedasticity, is constant across observations. Heteroscedasticity happens when variance differs[16]. Regression methods that do not suffer from heteroscedasticity are considered good. The Spearman test is the statistical method employed in this investigation. A significance threshold of 0.05 is used in the test. Heteroscedasticity is absent if the Prob value is greater than 0.05, and present if the Prob value is less than 0.05.

Table 5. Heteroscedasticity Test

No	Variables	Sig.	Information
1	Age	0.283	There is no heteroscedasticity
2	Community Development Strategy	0.363	There is no heteroscedasticity
3	Self-Empowerment	0.18	There is no heteroscedasticity

Based on the Spearman test results shown in Table 5, all variables have significance values above 0.05. This indicates that there is no indication of heteroscedasticity in the regression model. Thus, the classical assumption of error variance stability (homoscedasticity) has been met.

3.5 Findings from the Path Analysis

Path analysis to ascertain how age (X1) and community development tactics (X2) affect type 2 DM patients' quality of life (Z) through self-empowerment (Y).

1. The Conceptual Path Model

The path model in the study's findings can be explained as follows in figure 1:

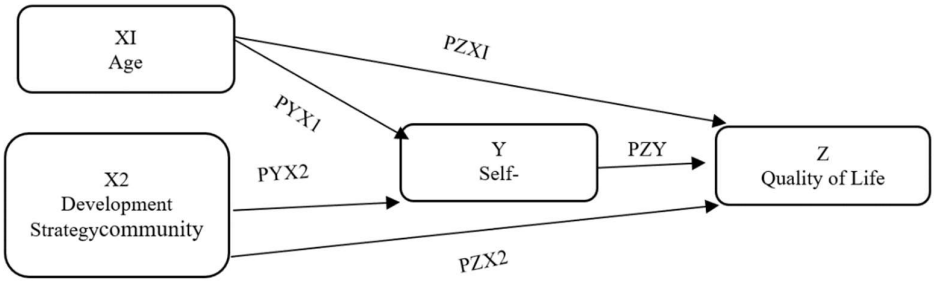

Fig. 1. Path Model

Information :

a) Direct influence: X1 to Y, X2 to Y, X1 to Z, X2 to Z, and Y to Z
b) Indirect influence: X1 through Y to Z, X2 through Y to Z

2. Path Coefficient Estimation.

The path coefficient is a standardized regression coefficient obtained from the path model. This coefficient value is used to see the direct and indirect relationships between the independent and dependent variables depicted in the path diagram[17].

Table 6. Path Coefficients of Model I

No	Variables	Beta (Standardize Coefficients)	p-value
1	Age	-0.136	0.008
2	Community Development Strategy	0.375	<0.001

Using model I's route coefficient from table 6: It is evident from the regression output of model I in the coefficients table section that the Self-Empowerment variable (Y) is significantly impacted by the significance values of the Community Development Strategy variable (X2) and the age variables (X1). The Model Summary table's R2 or R square value is 0.323, indicating that age variables (X1) and community development strategy (X2) have a 32.3% influence on self-empowerment (Y), with other variables not included in the study accounting for the remaining 67.7%. A path diagram of the structural model I is shown on figure 2 below.

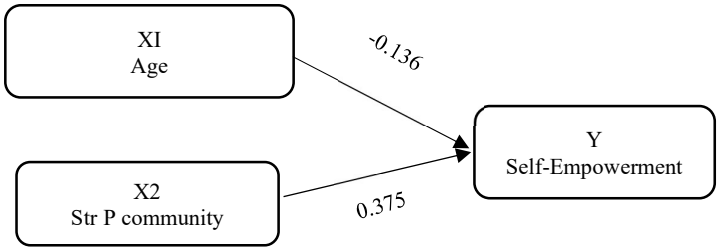

Fig.2. Structural Model Path I

3. Direct and Indirect Influence

Table 8. Path Coefficients of Model II

No	Variables	Beta (Standardize Coefficients)	p-value
1	Age	-0.037	0.529
2	Community Development Strategy	0.194	0.036
3	Self-Empowerment	0.245	0.001

Using Model II Path Coefficients from table 8: The significance value of the three variables: age (X1) = 0.529, community development strategy (X2) = 0.036, and self-empowerment (Y) = 0.001—is known based on the results of Regression Model II in the Coefficients table. According to the findings of this regression model II, Quality of Life (Z) is not significantly impacted by the age variable (X1). Nonetheless, Quality of Life (Z) is significantly impacted by the factors Community Development Strategy (X2) and Self-Empowerment (Y). In the Model Summary table, the R2 or R Square value is 0.107. This indicates that self-empowerment (Y), community development strategy (X2), and age characteristics (X1) contribute 10.7% to quality of life (Z), with other variables not included in the study accounting for the other 89.3%. Consequently, it is shown as follows in the structural model II's path diagram on figure 3.

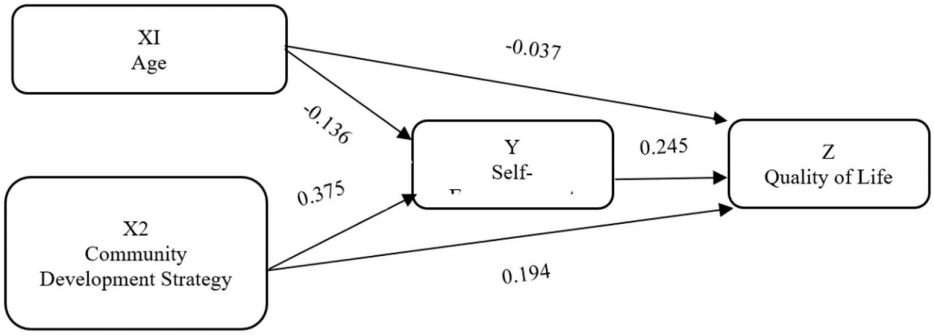

Fig. 3. Structural Model Path II

3.6 Stages of Hypothesis and Conclusion Formation

1. The analysis found a significance value for age (X1) (p 0.008 < 0.05). Therefore, it can be said that self-empowerment (Y) is directly and significantly influenced by the age variable X1.
   These results are consistent with[18] Health Belief Model, which holds that personal background characteristics, such as age determinants, have a significant impact on health attitudes and actions. Age, education, and career can all affect how well someone understands their illness and how well they manage it on their own. These results are corroborated by research conducted in Indonesia[19], which demonstrates that younger age and greater education levels are favorably correlated with self-empowerment levels in diabetics.
2. The analysis's findings showed that the community development approach variable (X2) had a significance value of 0.001 < 0.05. Therefore, it can be said that the Community Development Strategy variable (X2) has a direct and significant impact on Self-Empowerment (Y).
   These findings are consistent with the concept of community empowerment proposed by other study[12], which emphasizes the importance of the social environment in shaping individual beliefs and abilities. Furthermore, a community-based approach is highly effective in building self-confidence in people with chronic illnesses[20].
3. The study results revealed a significant value of the age variable (X1) of 0.529 > 0.05. Thus, it can be said that quality of life (Z) is not directly and significantly impacted by the age (X1).
   Social Cognitive Theory, which emphasizes that personal factors do not directly influence outcomes, but rather through behavioral mechanisms such as self-empowerment[21]. This means that while demographic factors are important, their impact on quality of life is more pronounced when individuals have control and ability to manage their illness.
4. The research revealed that the community development strategy (X2) had a significant value of 0.036 < 0.05. Thus, it can be said that quality of life (Z) is directly and significantly impacted by community development plan (X2).
   Other research[22] shows that community support in the form of education and mentoring influences clinical and psychosocial outcomes for people with diabetes, including adherence and mental health. This is further supported by ecological model theory, which states that the social environment is a crucial determinant of health outcomes[23].

5. The self-empowerment variable (Y) has a significant value of 0.001 < 0.05 according to the analysis results. Thus, it can be said that quality of life (Z) is directly and significantly impacted by the self-empowerment characteristic (Y).
   This finding is in line with a study[24] showed that self-management and empowerment are positively correlated with the quality of life of type 2 DM sufferers.
6. Examining how age factors (X1) affect quality of life (Z) through self-empowerment factors (Y): it is known that age factors (X1) have a -0.037 direct impact on quality of life (Z). By multiplying the beta value of age variables (X1) on self-empowerment (Y) by the beta value of self-empowerment (Y) on quality of life (Z), we can determine the indirect influence of age variables (X1) on quality of life (Z) through self-empowerment variables (Y), which is -0.136 x 0.245 = -0.03332. Thus, the sum of the direct and indirect effects of age factors (X1) on quality of life (Z) is -0.037 + (-0.03332) = -0.07032. The indirect influence value is bigger than the direct influence value, as indicated by the preceding computation results, which show that the direct influence value is -0.037 and the indirect influence value is -0.03332. These findings suggest that the quality of life (Z) is influenced indirectly by the age variable (X1).
   The study's findings are consistent with Social Cognitive Theory[21], which holds that behavioral elements like self-efficacy or self-empowerment mitigate the impact of individual traits on outcomes (like quality of life) rather than always being direct. Additionally, age traits are risk variables that affect health behavior through specific processes, such as self-empowerment, according to Anderson's Behavioral Model of Health Services Use[20].
   The study's findings are consistent with research before[24], which found that age have no direct impact on the quality of life of people with diabetes mellitus other than through effective self-management, and who found that self-empowerment is a significant mediator between age, education, and quality of life in people with chronic illnesses[25].
7. Examination of how the Community Development Strategy variable (X2) affects the quality of life (Z) through self-empowerment (Y): it is known that the Community Development Strategy variable (X2) has a direct impact of 0.194 on the quality of life (Z). When the beta value of the Community Development Strategy variable (X2) on self-empowerment (Y) is multiplied by the beta value of self-empowerment (Y) on the quality of life (Z), the result is 0.375 x 0.245 = 0.091875, which represents the indirect influence of the Community Development Strategy variable (X2) on self-empowerment (Y) on the quality of life (Z).
   Then, the sum of the direct and indirect effects of the Community Development Strategy variable (X2) on the quality of life (Z) is 0.194 + 0.091875 = 0.285875. The direct influence value is bigger than the indirect influence value, as indicated by the above computation results, which show that the direct influence value is 0.194 and the indirect influence value is 0.091875. These findings suggest that the quality of life (Z) is directly impacted by the community development variable (X2).
   The study's findings are consistent with Community Empowerment Model[12], which highlights the value of social capacity building and community involvement in enhancing health outcomes, including quality of life. Participation and decision-making rise when communities are empowered through community activities, which enhances personal empowerment and quality of life. Behavioral modifications and better self-management are two ways that community development initiatives affect quality of life[26]. Additionally, older individuals with chronic illnesses benefit from community empowerment in terms of their health and well-being[27].

Overall, it can be said that the relationship between age factors and community strategies and the quality of life of individuals with type 2 diabetes mellitus is significantly mediated by self-empowerment. In order to improve the quality of life for individuals with type 2 diabetes mellitus, treatments that emphasize empowering individuals and bolstering community measures are crucial.

4 Conclusion

The study found that age significantly influences self-empowerment, but does not directly affect quality of life. However, age impacts quality of life indirectly through self-empowerment. A strong link exists between community development strategies and both self-empowerment and quality of life, showing that such strategies can directly and indirectly improve well-being. Self-empowerment plays a key mediating role, significantly enhancing individuals' quality of life. Overall, community strategies are most effective when they empower individuals, leading to better life outcomes.

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