

Health Literacy and Medication Adherence among Diabetes Patients in Surabaya

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Abstract

Type 2 diabetes mellitus is a chronic disease that requires lifelong medication adherence to prevent various complications. However, patients' adherence to therapy remains a challenge, particularly among patients with low health literacy. This study aimed to explore the role of health literacy in medication adherence among patients with type 2 diabetes mellitus in Surabaya City. This study used a descriptive qualitative approach. A total of 15 participants were selected purposively from two primary healthcare centers based on the inclusion criteria, namely adult patients who had been diagnosed with type 2 diabetes mellitus for at least one year, were currently receiving antidiabetic therapy, and were willing to participate in in-depth interviews. Participant recruitment continued until data saturation was reached. Data were collected through semistructured interviews and analyzed using thematic analysis. The results identified four main themes, namely limited understanding of medication use, reliance on informal information sources, communication barriers with healthcare professionals, and health literacy as an empowering factor in diabetes management. The findings showed that low health literacy led to misunderstanding of medication instructions, non-adherence to therapy, and a tendency to follow health information from non-professional sources. Conversely, patients with better health literacy demonstrated more effective communication with healthcare professionals and were more consistent in following their treatment. This study concludes that strengthening health literacy through patient-centered communication and education tailored to patients' literacy levels is an important strategy for improving medication adherence in primary healthcare services.

Keywords: diabetes mellitus, medication adherence, health literacy, primary healthcare, qualitative study.

How to cite (APA Style):

Maulana, E. N & Wardhani, M. K. (2026). Health Literacy and Medication Adherence among Diabetes Patients in Surabaya. *Media Ilmiah Kesehatan Indonesia*, 4(3), 162–176. <https://doi.org/10.58184/miki.v4i3.998>

Received: 23 May 2026; Revised: 14 July 2026; Accepted: 13 Aug 2026; Published: 30 Sep 2026



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INTRODUCTION

Diabetes mellitus (DM) is one of the most prevalent chronic non-communicable diseases worldwide and continues to pose a serious public health challenge. The [International Diabetes Federation \(2021\)](#) reported that the number of people living with diabetes has increased steadily over the past decades, with the fastest growth occurring in low- and middle-income countries. In these settings, health systems often struggle to provide sustainable long-term care for chronic conditions. As diabetes requires lifelong management, effective disease control depends not only on the availability of medical treatment but also on patients' ability to understand their condition and adhere consistently to prescribed therapies. Similarly, the [World Health Organization \(2022\)](#)

emphasized that strengthening patients' capacity to manage chronic diseases has become a global priority because successful diabetes management relies heavily on informed self-care and continuous medication adherence.

Medication adherence plays a central role in diabetes management. [Cahyono \(2025\)](#) explained that regular and correct use of antidiabetic medication helps maintain glycemic control, prevents acute and chronic complications, and improves patients' quality of life. Nevertheless, medication adherence among patients with diabetes remains suboptimal worldwide, particularly in developing countries. [Jimmy and Jose \(2011\)](#) reported that many patients intentionally or unintentionally skip medication doses, modify treatment schedules, or discontinue therapy without consulting healthcare professionals. These behaviors substantially increase the risk of uncontrolled blood glucose, diabetes-related complications, repeated hospitalization, and higher healthcare costs. Therefore, improving medication adherence has become one of the primary goals of diabetes management programs internationally.

One of the key determinants of medication adherence is health literacy. [Nutbeam et al. \(2018\)](#) defined health literacy as an individual's ability to access, understand, evaluate, and apply health information to make appropriate health-related decisions. Within the context of diabetes management, health literacy extends beyond reading medication labels; it encompasses patients' ability to interpret physicians' recommendations, evaluate health information obtained from multiple sources, communicate effectively with healthcare providers, and implement appropriate self-management behaviors in daily life. [Berkman et al. \(2011\)](#) demonstrated that patients with limited health literacy frequently experience difficulties in understanding medication instructions, recognizing the importance of long-term treatment, and communicating effectively with healthcare professionals. Consequently, inadequate health literacy is consistently associated with poor medication adherence, low self-management capacity, and unfavorable clinical outcomes.

In Indonesia, the burden of diabetes has increased considerably during the past decade, particularly in rapidly urbanizing cities. The [Ministry of Health of the Republic of Indonesia \(2024\)](#) reported that urbanization, unhealthy dietary habits, sedentary lifestyles, and increasing psychosocial stress have contributed to the growing prevalence of type 2 diabetes in major metropolitan areas, including Surabaya. Although Surabaya has relatively better healthcare infrastructure than many other regions, as stated by [Ministry of Health RI \(2024\)](#), optimal diabetes management has not yet been achieved. This situation indicates that improving healthcare accessibility alone is insufficient without ensuring that patients possess adequate health literacy to understand and implement medical recommendations correctly.

Preliminary observations conducted by the researcher in primary healthcare centers in Surabaya suggest that medication non-adherence is frequently associated with patients' misunderstanding of medical instructions. [Hyvert et al. \(2023\)](#) found that some patients discontinue medication after experiencing symptom improvement, whereas others modify medication dosages based on personal judgment or recommendations from family members and peers. Furthermore, [Chong et al. \(2025\)](#) explained that many patients rely on informal information obtained through social media, community networks, or traditional beliefs rather than consulting healthcare professionals. These findings suggest that medication adherence is influenced not merely by the availability of healthcare services but also by patients' ability to interpret, evaluate, and appropriately apply health information within their daily lives.

Previous studies have consistently demonstrated a relationship between health literacy and medication adherence; however, their methodological approaches and research focus vary considerably. In Indonesia, [Pertiwi et al. \(2022\)](#) conducted a systematic review and concluded that

medication adherence among diabetes patients remains generally low, with inadequate knowledge and understanding representing major contributing factors. The review emphasized that strengthening patient education is essential for improving diabetes outcomes. Likewise, [Sriklo and Sermsinsiri \(2026\)](#) identified a significant association between health literacy and adherence to diabetes management behaviors, including medication use, dietary control, and physical activity. Their findings indicated that patients with higher health literacy were more likely to follow treatment recommendations consistently.

International evidence has also reinforced these findings. [Chong *et al.* \(2025\)](#) revealed that patients' understanding and acceptance of treatment information substantially influenced their willingness to adhere to medication, particularly when supported by effective communication and digital health technologies. [Vidiani *et al.* \(2023\)](#) found that limited health literacy was associated with poor adherence to oral antidiabetic medication and recommended simplified medication instructions alongside patient-centered communication. Furthermore, [Hilyah *et al.* \(2025\)](#) demonstrated that patients with limited health literacy frequently depended on family members when making medication-related decisions, which occasionally reduced adherence to professional medical recommendations.

Although these studies have substantially advanced current knowledge regarding health literacy and medication adherence, several important research gaps remain. First, most previous studies employed quantitative methods that primarily examined statistical relationships between health literacy and medication adherence without exploring the underlying experiences shaping patients' behavior. Second, qualitative evidence explaining how patients interpret medication instructions, evaluate health information, and make medication-related decisions in their everyday lives remains limited. Third, few qualitative studies have specifically investigated these issues within urban Indonesian primary healthcare settings such as Surabaya, where diverse social, cultural, and informational influences may affect medication adherence. Consequently, the mechanisms through which health literacy influences patients' medication-related decisions remain insufficiently understood.

Addressing these gaps constitutes the primary contribution of the present study. Unlike previous quantitative investigations, this study adopts a qualitative descriptive approach to explore patients' lived experiences regarding medication adherence through the perspective of health literacy. Specifically, this research investigates how patients understand diabetes and medication instructions, identify and evaluate health information sources, communicate with healthcare providers, and overcome barriers encountered during long-term diabetes treatment. By providing an in-depth understanding of patients' perspectives, this study offers novel evidence to support the development of literacy-sensitive, patient-centered interventions that may improve medication adherence and strengthen diabetes management programs within Indonesian primary healthcare settings.

METHODS

This study adopted a qualitative descriptive design to gain an in-depth understanding of how health literacy influences medication adherence among patients with type 2 diabetes mellitus. A qualitative approach was considered appropriate because it allows researchers to explore participants' experiences, perceptions, and interpretations of health-related information in their natural contexts. A qualitative descriptive design was selected because the study sought to obtain a comprehensive description of patients' experiences rather than to develop a theory or explain causal relationships ([Sandelowski, 2000](#)). This approach is particularly appropriate for exploring how

individuals understand health information and translate it into everyday medication-taking behaviors. The study was conducted in Surabaya, Indonesia, between March and June 2025, a period during which data collection could be carried out without major disruptions to routine healthcare services.

Participants were selected using purposive sampling to ensure the inclusion of individuals with relevant experiences. Participant recruitment was conducted in collaboration with healthcare professionals at two primary healthcare centers in Surabaya. Healthcare providers first identified patients who met the inclusion criteria. Eligible patients were subsequently approached individually by the researchers, informed about the objectives and procedures of the study, and invited to participate voluntarily. Recruitment continued until no new concepts or themes emerged during the interviews, indicating that data saturation had been achieved.

A total of fifteen participants were included in the study. The decision to recruit fifteen participants was based on the principle of data saturation rather than statistical representativeness. In qualitative descriptive research, sample adequacy is determined by the richness and redundancy of the collected information (Braun & Clarke, 2021). During the present study, interviews conducted after the fifteenth participant did not generate additional codes or themes, suggesting that thematic saturation had been reached and no further recruitment was necessary.

The inclusion criteria were as follows: participants had to (1) be aged 18 years or older; (2) have been diagnosed with type 2 diabetes mellitus for at least one year; (3) currently receive oral antidiabetic medication and/or insulin therapy; (4) be able to communicate effectively in Indonesian; and (5) provide written informed consent. Exclusion criteria included patients with severe cognitive impairment, acute diabetic complications requiring hospitalization, hearing or communication difficulties that prevented participation in interviews, or any condition that limited their ability to provide complete information. Participants were deliberately selected to represent variation in age, educational background, occupation, and duration of illness to capture diverse perspectives on health literacy and medication adherence.

Data were collected through semi-structured, in-depth interviews. This method allowed flexibility for participants to share their experiences while ensuring that key topics relevant to the research objectives were addressed. The interview guide included questions related to participants' understanding of diabetes, knowledge of medication use, interpretation of dosage instructions, communication with healthcare providers, and daily medication-taking practices. Additional probing questions were used to encourage participants to elaborate on their experiences, clarify ambiguous responses, and provide concrete examples of medication-related decision-making. Interviews were conducted face-to-face in Indonesian to facilitate clear communication and participant comfort. Each interview lasted approximately 45 to 60 minutes and was audio-recorded with participants' permission.

All interviews were transcribed verbatim prior to analysis. The data analysis process followed the six phases of thematic analysis proposed by Braun and Clarke (2021), consisting of (1) familiarization with the data through repeated reading of interview transcripts; (2) generation of initial codes; (3) searching for potential themes; (4) reviewing and refining themes; (5) defining and naming themes; and (6) producing the final report. An inductive coding strategy was employed, allowing themes to emerge directly from participants' narratives rather than being predetermined by existing theoretical frameworks. Transcripts were read repeatedly to achieve data familiarization, followed by initial coding and the identification of emerging patterns. Codes were then grouped into broader themes that reflected shared meanings across participants' narratives. To enhance the credibility, dependability, and confirmability of the findings, several trustworthiness strategies were

implemented. Member checking was conducted by summarizing key interview findings and asking participants to confirm the accuracy of the researchers' interpretations. Peer debriefing was performed through regular discussions among the research team to review coding decisions and thematic development. An audit trail documenting coding decisions, theme refinement, and analytical memos was also maintained throughout the study to strengthen methodological transparency.

Ethical approval for the study was obtained from the institutional ethics committee of Universitas Pesantren Tinggi Darul Ulum (Ethical Clearance No. 012/ETIK-LPPM/1/2025). All participants provided written informed consent prior to participation. Confidentiality and anonymity were ensured by using pseudonyms and removing identifying information from transcripts and reports. Participants were informed that their involvement was entirely voluntary and that they could withdraw from the study at any stage without affecting the healthcare services they received. All digital recordings and interview transcripts were stored securely and were accessible only to the research team.

RESULTS AND DISCUSSION

Participant Characteristics

Table 1 presents the demographic and clinical characteristics of the fifteen participants included in this study. Participants ranged in age from 35 to 68 years, representing adults who had experienced diabetes management for varying periods. The gender distribution was relatively balanced, consisting of eight women and seven men, allowing exploration of experiences from both perspectives. Participants also demonstrated considerable diversity in occupation and educational attainment, ranging from primary school graduates to university graduates. Years of formal education varied between six and sixteen years, indicating differences in educational exposure that may influence individuals' ability to obtain, understand, and apply health information.

Table 1. Characteristics of Participants (n = 15)

Characteristics	Description
Number of participants	15
Age (years)	35–68
Gender	8 Female; 7 Male
Occupation	Housewife, private employee, entrepreneur, retired employee, civil servant
Educational attainment	Primary school, junior high school, senior high school, diploma, university
Years of education	6–16 years
Duration of diabetes	2–15 years
Diabetes complications	None, hypertension, diabetic neuropathy, diabetic retinopathy
Antidiabetic medication	Metformin, Glimepiride, Insulin, Combination therapy
BPJS membership	13 insured, 2 non-insured

Clinical characteristics also varied considerably. Participants had lived with diabetes for between two and fifteen years and were receiving different treatment regimens, including oral antidiabetic drugs, insulin therapy, or combination therapy. Several participants had already developed diabetes-related complications, including hypertension, diabetic neuropathy, and

diabetic retinopathy, whereas others reported no complications. Most participants were covered by the Indonesian National Health Insurance (BPJS), suggesting relatively adequate financial access to healthcare services. Nevertheless, despite this healthcare coverage, participants continued to report various difficulties in adhering to medication regimens, indicating that healthcare access alone does not necessarily translate into optimal medication adherence.

The diversity of participant characteristics strengthened the credibility of the findings because it enabled exploration of medication adherence experiences across different educational, occupational, and clinical backgrounds. This variation further illustrates that health literacy is not determined solely by educational attainment but is also shaped by previous healthcare experiences, communication with healthcare professionals, and access to understandable health information. Similar observations have been reported by [Berkman *et al.* \(2011\)](#), who emphasized that health literacy is influenced by multiple individual and healthcare system factors rather than educational level alone.

Main Themes Identified from Thematic Analysis

The thematic analysis identified four interconnected themes describing how health literacy influenced medication adherence among patients with type 2 diabetes mellitus. Rather than representing isolated experiences, these themes illustrate a continuum in which patients' understanding of medication, access to health information, communication with healthcare providers, and confidence in self-management collectively shaped their medication-taking behavior. The four themes identified were limited understanding of medication, reliance on informal information sources, communication barriers with healthcare providers, and health literacy as empowerment. A summary of these themes and their key characteristics is presented in [Table 2](#), providing an analytical framework for the subsequent presentation of the findings.

Table 2. Main Themes Identified from Thematic Analysis

Theme	Description
Limited understanding of medication	Confusion regarding dosage, timing, and duration of medication
Reliance on informal information sources	Dependence on advice from family members, peers, and community
Communication barriers with healthcare providers	Hesitation to ask questions and limited consultation time
Health literacy as empowerment	Confidence and self-efficacy in diabetes self-management

A. Theme 1 (Limited Understanding of Medication)

Participants consistently described uncertainty regarding medication dosage, timing, and duration of treatment. Many believed that antidiabetic medication should only be taken when symptoms such as dizziness, weakness, or frequent urination were present. Consequently, several participants admitted reducing medication doses or temporarily discontinuing treatment after experiencing symptomatic improvement without consulting healthcare professionals. This misunderstanding reflected an incomplete understanding of diabetes as a chronic disease requiring lifelong pharmacological management.

Participants also reported considerable difficulty interpreting both written and verbal medication instructions. Medical terminology used during consultations and information printed

on medication labels were frequently perceived as complicated and difficult to understand. Individuals with lower educational backgrounds particularly reported problems remembering dosage schedules and differentiating medications prescribed for different health conditions. Consequently, several participants relied on memory, personal assumptions, or previous experiences when taking medication, increasing the likelihood of missed doses or incorrect medication use.

These findings demonstrate that medication non-adherence among participants was not primarily caused by intentional refusal to follow medical advice but rather by limited functional health literacy. Participants experienced difficulties understanding fundamental information regarding medication use, including dosage frequency, treatment duration, and the preventive purpose of continuous medication. This finding supports [Nutbeam *et al.* \(2018\)](#), who explained that functional health literacy represents the basic capacity to obtain and understand health information necessary for making appropriate health decisions. When these competencies are inadequate, patients may unintentionally misuse medication despite expressing willingness to follow treatment recommendations.

The present findings are also consistent with [Berkman *et al.* \(2011\)](#), who demonstrated that individuals with limited health literacy frequently misunderstand prescription instructions and experience greater difficulty interpreting medication labels than patients with adequate health literacy. Similarly, [Hyvert *et al.* \(2023\)](#) reported that inadequate health literacy contributes significantly to medication errors, poor glycemic control, and increased hospitalization among patients with diabetes. These studies reinforce the present findings by suggesting that misunderstanding medication instructions should be interpreted as a consequence of limited comprehension rather than deliberate non-compliance.

Furthermore, the findings correspond with the observations of [de Carvalho *et al.* \(2025\)](#), who reported that patients with limited health literacy frequently discontinue medication prematurely because they incorrectly associate symptom improvement with disease recovery. A comparable pattern emerged in the present study, where participants interpreted the disappearance of diabetes symptoms as evidence that medication was no longer necessary. This misconception illustrates a substantial gap between patients' personal beliefs and the biomedical understanding of diabetes as a lifelong condition requiring continuous treatment.

An important finding emerging from this study is that educational attainment alone did not fully explain participants' understanding of medication instructions. Several participants with relatively higher educational backgrounds also experienced uncertainty when interpreting medical terminology and treatment recommendations. This finding suggests that health literacy should be understood as a multidimensional construct involving not only reading ability but also communication skills, critical appraisal of health information, and confidence in interacting with healthcare professionals. Consequently, healthcare providers should avoid assuming that patients with higher formal education automatically possess adequate health literacy.

From a practical perspective, these findings highlight the importance of implementing literacy-sensitive communication strategies within primary healthcare services. Healthcare professionals should provide medication instructions using plain language, verify patients' understanding through techniques such as the teach-back method, and provide written educational materials that are easily understood by patients with diverse educational backgrounds [Roshan-Nejad *et al.* \(2025\)](#). Such interventions may reduce misunderstanding regarding medication use and ultimately improve long-term adherence among patients with type 2 diabetes mellitus.

B. Theme 2 (Reliance on Informal Information Sources)

The second major theme identified in this study was participants' reliance on informal information sources when making decisions related to diabetes management and medication use. Almost all participants reported obtaining health information not only from healthcare professionals but also from family members, friends, neighbors, social media, and community members who had similar experiences living with diabetes. Participants frequently perceived these informal sources as more accessible, easier to understand, and more practical than information received during clinical consultations.

Many participants explained that discussions with family members or acquaintances living with diabetes helped them understand how to take medication, regulate diet, or manage blood glucose levels. Advice received from these sources was often accepted without verification because it was based on shared experiences and delivered using simple language that participants considered easier to comprehend than medical explanations. Consequently, some participants modified medication schedules, reduced dosages, or delayed taking prescribed medication based on recommendations from family members or peers rather than consulting healthcare professionals.

Another notable finding was the widespread use of traditional remedies and herbal medicines as complementary or alternative treatments. Several participants believed that herbal products were safer because they were considered "natural" and had fewer side effects than prescribed medication. In some cases, participants admitted replacing antidiabetic medication with herbal remedies after hearing positive testimonials from relatives or neighbors. Others combined herbal medicine with prescribed medication without informing healthcare providers, believing that such practices would accelerate recovery.

These findings indicate that participants' reliance on informal information sources was closely associated with limited health literacy. Difficulties in understanding medical terminology, interpreting written medication instructions, and communicating effectively with healthcare providers encouraged participants to seek explanations from individuals they trusted and who used more familiar language. Consequently, informal information became an important component of participants' medication decision-making processes.

This finding supports the conceptualization of health literacy proposed by [Nutbeam *et al.* \(2018\)](#), who argued that health literacy extends beyond the ability to read health information and includes the capacity to evaluate the credibility and relevance of different information sources before making health-related decisions. Participants in the present study frequently demonstrated adequate access to information but experienced difficulties critically evaluating whether the information they received was scientifically accurate and consistent with professional medical recommendations.

The present findings are consistent with those reported by [Hilyah *et al.* \(2025\)](#), who found that patients with limited health literacy often depend heavily on family members when making decisions regarding medication use. Family members frequently function as interpreters of medical information and provide practical support for disease management. Although such support may facilitate treatment adherence, it can also contribute to inappropriate medication practices when family advice contradicts professional recommendations. Similar patterns were observed in this study, where participants occasionally prioritized family recommendations over physicians' instructions, particularly regarding medication discontinuation and the use of traditional remedies.

Likewise, [Veronika \(2024\)](#) emphasized that family support represents one of the strongest determinants of medication adherence among individuals with chronic diseases. Emotional encouragement, practical assistance, and reminders from family members can improve adherence

and strengthen patients' motivation to continue long-term treatment. The present findings confirm this observation by demonstrating that family members frequently assisted participants in remembering medication schedules, accompanying them to healthcare facilities, and encouraging healthier lifestyles. However, the findings also reveal that family influence may become counterproductive when inaccurate information is repeatedly reinforced within the household.

The reliance on informal information identified in this study also reflects the collectivist sociocultural context of Indonesian society, where health-related decisions are often shared among family members rather than made independently by individual patients. In such contexts, family members are not merely sources of emotional support but also active participants in interpreting health information and determining treatment strategies. This sociocultural characteristic differentiates medication adherence behavior from that reported in many Western healthcare settings, where decision-making tends to be more patient-centered and individually driven. Therefore, interventions aimed at improving medication adherence in Indonesia should recognize the important role of families in influencing patients' health behaviors.

These findings are further supported by [Wu *et al.* \(2025\)](#), who demonstrated that family-centered health education significantly improves medication adherence among patients with chronic diseases because family members become active partners in monitoring treatment and reinforcing healthy behaviors. Similarly, [Hyvert *et al.* \(2023\)](#) argued that social support can reduce the negative consequences of limited health literacy by helping patients interpret medical information and maintain treatment routines. However, both studies emphasized that family support is beneficial only when family members possess accurate knowledge regarding disease management. Otherwise, misinformation may unintentionally contribute to medication errors and poor adherence.

An important contribution of the present study is the identification of informal information sources as both protective and risk factors for medication adherence. Unlike previous quantitative studies that primarily measured the statistical association between social support and medication adherence, this qualitative study demonstrates the mechanisms through which informal information influences patients' medication-related decisions. Specifically, participants continuously evaluated and negotiated information obtained from healthcare providers alongside advice from family members, neighbors, and social media before deciding whether to follow prescribed treatment recommendations. This finding provides a deeper understanding of how health literacy operates within patients' everyday social environments.

From a practical perspective, these findings suggest that interventions designed to improve medication adherence should extend beyond educating individual patients. Healthcare providers should actively involve family members in diabetes education sessions, provide simple and culturally appropriate educational materials, and encourage patients to verify health information obtained from informal sources before changing medication regimens. Community-based education programs and family-centered counseling may reduce misinformation while strengthening patients' capacity to distinguish evidence-based recommendations from inaccurate health information circulating within their social networks. Such literacy-sensitive interventions are likely to enhance medication adherence more effectively than approaches focusing exclusively on individual patients.

C. Theme 3 (Communication Barriers with Healthcare Providers)

The third theme emerging from the analysis was the presence of communication barriers between patients and healthcare providers. Although all participants regularly attended healthcare facilities to obtain medication and routine medical examinations, many acknowledged that they did

not fully understand the explanations provided during consultations. Most participants described clinical encounters as brief and predominantly focused on prescribing medication rather than discussing disease management or clarifying patients' concerns. Consequently, participants frequently left the consultation without a comprehensive understanding of their treatment plans.

Several participants admitted that they rarely asked questions during consultations despite experiencing uncertainty regarding medication use. Feelings of hesitation, fear of interrupting healthcare professionals, and the perception that physicians were too busy discouraged participants from seeking clarification. Some participants believed that asking too many questions might be considered inappropriate or disrespectful. Others reported that they simply accepted medical instructions without fully understanding their meaning because they trusted healthcare professionals' authority.

Participants also described difficulties understanding medical terminology used during consultations. Explanations regarding blood glucose control, medication mechanisms, or potential side effects were often perceived as overly technical and difficult to interpret. As a result, several participants relied on their own assumptions after returning home or sought additional explanations from family members or neighbors. This communication gap frequently resulted in uncertainty regarding medication schedules, treatment duration, and the appropriate response to changes in blood glucose levels or medication side effects.

The findings indicate that communication barriers extend beyond patients' individual health literacy and also reflect limitations in the way health information is delivered within healthcare settings. Although participants demonstrated willingness to follow medical advice, inadequate communication prevented them from fully understanding treatment recommendations. Consequently, medication adherence was influenced not only by patients' capacity to comprehend information but also by healthcare providers' ability to communicate information clearly and effectively.

These findings support the work of [Chong et al. \(2025\)](#), who demonstrated that patients' willingness to adhere to medication is strongly influenced by the quality of communication established during clinical encounters. Their study found that patients who received clear explanations, sufficient consultation time, and opportunities to ask questions were more likely to understand treatment recommendations and consistently follow prescribed medication regimens. Similar experiences were observed in the present study, where participants who perceived healthcare providers as approachable reported greater confidence in managing their diabetes.

The present findings are likewise consistent with [Vidiani et al. \(2023\)](#), who reported that patient-centered communication significantly improves medication adherence by enhancing patients' understanding of medication instructions and strengthening their confidence in self-management. Participants in the current study frequently expressed the need for explanations using simple language, practical examples, and repeated clarification. These findings suggest that improving communication strategies may be as important as improving patients' individual health literacy.

Furthermore, [Berkman et al. \(2011\)](#) emphasized that effective communication represents a central component of health literacy because understanding health information depends not only on patients' cognitive abilities but also on the clarity and accessibility of the information provided by healthcare professionals. Patients with limited health literacy are particularly vulnerable when healthcare communication relies heavily on technical terminology or assumes prior medical knowledge. The experiences described by participants in this study clearly illustrate this phenomenon, as misunderstanding frequently originated from communication that exceeded

patients' level of comprehension rather than from unwillingness to follow treatment recommendations.

An important finding emerging from this study is that communication barriers were shaped by both structural and sociocultural factors. Structurally, high patient volumes and limited consultation time reduced opportunities for individualized education and clarification ([Iroegbu et al., 2025](#)). Socioculturally, participants tended to adopt a passive communication style characterized by high respect for healthcare professionals' authority. Rather than engaging in shared decision-making, many participants preferred to accept physicians' recommendations without discussion, even when they did not fully understand the information provided. This interaction pattern may unintentionally perpetuate misunderstanding and contribute to long-term medication non-adherence.

This finding extends previous research by illustrating how cultural norms influence health literacy in everyday clinical practice. While previous quantitative studies have demonstrated statistical associations between patient-provider communication and medication adherence, the present qualitative findings reveal the mechanisms underlying these relationships. Specifically, participants' reluctance to ask questions, combined with limited consultation time and complex medical explanations, created communication barriers that directly affected medication-related decision-making. This deeper understanding represents an important contribution because it explains why adequate healthcare access alone does not necessarily result in optimal adherence among patients with type 2 diabetes mellitus.

The findings also reinforce the principles of patient-centered care advocated by the [World Health Organization \(2022\)](#), which emphasize that effective chronic disease management requires active collaboration between healthcare professionals and patients. Patient-centered communication encourages shared decision-making, mutual understanding, and continuous dialogue rather than one-way information delivery. Within this framework, healthcare providers are expected to adapt explanations to patients' educational backgrounds, health literacy levels, and sociocultural contexts to ensure that treatment recommendations are accurately understood and implemented.

From a practical perspective, these findings suggest that healthcare providers should adopt literacy-sensitive communication strategies during diabetes consultations. The use of plain language, visual educational materials, culturally relevant examples, and the teach-back method may help confirm patients' understanding before consultations conclude. In addition, allocating opportunities for patients to ask questions and involving family members during counseling sessions may strengthen patients' confidence in managing long-term treatment. Such communication strategies are likely to reduce misunderstanding, improve medication adherence, and ultimately enhance glycemic control among patients with type 2 diabetes mellitus.

D. Theme 4 (Health Literacy as an Empowering Factor for Diabetes Self-Management)

The fourth and final theme identified in this study highlights health literacy as an empowering factor that enables patients to actively manage their diabetes and maintain long-term medication adherence. Participants who demonstrated a better understanding of their condition were more likely to perceive medication not merely as a physician's prescription but as an essential component of lifelong disease management. Rather than taking medication only when symptoms appeared, these participants understood that diabetes often progresses without obvious symptoms and therefore requires continuous treatment to prevent complications.

Participants with higher levels of health literacy also reported greater confidence in communicating with healthcare professionals. They actively sought clarification when medication

instructions were unclear, verified health information obtained from social media or acquaintances, and were more willing to discuss treatment alternatives with physicians. These participants viewed healthcare providers as partners in managing their disease rather than solely as authority figures whose instructions should be accepted without question. Such collaborative communication strengthened their confidence in making appropriate medication-related decisions.

Another important finding was the development of self-efficacy among participants with adequate health literacy. They described being able to integrate medication routines into their daily activities by establishing regular schedules, using reminders, and monitoring their own blood glucose levels. Medication adherence was therefore not perceived as an isolated activity but as part of a broader self-management strategy that also included dietary modification, physical activity, routine medical check-ups, and continuous monitoring of disease progression (Chen *et al.*, 2023). These participants expressed greater confidence in their ability to maintain treatment despite the lifelong nature of diabetes.

The findings suggest that health literacy functions not only as a cognitive ability to understand health information but also as a psychological resource that strengthens patients' motivation, confidence, and decision-making capacity (Nutbeam, 2008). Participants who understood the rationale for treatment were more likely to perceive medication adherence as a meaningful investment in their long-term health rather than as a burdensome obligation. Consequently, health literacy facilitated the transition from passive compliance to active engagement in chronic disease management.

These findings strongly support the multidimensional health literacy framework proposed by Nutbeam *et al.* (2018), which distinguishes functional, interactive, and critical health literacy. Functional health literacy enables patients to understand basic medication instructions, while interactive health literacy supports effective communication with healthcare providers and active participation in treatment decisions. Critical health literacy further enables patients to evaluate the credibility of health information obtained from multiple sources and apply that information appropriately in everyday life. The experiences reported by participants illustrate the interaction of these three dimensions in shaping sustainable medication adherence.

The present findings are also consistent with Chong *et al.* (2025), who reported that patients with higher health literacy were more likely to engage actively in shared decision-making and demonstrate greater confidence in managing long-term treatment. Likewise, Vidiani *et al.* (2023) found that patients who clearly understood medication instructions showed significantly better adherence to oral antidiabetic therapy than those with limited understanding. Together, these studies reinforce the present findings by demonstrating that health literacy improves not only knowledge but also behavioral commitment to treatment.

Furthermore, Berkman *et al.* (2011) emphasized that adequate health literacy contributes to improved self-management, healthier behavioral choices, and more favorable clinical outcomes among individuals with chronic diseases. The present study extends these findings by illustrating the processes through which health literacy empowers patients in everyday life. Rather than merely possessing knowledge about diabetes, participants with higher health literacy continuously interpreted health information, evaluated competing sources of advice, communicated with healthcare professionals, and adapted treatment recommendations to their personal circumstances while maintaining adherence to evidence-based medical guidance.

An important contribution of this study lies in its explanation of the mechanisms through which health literacy influences medication adherence. Previous quantitative studies conducted in Indonesia have primarily demonstrated statistical associations between health literacy and

adherence without explaining how these relationships develop in patients' daily lives. In contrast, the present qualitative findings reveal that health literacy operates through a dynamic process involving understanding medication instructions, evaluating health information, negotiating communication with healthcare professionals, and developing confidence for independent self-management. This process-oriented understanding represents the principal novelty of the present study and provides a richer explanation of medication adherence behavior among Indonesian patients with type 2 diabetes mellitus.

Another noteworthy finding concerns the influence of the Indonesian sociocultural context. Participants rarely made medication-related decisions independently; instead, decisions were shaped through continuous interaction with family members, community networks, and healthcare professionals. Consequently, empowerment should not be understood solely as an individual attribute but also as a social process supported by trustworthy communication and appropriate family involvement (Poureslami *et al.*, 2017). This contextual finding enriches the existing literature by demonstrating that health literacy interventions in collectivist societies should incorporate family-centered educational approaches rather than focusing exclusively on individual patients.

The findings have several practical implications for diabetes management within Indonesian primary healthcare settings. Health literacy interventions should extend beyond providing written educational materials and instead emphasize interactive communication, individualized counseling, and family engagement throughout the treatment process. Healthcare professionals should routinely assess patients' understanding of medication instructions, encourage questions during consultations, and apply literacy-sensitive communication strategies such as the teach-back method, visual educational materials, and culturally appropriate explanations. Community-based diabetes education involving patients and family members may further strengthen patients' confidence in self-management and reduce dependence on inaccurate informal information.

Overall, the four themes identified in this study demonstrate that medication adherence is shaped by a complex interaction between patients' understanding of health information, communication with healthcare providers, social influences, and confidence in managing chronic illness. Health literacy therefore emerges not merely as an individual competency but as a multidimensional process that connects knowledge, communication, and self-management behaviors. Strengthening health literacy should consequently become a strategic priority within diabetes management programs to improve medication adherence and long-term health outcomes among patients with type 2 diabetes mellitus.

CONCLUSION

Health literacy plays an important role in medication adherence among patients with type 2 diabetes mellitus. This study identified four main themes: limited understanding of medication use, reliance on informal information sources, communication barriers with healthcare professionals, and health literacy as an empowering factor in diabetes management. Patients with low health literacy often misunderstood medication instructions, were less consistent in taking medication, and tended to rely on non-professional health information. In contrast, patients with better health literacy were able to communicate more effectively with healthcare professionals and follow their treatment more consistently. Therefore, improving health literacy is important in primary healthcare services. Patient-centered communication, clear medication information, and education adapted to patients' literacy levels are needed to improve medication adherence among patients with type 2 diabetes mellitus.

AUTHOR CONTRIBUTION STATEMENT

The authors declare that each author contributed to the preparation of this manuscript as follows: ENM, as the main contributor and corresponding author, was responsible for designing the study, conceptualizing the research, collecting data, analyzing data, and reviewing the data analysis. MKW, as the second author and member, contributed to language editing of the manuscript. The authors have attached the author declaration statement.

CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest regarding the publication of this article.

FUNDING

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

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