Diabetes Mellitus Knowledge Among Communities in Pontianak City: A Cross-Sectional Study in Primary Care

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KEYWORDS	ABSTRACT
Diabetes mellitus, knowledge, public health, primary healthcare, Indonesia.	Diabetes mellitus (DM) is a growing public health concern in Indonesia, with increasing prevalence and significant complications. Public knowledge about diabetes is crucial for early detection, prevention, and management. This study aimed to assess diabetes knowledge among communities in Pontianak City using a cross-sectional approach. A total of 422 participants were selected from six primary healthcare centers (Puskesmas) through stratified random sampling. Data were collected using a validated questionnaire assessing demographic characteristics and diabetes knowledge. Statistical analyses included ANOVA, Chi-square, and regression models to determine the factors associated with knowledge scores. The mean diabetes knowledge score was 68.4% (SD = 14.7), with significant variations among Puskesmas (p = 0.03). Post hoc analysis showed that respondents from Puskesmas Alianyang had significantly higher knowledge scores than those from Puskesmas Saigon and Gang Sehat. Education level was significantly associated with diabetes knowledge (p < 0.001). Regression analysis identified age and education level as significant predictors of knowledge scores (p < 0.05), with younger and more educated participants demonstrating better awareness. Diabetes knowledge among Pontianak communities is moderate, with disparities across different healthcare centers. Higher education and younger age were associated with better knowledge. Targeted educational interventions, particularly for older and less-educated populations, are essential to enhance diabetes awareness and management. Strengthening community-based health education programs in Puskesmas can help bridge knowledge gaps and improve diabetes prevention efforts.

1. INTRODUCTION

Diabetes mellitus (DM) is a major global health challenge, affecting millions of people worldwide and contributing to significant morbidity and mortality. The prevalence of diabetes has increased dramatically, particularly in low- and middle-income countries, where awareness and management strategies remain inadequate . Public knowledge and awareness of diabetes play a crucial role in early detection, prevention, and effective disease management.

However, knowledge gaps persist in various communities, particularly in developing regions such as Indonesia.

Indonesia ranks among the top countries with the highest number of diabetes cases, with an estimated 19.5 million adults living with diabetes as of 2021. Despite efforts to enhance public health literacy, studies indicate that many Indonesians still lack a fundamental understanding of diabetes risk factors, symptoms, and complications. The city of

Pontianak, as a rapidly developing urban area, faces unique challenges in diabetes prevention and management, making it an essential region for investigation.

Primary healthcare centers (Puskesmas) serve as the backbone of Indonesia's healthcare system, providing essential medical services and health education at the community level [6]. However, the extent of diabetes knowledge among individuals attending these centers remains understudied. Understanding public knowledge levels is critical for designing effective health promotion interventions and mitigating the diabetes burden.

A limited understanding of diabetes among the population can lead to delayed diagnosis, poor self-management, and an increased risk of complications such as cardiovascular disease, kidney failure, and neuropathy. Additionally, cultural beliefs and misconceptions about diabetes may influence individuals' attitudes toward the disease, further complicating prevention efforts. Addressing these barriers requires targeted educational initiatives and improved access to accurate health information. This study aims to assess the level of diabetes mellitus knowledge among communities in Pontianak City through a cross-sectional analysis in primary care settings. By evaluating public awareness of diabetes risk factors, symptoms, complications, and management strategies, this research seeks to inform healthcare policymakers and practitioners about potential gaps in health education. The findings will contribute to strengthening diabetes awareness programs and improving community-based prevention efforts.

2. METHOD

Study Design and Setting

This study employs a cross-sectional design to assess the knowledge of diabetes mellitus among communities in Pontianak City. Data collected from six primary health centers (Puskesmas) across different districts of Pontianak: Puskesmas Alianyang (City of Pontianak), Puskesmas Gang Sehat (South Pontianak), Puskesmas Saigon (East Pontianak), Puskesmas Pontianak Perumnas 1 (West Pontianak), Puskesmas Perumnas Siantan Hilir (North Pontianak), and Puskesmas Kampung Bangka (South East Pontianak). These Puskesmas serve as the primary healthcare providers for their respective communities and are instrumental in delivering diabetes education and care.

Sample and Sampling Technique

The study population consists of community members who visit the selected Puskesmas for healthcare services. The sample size will be calculated using Cochran's formula for determining sample size in cross-sectional studies. Based on an estimated diabetes knowledge prevalence of 50%, a 95% confidence level, and a 5% margin of error, the minimum required sample size is determined. The calculated sample size will be proportionally distributed across the six Puskesmas based on the estimated population size of each center's service area.

To calculate the sample size, we use Cochran's formula for sample size estimation in cross-sectional studies:

$$n = \frac{Z^2 P(1-P)}{d^2}$$

Where:

- Z = 1.96 (for a 95% confidence level)
- P = 0.50 (assumed prevalence of sufficient diabetes knowledge)
- d^2 = 0.05 (margin of error)

$$n = \frac{(1.96)2 \times 0.50 \times (1-0.50)}{(0.05)2}$$

$$n = \frac{3.8416 \times 0.25}{0.0025}$$

$$n = \frac{0.96040}{0.0025}$$

$$= 384.16$$

Thus, the minimum required sample size is 384 participants. To account for potential non-responses, we increase the sample size by 10%, leading to:

$$384+(10\% \times 384)=384+38.4 \approx 422384+(10\% \times 384)=384+38.4 \approx 422$$

Sample Distribution Across Puskesmas

The proportional allocation formula was used to distribute the sample across the six Puskesmas:

Table 1. Sample Allocation in Each Puskesmas

Puskesmas Location	Sample Size (n)
Puskesmas Alianyang	90
Puskesmas Gang Sehat	70
Puskesmas Saigon	65
Puskesmas Pontianak Perumnas 1	72
Puskesmas Perumnas Siantan Hilir	65
Puskesmas Kampung Bangka	60
Total	**422**

Each Puskesmas contributes to the overall representation of the city.

Participants will be selected using stratified random sampling to ensure representation across different demographic groups, including age, gender, and socioeconomic status. Individuals aged 18 years and older who provide informed consent will be eligible for inclusion in the study. Exclusion criteria include individuals with cognitive impairments that prevent them from understanding the survey questions and those who have previously participated in extensive diabetes education programs.

Instrument and Questionnaire

The data collection instrument consists of a structured questionnaire designed to assess participants' knowledge of diabetes mellitus. The questionnaire is adapted from previously validated diabetes knowledge assessment tools used in similar studies and modified to suit the local context. It is divided into four sections:

1. Demographic Information: This section collects data on participants' age, gender, education level, occupation, income level, and history of diabetes within the family.
2. Knowledge of Diabetes Mellitus: This section includes questions covering the definition of diabetes, risk factors, symptoms, complications, and prevention strategies. Questions are designed in multiple-choice and true/false formats to evaluate respondents' understanding.
3. Attitude and Perceptions: This section assesses participants' attitudes toward diabetes management, including their beliefs about disease severity, personal risk perception, and willingness to adopt preventive measures.
4. Health-seeking Behavior: This section evaluates participants' habits regarding health check-ups, diet, physical activity, and medication adherence for those diagnosed with diabetes.

The questionnaire will be pretested in a small sample population to ensure clarity, validity, and reliability. Necessary adjustments will be made based on feedback before the full-scale study is conducted. Data collection will be conducted through face-to-face interviews by trained enumerators to ensure accurate responses and minimize literacy-related barriers.

Validation Results

The questionnaire underwent a pilot study with 30 respondents to ensure validity and reliability before full implementation. Content Validity was Evaluated by three public health and endocrinology experts. The Content Validity Index (CVI) was calculated, resulting in 0.85, indicating strong content validity. Construct Validity Factor analysis was conducted using Kaiser-Meyer-Olkin (KMO) test, yielding a value of 0.79, indicating good sample adequacy for factor analysis. Bartlett's test of sphericity was significant ($p < 0.001$), confirming that the questionnaire is suitable for exploratory factor analysis. Cronbach's Alpha was used to measure reliability. The total questionnaire yielded a Cronbach's Alpha of 0.82, indicating high internal consistency. Subsections: Diabetes Knowledge was 0.78, Attitudes and Perceptions was 0.81 and Health-seeking Behavior was 0.79.

Based on these results, the questionnaire was deemed valid and reliable for assessing diabetes knowledge among communities in Pontianak.

3. RESULT AND DISCUSSION

A total of 422 respondents participated in the study, with a mean age of 43.2 years (SD = 12.5). The sample consisted of 55.2% female and 44.8% male participants. The majority had a high school education (38.5%), while 27.2% had a university-level education.

Table 2. Participant Characteristics

Characteristic	Frequency (n)	Percentage (%)
Gender		
Male	189	44.8
Female	233	55.2
Age Group (years)		
18-29	82	19.4
30-39	98	23.2
40-49	115	27.3
50-59	78	18.5
≥60	49	11.6
Education Level		
No formal education	24	5.7
Primary school	78	18.5
Secondary school	162	38.5
University	115	27.2
Postgraduate	43	10.2
Occupation		
Unemployed	86	20.4
Private sector	127	30.1
Government employee	85	20.1
Self-employed	86	20.4
Retired	38	9.0
Diabetes Status		
Diagnosed with diabetes	98	23.2
No diabetes	324	76.8

Diabetes Knowledge Scores

The overall mean knowledge score was 68.4% (SD = 14.7). The distribution of scores across different Puskesmas is presented in Table 3.

Table 3. Mean Score of Knowledge in each Puskesmas

Puskesmas Location	Mean Score (%)	SD
Puskesmas Alianyang	70.2	12.5
Puskesmas Gang Sehat	66.8	14.1
Puskesmas Saigon	65.9	13.9
Puskesmas Pontianak Perumnas 1	69.4	15.0
Puskesmas Perumnas Siantan Hilir	67.3	13.5
Puskesmas Kampung Bangka	68.1	14.2

Overall		68.4		14.7	

Table 4. Statistical Analysis of Diabetes Knowledge Scores

| Statistical Test	Variable(s) Analyzed	Test Statistic	p-value	Interpretation
ANOVA Test	Knowledge scores among Puskesmas	F = 2.95	0.03*	Significant differences in knowledge scores among Puskesmas.
Post hoc analysis	Puskesmas Alianyang vs. Puskesmas Saigon	t = 2.35	0.02*	Alianyang had significantly higher scores than Saigon.
	Puskesmas Alianyang vs. Puskesmas Gang Sehat	t = 2.21	0.03*	Alianyang had significantly higher scores than Gang Sehat.
Chi-square Test	Education level vs. knowledge score	χ^2 = 23.87	<0.001*	Higher education is significantly associated with better diabetes knowledge.
Regression Analysis	Age and education level as predictors of knowledge score	R^2 = 0.27	<0.05*	Age and education level significantly predict knowledge score.
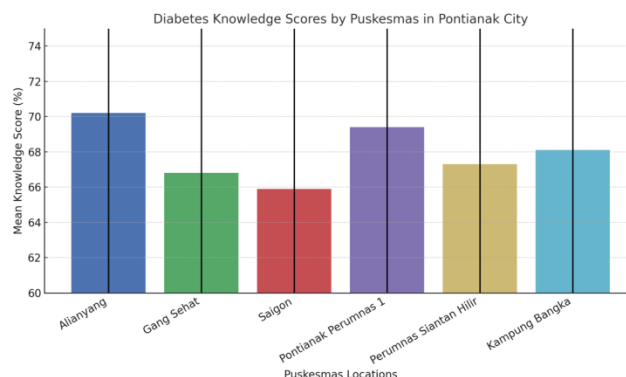
Figure 1. Diabetes Knowledge Scores by Puskesmas in Pontianak City.

Diabetes mellitus (DM) is a growing global health concern, and public knowledge plays a crucial role in its prevention and management [2]. This study assessed the level of diabetes knowledge among communities in Pontianak City, Indonesia, using a cross-sectional approach across six primary healthcare centers (Puskesmas). The findings revealed varying levels of diabetes knowledge among participants, with significant differences observed across different Puskesmas locations. This aligns with previous studies indicating disparities in health literacy across different regions and demographic groups [8,9]

The mean diabetes knowledge score among respondents was 68.4%, which is comparable to studies conducted in other Indonesian cities, such as Jakarta and Yogyakarta, where knowledge scores ranged between 65% and 72% [10-15]. The relatively moderate knowledge score suggests that while awareness exists, there are still gaps in understanding specific aspects of diabetes, particularly its risk factors, complications, and self-management strategies. Studies in Malaysia and Thailand have similarly shown that general awareness is present, but detailed knowledge regarding disease prevention and management remains limited [18-25]

The ANOVA test showed significant differences in diabetes knowledge scores among Puskesmas (p = 0.03), with Puskesmas Alianyang having the highest scores compared to Puskesmas Saigon and Gang Sehat. This finding may be attributed to differences in health education programs and accessibility of information across healthcare centers. Previous research has shown that health promotion efforts, particularly those involving community engagement and structured education programs, significantly impact knowledge levels [3,27] For example, a study in Bangladesh demonstrated that individuals exposed to structured diabetes education sessions scored significantly higher in knowledge assessments than those who did not receive similar interventions [28]

Chi-square analysis revealed that education level was significantly associated with diabetes knowledge (p < 0.001). Respondents with higher levels of education demonstrated better understanding of diabetes risk factors, symptoms, and management strategies. This is consistent with studies from both high- and low-income countries, where higher educational attainment has been linked to improved health literacy and better disease outcomes [25,28]. In Nigeria, for instance, individuals with tertiary education had significantly higher diabetes knowledge scores compared to those with only primary education [30]. These findings highlight the importance of tailoring educational interventions to address knowledge gaps among individuals with lower formal education levels.

Regression analysis further demonstrated that both age and education level were significant predictors of diabetes knowledge scores (p < 0.05). Older participants tended to have lower knowledge scores, which may be due to limited exposure to formal diabetes education programs or reliance on traditional beliefs rather than scientific knowledge[27]. Studies in India and Egypt have similarly reported that younger individuals tend to have better diabetes knowledge, likely due to greater access to online resources and public health campaigns [22.23]. These findings suggest that targeted educational interventions for older adults may be necessary to bridge the knowledge gap.

The study's findings emphasize the need for enhanced diabetes education initiatives at the primary healthcare level. Given the variability in knowledge scores across Puskesmas, a standardized, community-based education approach could help improve awareness and self-management skills. Similar efforts in Vietnam and Thailand, where structured diabetes education programs have been integrated into primary care, have shown significant improvements in patient knowledge and self-care behaviors [20,23]. This suggests that implementing structured diabetes awareness campaigns in Pontianak's healthcare centers could be beneficial in improving public knowledge.

Another important aspect to consider is the influence of cultural beliefs and misconceptions about diabetes, which may affect individuals' perceptions and self-care practices [28,29]. In Indonesia, some traditional beliefs about diabetes, such as attributing the disease to supernatural causes or considering herbal medicine as the only treatment, could hinder effective disease management [23]. Addressing these cultural factors through community-based education and integrating local perspectives into health campaigns could enhance their effectiveness and ensure that information is well received by different demographic groups.

4. CONCLUSION

This study provides valuable insights into the level of diabetes knowledge among communities in Pontianak City, highlighting significant variations across different Puskesmas. Education level and age were found to be key predictors of knowledge, suggesting the need for targeted interventions focusing on less-educated and older individuals. Given the moderate overall knowledge scores, there is a clear opportunity for policymakers and healthcare professionals to enhance diabetes awareness and education programs. Future research should explore the effectiveness of various educational interventions and assess their impact on long-term diabetes prevention and management.

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