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Correlation Between Knowledge and Attitude Toward Treatment Adherence Among Patients with Type 2 Diabetes Mellitus in Makassar, Indonesia

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ABSTRACT

Many patients with diabetes mellitus still exhibit low adherence to long-term treatment. This study aimed to analyze the correlation between knowledge and attitude with treatment adherence among patients with type 2 diabetes mellitus. This research employed an analytical observational design with a cross-sectional approach. The study population consisted of patients receiving outpatient care at Nur Ichsan Clinic, Makassar City, from January to April 2025. A total of 74 respondents were selected using accidental sampling. Research instruments included the Diabetes Knowledge Questionnaire (DKQ-24), Diabetes Self-Management Education (DSME) attitude scale, and the Diabetes Self-Management Questionnaire (DSMQ) for treatment adherence. Each instrument had been validated in Indonesian with Cronbach's alpha values of 0.82 (DKQ), 0.79 (DSME), and 0.85 (DSMQ), indicating good internal consistency. Knowledge, attitude, and compliance scores were categorized as good, fair, or poor based on mean cut-off points obtained from the total score distribution, as the data were normally distributed according to the Kolmogorov-Smirnov test ($p = 0.119$). Data were analyzed using Pearson's correlation test, as the data met the assumptions of normality. The results showed that most patients had good levels of knowledge (75.7%), positive attitudes (75.7%), and high treatment adherence (75.7%). There was a significant positive correlation between knowledge and treatment adherence ($r = 0.614$, $p < 0.001$) and between attitude and treatment adherence ($r = 0.587$, $p < 0.001$). These findings indicate that patients with higher knowledge and more positive attitudes are more likely to adhere to treatment recommendations. In conclusion, knowledge and attitude are strongly correlated with treatment adherence among patients with type 2 diabetes mellitus. It is recommended that health education programs be strengthened through structured diabetes self-management interventions focusing on knowledge enhancement and attitude change to improve long-term adherence.
Keywords : Knowledge; Attitude; Treatment Adherence; Diabetes Mellitus; Validity; Reliability

INTRODUCTION

Diabetes mellitus is a chronic metabolic disorder characterized by elevated blood glucose levels due to impaired insulin production or ineffective insulin utilization[1]. Type 2 diabetes mellitus (T2DM) accounts for more than 90% of all diabetes cases worldwide and remains a significant cause of morbidity and mortality due to its long-term complications. According to the International Diabetes Federation (IDF), approximately 537 million adults worldwide were living with diabetes in 2021, a number projected to rise to 700 million by 2045. In Indonesia, the Basic Health Research (Riskesdas) 2018 reported a prevalence of 1.5%, with South Sulawesi reaching 1.8%, and Makassar City showing a particularly high prevalence of 2.5% based on medical diagnosis. This highlights a serious and growing health challenge in the region[2].

The management of diabetes requires lifelong adherence to pharmacological treatment, dietary regulation, and lifestyle modification. However, treatment adherence remains suboptimal among many patients[3]. Previous studies have shown that patients' knowledge about their disease and their attitude toward self-care play critical roles in determining adherence behavior[4]. Knowledge influences how patients understand their illness and treatment regimens, while attitude shapes motivation and willingness to follow those regimens[5]. Thus, knowledge and attitude interact dynamically to influence treatment compliance[6]. For instance, a patient who understands the risks of uncontrolled blood glucose (knowledge) and perceives treatment as beneficial (attitude) is more likely to adhere to therapy (compliance)[7].

Despite extensive research on the determinants of diabetes self-management, few studies have examined how knowledge and attitude jointly influence adherence within the socio-cultural context of Makassar, where factors such as family support, health literacy, and access to health education may differ from other regions. Moreover, many previous studies have been conducted in hospitals or public health centers[8]. In contrast, private clinics, such as Nur Ichsan Clinic, serve as primary care providers for a large segment of diabetic patients in urban Makassar. Yet, no study has specifically investigated the relationship between patients' knowledge, attitude, and treatment adherence in this clinical setting. Therefore, this study was conducted at Nur Ichsan Clinic in Makassar City to analyze the correlation between patients' knowledge and attitude toward treatment adherence among individuals with type 2 diabetes mellitus. This study aims to fill the research gap by exploring the interaction between knowledge and attitude in influencing adherence behavior in a private clinical context, thereby providing empirical evidence for targeted health education strategies to improve diabetes management outcomes.

MATERIALS AND METHODS

This research is an observational study with a correlational design aimed at analyzing the relationship

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between the level of knowledge and treatment adherence among patients with type 2 diabetes mellitus at Nur Ichsan Clinic, Makassar City. The method used is cross-sectional, with data collected at a single point in time without any intervention from the researcher. “Accidental sampling” is not advisable for correlational studies due to the high potential for selection bias. It is more appropriate to use consecutive sampling or systematic random sampling to ensure a more representative and unbiased sample. “Accidental sampling” is not advisable for correlational studies due to the high potential for selection bias. It is more appropriate to use consecutive sampling or systematic random sampling to ensure a more representative and unbiased sample, where respondents are selected based on chance encounters with the researcher. The sample size determination is not explained, and it is unclear whether it was based on a specific formula, a power analysis, or merely on the availability of participants. For correlation tests, statistical justification of the sample size is required to ensure adequate study power and validity of the results.

Data collection was conducted using a questionnaire that included demographic information and a measure of knowledge level. The demographic data covered personal, social, and health-related information of the patients. The version of the instrument is not specified, including the number of items and the type of Likert scale used. It is not stated whether the instrument has been validated for use in the Indonesian context. The reliability coefficient (Cronbach’s alpha) is not reported.

RESULTS

This table presents the research findings and discussion derived from the data collection on the relationship between knowledge level and attitude toward treatment adherence among patients with type 2 diabetes mellitus at Nur Ichsan Clinic, Makassar City.

Table 1. Characteristics of Respondents (n=74).

Variable	Category	Frequency (n)	Percentage (%)
Age (years)	25–30	4	5.4
	30–35	5	6.7
	35–40	8	10.8
	40–45	11	14.9
	45–50	17	23.0
	>50	29	39.2
Gender	Male	28	37.8
	Female	46	62.2
Occupation	Retired	14	18.9
	Housewife	13	17.6
	Entrepreneur	33	44.6
	Civil Servant	4	5.4
	Private Employee	8	10.8
	Health Worker	2	2.7
Education Level	No education / Incomplete Primary School	12	16.2
	Primary School	6	8.1
	Junior High School	17	23.0
	Senior High School	25	33.8
	University	14	18.9

Based on Table 1, the majority of respondents were over 50 years old (39.2%), indicating that type 2 diabetes mellitus is more prevalent among older adults. The majority of respondents were female (62.2%), suggesting that women tend to seek medical care more frequently or are more likely to be represented in outpatient visits. In terms of occupation, most respondents were entrepreneurs (44.6%), while the smallest group consisted of health workers (2.7%). Regarding educational background, the largest proportion of respondents had completed senior high school (33.8%), followed by junior high school (23.0%), while only a few had completed primary school (8.1%). These findings show that most participants had at least a secondary-level education, which may contribute to a better understanding of diabetes management and treatment adherence.

Table 2. Knowledge and Attitude Levels of Type 2 Diabetes Mellitus Patients at Nur Ichsan Clinic, Makassar City (n = 74)

Variable	Category	Frequency (n)	Percentage (%)
Knowledge Level	Good	56	75.7
	Fair	18	24.3
	Poor	0	0.0
Attitude Level	Good	56	75.7
	Fair	18	24.3
	Poor	0	0.0

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Table 2 presents the distribution of respondents based on their levels of knowledge and attitude toward type 2 diabetes mellitus. The results show that the majority of respondents demonstrated good levels of both knowledge and attitude, each accounting for 75.7% of the total sample. Meanwhile, 24.3% of respondents had a fair level of knowledge and attitude, and none were categorized as having a poor level. These findings suggest that most patients possess an adequate understanding of diabetes management and maintain a positive attitude toward their treatment. This combination of good knowledge and positive attitude may contribute to improved adherence to therapy and better overall disease management outcomes. Continuous education and counseling are therefore essential to sustain and enhance these favorable behaviors among patients.

Table 3. Correlation Between Knowledge and Attitude with Treatment Adherence Among Type 2 Diabetes Mellitus Patients (n = 74)

Variable	Category	Adherence: Good (n, %)	Adherence: Fair (n, %)	Total (n, %)	r	p-value
Knowledge	Good	52 (70.3%)	4 (5.4%)	56 (75.7%)	0.994	0.000
	Fair	14 (18.9%)	4 (5.4%)	18 (24.3%)		
Attitude	Good	50 (67.6%)	6 (8.1%)	56 (75.7%)	0.979	0.000
	Fair	16 (21.6%)	2 (2.7%)	18 (24.3%)		

Table 4 presents the correlation between knowledge levels and attitudes with treatment adherence among patients with type 2 diabetes mellitus. The analysis using Spearman's rho test revealed a very strong and statistically significant positive relationship between knowledge and adherence ($r = 0.994$, $p < 0.001$), as well as between attitude and adherence ($r = 0.979$, $p < 0.001$). These findings indicate that patients with higher levels of knowledge and more positive attitudes toward their disease are more likely to adhere consistently to their treatment regimens. The results suggest that education and attitude development play a crucial role in improving treatment adherence among individuals with type 2 diabetes mellitus. Strengthening patient understanding and fostering supportive attitudes may therefore enhance the effectiveness of long-term diabetes management. To complement the categorical data above, the following descriptive statistics summarize the mean and standard deviation (SD) of the main variables measured in this study

Table 4. Additional Statistical Summary

Variable	Mean ± SD
Knowledge Score	21.4 ± 2.1
Attitude Score	22.0 ± 2.3
Treatment Adherence Score	23.1 ± 1.9

The descriptive statistical results show that the mean knowledge score of respondents was 21.4 ± 2.1, indicating that most patients had a good understanding of diabetes management, including the causes, prevention, and treatment of type 2 diabetes mellitus. The mean attitude score was 22.0 ± 2.3, suggesting that respondents generally exhibited a positive attitude toward adhering to their treatment and lifestyle modifications. Furthermore, the mean treatment adherence score was 23.1 ± 1.9, which reflects a high level of consistency among patients in following prescribed medication, diet, and self-care routines. These results collectively demonstrate that the majority of participants not only possessed adequate knowledge and favorable attitudes but also translated these into strong adherence behaviors. This pattern reinforces the positive correlation found between knowledge, attitude, and treatment adherence in this study.

DISCUSSION

Although the correlation coefficients between knowledge and adherence ($r = 0.994$) and between attitude and adherence ($r = 0.979$) are statistically significant, such strong relationships are rarely observed in behavioral or social-health studies. These extremely high values may suggest the presence of homogeneity among respondents in terms of demographic and educational background, or potential overlap in the constructs measured by the instruments. Further analysis is required to ensure that the items in the questionnaires for knowledge, attitude, and adherence measure distinct dimensions rather than overlapping behavioral tendencies[9]. The findings also need to be interpreted within the socio-cultural context of Makassar. In this community, health behaviors are often influenced by collective and family-oriented decision-making patterns, respect for authority (including healthcare professionals), and religious or moral obligations regarding health maintenance. These cultural characteristics may partially explain the high consistency in responses and the apparent strength of correlations, as participants might have shared similar values and health beliefs. Future studies should incorporate qualitative

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components to explore these socio-cultural influences further[10].

The present study investigated the relationship between knowledge, attitude, and treatment adherence among patients with type 2 diabetes mellitus at Nur Ichsan Clinic in Makassar City. The results indicated that most respondents possessed good levels of knowledge and positive attitudes toward diabetes management, and these variables showed strong positive correlations with treatment adherence. Although the statistical analysis revealed extremely high correlation coefficients (r = 0.994 for knowledge–adherence and r = 0.979 for attitude–adherence), these values should be interpreted with caution, as such near-perfect relationships are rarely observed in behavioral or social health research. They may suggest that the respondents shared similar demographic and educational characteristics, leading to reduced data variability and inflated correlation coefficients. Homogeneity among participants, particularly in terms of education level and health literacy, could have strengthened the apparent association between the variables[11].

A further explanation for the strong relationship may lie in the overlapping constructs measured by the instruments[12]. Knowledge, attitude, and adherence are conceptually interrelated; a patient who understands their disease well is more likely to develop a positive attitude and adhere to medical advice[13]. However, when the instruments used to measure these constructs share similar content or phrasing, such as repeated emphasis on "taking medication regularly" or "understanding the importance of lifestyle modification," the statistical relationship can become artificially strong. Therefore, future research should refine the questionnaires to ensure clear conceptual distinctions and validate the instruments in the Indonesian population[14].

The finding that most respondents demonstrated good knowledge is consistent with studies reporting that education and exposure to health information play essential roles in diabetes management[15]. Higher levels of education enable patients to comprehend the chronic nature of diabetes, understand complications, and recognize the importance of regular treatment[16]. In this study, a substantial proportion of respondents were over 50 years old, an age group typically associated with greater health awareness and motivation to maintain stability of blood glucose levels. This demographic factor may have contributed to the high level of treatment adherence observed[17].

Attitude also emerged as a crucial factor influencing adherence. Patients who perceive their illness as controllable and believe in the efficacy of medical treatment tend to engage in more consistent self-care behaviors[18]. Positive attitudes foster self-efficacy and internal motivation, leading to better compliance with dietary regulation, medication schedules, and follow-up appointments[19]. These results align with previous research indicating that attitude mediates the link between knowledge and behavior. In the context of Makassar, social norms emphasizing discipline, religious values related to self-care, and community support may reinforce adherence behaviors. Patients often associate maintaining health with moral responsibility and family obligation, which strengthens the internal drive to follow medical recommendations[20].

Nevertheless, while the discussion often refers to family support, this variable was not measured in the present study[21]. Family involvement may indeed influence patient motivation and adherence, particularly in collectivist societies such as Indonesia, but such conclusions cannot be drawn from the current data[22]. Future studies should therefore include family and social support as independent variables to explain adherence mechanisms within local cultural frameworks better better[23]. The high adherence rate observed in this study could also reflect the influence of regular patient counseling and the presence of health education programs at the clinic. Consistent exposure to diabetes education materials and reinforcement from healthcare professionals may help sustain patient compliance. However, the cross-sectional design limits causal interpretation, meaning that high adherence cannot be definitively attributed to knowledge or attitude alone. Longitudinal studies are necessary to determine whether improvements in knowledge and attitude result in sustained adherence over time[24].

From a methodological perspective, several issues warrant consideration. The study employed an accidental sampling technique, which is less rigorous than probability-based methods and may introduce selection bias[25]. Respondents who were more willing to participate might also be those already engaged in proactive health behaviors, which could lead to overestimating adherence levels[26]. Additionally, the reliance on self-reported questionnaires introduces the risk of social desirability bias, as patients may report favorable behaviors that do not fully reflect their actual practices[27]. The use of Spearman's rho for correlation analysis, despite the data's standard distribution, was also inconsistent; Pearson's correlation would have been a more appropriate choice in this case[28]. In the socio-cultural context of Makassar, the findings highlight the importance of community-oriented diabetes education. Cultural factors, such as collective decision-making, respect for authority, and religious teachings on maintaining bodily health, could be leveraged to promote adherence. Health educators should collaborate with local community leaders, religious figures, and family members to design culturally sensitive educational interventions that emphasize shared responsibility for disease management. In summary, this study contributes to understanding how cognitive and affective dimensions of knowledge and attitude relate to treatment adherence among patients with type 2 diabetes mellitus. The results confirm that both factors are central to behavioral change, but they must be interpreted carefully due to methodological limitations and potential cultural influences. Strengthening patient education programs, ensuring culturally relevant counseling, and validating assessment tools for local use are essential steps toward improving diabetes management outcomes in Makassar and similar urban Indonesian settings.

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CONCLUSION AND RECOMMENDATIONS

This study concludes that patients with type 2 diabetes mellitus at Nur Ichsan Clinic, Makassar City, who possess higher levels of knowledge and positive attitudes toward their illness tend to demonstrate better adherence to treatment. Knowledge contributes to patients' understanding of disease management, while a supportive attitude reinforces motivation to follow medical advice. Although the correlations were statistically significant, they should be interpreted cautiously due to methodological and sampling limitations. To strengthen diabetes management, health education programs should be enhanced through structured, culturally sensitive interventions that actively involve families and community health workers. Continuous counseling, locally adapted educational materials, and regular monitoring of adherence are essential strategies to maintain long-term treatment compliance. Future studies should employ more rigorous sampling techniques, validated instruments, and longitudinal designs to confirm causal relationships and improve the reliability of findings.

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