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Pharmacists' Experiences and Needs in Pharmaceutical Care to Support Diabetes Medication Adherence in Indonesian Primary Care

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ABSTRACT

Introduction: Medication adherence remains a major challenge in the management of diabetes mellitus, particularly in primary health care. Pharmacists play an important role in supporting adherence through pharmaceutical care. However, there is still limited evidence regarding pharmacists' experiences and needs in implementing pharmaceutical care related to adherence in community health centers *(Puskesmas)* in Indonesia.
Methods: This descriptive cross-sectional study was conducted among pharmacists working at Community Health Centers *(Puskesmas)* in South Kalimantan Province, Indonesia, between July and August 2025. A total of 244 pharmacists were invited, and 161 participated (response rate 66.0%). Data were collected using a validated structured questionnaire consisting of 35 items on a five-point Likert scale, covering pharmacists' experiences, barriers, and needs in implementing pharmaceutical care to support medication adherence among patients with diabetes mellitus. Data were analyzed descriptively.
Results: Pharmacists predominantly relied on indirect adherence assessment, most commonly through prescription refill monitoring (60.9%), while less consistently confirming patients' understanding of therapeutic goals. Adherence-support interventions were largely limited to face-to-face education, with minimal use of remote/digital modalities (telephone or social media: 60.9% never). Monitoring and follow-up were also inconsistent, including limited assessment of adverse drug reactions. Key systemic and workflow barriers included limited time, lack of training, and restricted access to patients' clinical information (75.8%). Pharmacists reported strong needs for standardized adherence assessment tools, accessible patient medication records, systematic guidelines, and training programs.
Conclusion: Pharmaceutical care to support medication adherence among patients with diabetes mellitus in *Puskesmas* is not yet implemented consistently. Strengthening pharmacist competencies through practical tools, clear guidance, and continuous training, together with better access to patient information and appropriate use of digital resources, may improve the delivery of adherence services in primary care.

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INTRODUCTION

Diabetes mellitus (DM) continues to contribute substantially to the global burden of chronic disease, including in Indonesia. One of the main challenges in its management is poor medication adherence (1). Medication adherence among patients with diabetes mellitus remains suboptimal, and this has been associated with treatment failure, greater risk of complications, and lower quality of life (2-4). For this reason, strategies to maintain and improve medication adherence play an important role in diabetes mellitus management.

Pharmaceutical care is an important component of improving medication adherence in patients with diabetes mellitus (5,6). Through the processes of identifying drug-related problems and providing education, counseling, and therapeutic follow-up, pharmacists can help patients understand the importance of long-term treatment and prevent non-adherence to medication. Scientific evidence has demonstrated that structured pharmaceutical care interventions can improve medication adherence, enhance glycemic control, and reduce the risk of complications in patients with diabetes mellitus (7-10). However, at the primary healthcare level, the implementation of pharmaceutical care in the context of medication adherence is often not optimal. In primary care settings, translating evidence-based pharmaceutical care into routine practice depends on implementation conditions, including workload and workflow capacity, pharmacists' competencies and training, availability of standardized tools and guidelines, and access to patients' clinical information and medication records. These system and professional factors may determine whether adherence-support services can be delivered consistently and comprehensively in real-world primary health care (11,12).

Although the effectiveness of pharmaceutical care in improving medication adherence among patients with diabetes mellitus has been widely demonstrated, its implementation in practice is strongly influenced by the conditions of pharmacists as implementing professionals (13,14). Therefore, evidence of effectiveness does not necessarily translate into effective delivery in routine practice. Understanding pharmacists' real-world experiences and the system-level conditions under which they work is essential to identify implementation gaps and readiness for adherence-support pharmaceutical care in primary health care. Pharmacists often face various barriers such as limited time due to heavy workloads, lack of advanced communication skills, and insufficient support in terms of facilities and policies. In addition, the need for continuous training, appropriate educational resources, and the utilization of digital media is becoming increasingly important to enable pharmacists to perform their roles optimally(15,16). By understanding pharmacists' experiences and needs, pharmaceutical care interventions aimed at improving medication adherence among patients with diabetes mellitus can be designed more effectively and tailored to the context of primary health care(17).

Diabetes mellitus is becoming increasingly prevalent in Indonesia and now contributes substantially to morbidity and mortality from chronic diseases (18,19). Based on a systematic review of 30 studies in Indonesia, the level of medication adherence among patients with diabetes mellitus remains relatively low (20). Community Health Centers (*Puskesmas*), as primary health care providers, play a strategic role in managing patients with diabetes mellitus, including delivering pharmaceutical care to support medication adherence. However, evidence remains limited on how pharmaceutical care to support medication adherence is implemented in routine practice within Puskesmas, particularly regarding pharmacists' workflow realities, access to clinical information, availability of practical tools/guidelines, and training needs. A better understanding of pharmacists' experiences and working conditions is necessary to develop practical strategies to improve medication adherence services in Indonesian primary care (21).

To address this implementation-focused knowledge gap, we conducted a descriptive survey to map pharmacists' current practices, perceived barriers, and support needs for adherence-focused pharmaceutical care in *Puskesmas*. This study aimed to explore pharmacists' experiences in implementing pharmaceutical care intended to maintain and improve medication adherence among patients with diabetes mellitus in Community Health Centers (*Puskesmas*) and to identify pharmacists' needs to support the delivery of pharmaceutical care through face-to-face interactions and social media. These findings are expected to provide insights into appropriate strategies to strengthen the role of pharmacists in improving medication adherence among patients with diabetes mellitus in primary health care.

METHOD

This descriptive cross-sectional study was conducted among pharmacists at Community Health Centers (*Puskesmas*) in South Kalimantan Province, Indonesia, between July and August 2025. This study was designed as an exploratory, mapping-oriented survey to provide a descriptive profile of pharmacists' experiences, perceived barriers, and support needs regarding pharmaceutical care for diabetes medication adherence in primary care. All pharmacists working at the selected *Puskesmas* (n = 244) were invited to participate, including active pharmacists involved in patient care, having at least six months of experience in primary health care, and willingness to participate in the study.

Data were collected using a structured questionnaire that was specifically developed for this study. The questionnaire was designed to assess the two main variables. The first variable was pharmacists' experience in implementing pharmaceutical care to improve medication adherence, which included assessment, intervention, and monitoring and evaluation of adherence among patients with diabetes mellitus. The second variable was pharmacists' barriers and needs to support the implementation of pharmaceutical care, including facilities, infrastructure, content, and competencies.

The questionnaire consisted of 35 items measured on a five-point Likert scale. Content validity was evaluated by four independent experts in the field of pharmaceutical care, who demonstrated that all items were consistent with the concepts being measured. Furthermore, the item validity was tested statistically, showing that all items had adequate validity ($r > 0.413$), while the internal reliability of the instrument was very high (Cronbach's $\alpha = 0.931$).

The questionnaire was distributed in both paper-based and online formats (Google Forms), with participation being voluntary and anonymous. Participants' consent was obtained through the completion and submission of the questionnaire. Data were analyzed descriptively using frequencies, percentages, means, and standard deviations to describe the pharmacists' demographic characteristics, experiences, and needs. All analyses were performed using IBM SPSS version 25.0. This study was approved by the Health Research Ethics Committee of Universitas Sari Mulia, Banjarmasin (approval number 047/KEP-UNISM/VI/2025).

RESULTS

A total of 161 pharmacists from Community Health Centers (Puskesmas) participated in this study, out of 244 who were invited, yielding a response rate of 66.0%. The mean age of the respondents was 33.5 ± 6.5 years, with the majority being female (70.8%). Most pharmacists had graduated between 2011 and 2020 (64.0%), and more than half (63.4%) had less than five years of practice experience. The average number of diabetes prescriptions handled was 56.6 ± 28.2 per month. The respondents' demographic characteristics are presented in Table 1.

Table 1. Respondent Demographic

Demographics (n=161)	**Mean ± SD / n (%)**
Age (years)	33.5 ± 6.5
Number of Prescriptions for Diabetic Patients Per Month	56.6 ± 28.2
Gender	
Male	47 (29.2)
Female	114 (70.8)
Education level	
Pharmacist	157 (97.5)
Pharmacist & Master	4 (2.5)
Pharmacy Graduation (Years)	
1991-2000	2 (1.2)
2001-2010	39 (24.2)
2011-2020	103 (64.0)
2021-2025	17 (10.6)
Length of pharmacy practice (years)	
≤ 5	102 (63.4)
> 5	59 (36.6)

In terms of medication adherence assessment, pharmacists generally relied on indirect and subjective methods (Table 2). More than half (60.9%) of the participants sometimes assessed adherence based on prescription refills, and only 4.3% frequently conducted patient interviews to evaluate medication adherence. Exploration of patient behaviors, such as taking medication only when blood glucose levels are high or forgetting to take medication, is generally performed infrequently. Only 30.4% of pharmacists always confirmed patients' understanding of the treatment goals. Overall, these findings indicate a key practice gap: adherence assessment is predominantly indirect and not yet routinely supported by structured, patient-centered assessment approaches. This assessment pattern may limit early identification of adherence problems in routine primary care.

Table 2. Medication Adherence Assessment

No	Indicators	Always	Often	Sometimes	Rarely	Never
1	Assessment of medication adherence via prescription refill timing	0 (0.0)	28 (17.4)	98 (60.9)	35 (21.7)	0 (0.0)
2	Assessment of medication adherence via patient interviews	0 (0.0)	7 (4.3)	49 (30.4)	70 (43.5)	35 (21.7)
3	Assessment of intermittent use of diabetes medications based on blood glucose levels	0 (0.0)	28 (17.4)	49 (30.4)	77 (47.8)	7 (4.3)
4	Assessment of forgotten doses of diabetes medication	0 (0.0)	14 (8.7)	56 (34.8)	56 (34.8)	35 (21.7)
5	Assessment of patient burnout related to routine diabetes mellitus medication use	0 (0.0)	35 (21.7)	70 (43.5)	49 (30.4)	7 (4.3)
6	Assessing patients' understanding of the therapeutic goals in diabetes mellitus management	49 (30.4)	70 (43.5)	21 (13.0)	14 (8.7)	7 (4.3)

In terms of interventions to improve medication adherence, as shown in Table 3, direct face-to-face education was the most frequently applied approach, although only 8.7% of pharmacists always implemented it and more than half (52.2%) did so sometimes. The use of remote methods such as telephone or social media was very limited, with the majority (60.9%) reporting never using them. The provision of educational materials was also suboptimal: nearly half (47.8%) sometimes provided printed booklets, whereas electronic materials via digital platforms were rarely utilized (21.7%). Information regarding drug side effects, therapeutic goals, and benefits of adherence was also infrequently conveyed. Follow-up strategies, such as the integration of reminder applications or simplification of medication regimens, have rarely been implemented. Taken together, the intervention profile remains largely face-to-face and informational, with minimal adoption of digital/remote adherence-support tools and limited structured follow-up strategies, which represents a critical implementation gap in primary care.

With regard to monitoring and evaluation, the results presented in Table 4 indicate that pharmacists most frequently inquired about patients' blood glucose levels (43.5% sometimes and 34.8% rarely), experienced symptoms (60.9% sometimes), and medication-taking routines (44.1% sometimes). However, discussions related to drug side effects were very limited, with 47.8% of pharmacists reporting that they had never asked about them. These findings suggest that monitoring activities have not yet been conducted systematically. Limited adverse drug reactions

monitoring represents a critical deficiency, as it may delay the detection of medication-related problems that can directly contribute to non-adherence and suboptimal treatment outcomes.

Table 3. Interventions to Improve Medication Adherence

No	Indicators	Always	Often	Sometimes	Rarely	Never
1	Providing face-to-face education on medication adherence in diabetes mellitus management	14 (8.7)	49 (30.4)	84 (52.2)	7 (4.3)	7 (4.3)
2	Providing telephone-based education on medication adherence in diabetes mellitus management	0 (0.0)	0 (0.0)	0 (0.0)	63 (39.1)	98 (60.9)
3	Providing social media–based education on medication adherence in diabetes mellitus management	0 (0.0)	0 (0.0)	0 (0.0)	63 (39.1)	98 (60.9)
4	Providing patients with educational booklets or leaflets on medication adherence in diabetes mellitus through direct distribution	7 (4.3)	28 (17.4	77 (47.8)	42 (26.1)	7 (4.3)
5	Providing electronic educational booklets or leaflets on diabetes mellitus medication adherence through social media platforms	0 (0.0)	0 (0.0)	0 (0.0)	35 (21.7)	126 (78.3)
6	Providing information on the prescribed frequency of diabetes mellitus drug administration	0 (0.0)	7 (4.3)	42 (26.1)	105 (65.3)	7 (4.3)
7	Providing information on actions to be taken in the event of adverse effects from diabetes mellitus medications	0 (0.0)	0 (0.0)	0 (0.0)	21 (13.0)	140 (87.0)
8	Providing information regarding the objectives of diabetes mellitus management	0 (0.0)	7 (4.3)	28 (17.4)	77 (47.8)	49 (30.4)
9	Providing information on the possible risks associated with non-adherence to diabetes mellitus medication	0 (0.0)	0 (0.0)	28 (17.4)	14 (8.7)	119 (73.9)
10	Providing information on the positive outcomes associated with proper adherence to diabetes mellitus medication	0 (0.0)	0 (0.0)	28 (17.4)	35 (21.7)	98 (60.9)
11	Providing education regarding potential interactions of diabetes mellitus medications with other drugs and with food	0 (0.0)	0 (0.0)	56 (34.8)	21 (13.0)	84 (52.2)
12	Simplifying the diabetes mellitus treatment medication	0 (0.0)	7 (4.3)	42 (26.1)	49 (30.4)	63 (39.1)
13	Integrating mobile phone–based applications for medication reminders and diabetes mellitus prescription refills	0 (0.0)	28 (17.4)	49 (30.4)	42 (26.1)	42 (26.1)
14	Providing medication reminders for diabetes mellitus through phone calls. text messaging. or social media platforms	0 (0.0)	0 (0.0)	0 (0.0)	21 (13.0)	140 (87.0)
15	Providing reminders for prescription refills in diabetes mellitus management through phone calls. text messages. or social media platforms	0 (0.0)	0 (0.0)	0 (0.0)	21 (13.0)	140 (87.0)

Table 4. Monitoring and Evaluation of Medication Adherence

No	Indicators	Always	Often	Sometimes	Rarely	Never
1	Assessing patients' reported blood glucose levels	0 (0.0)	14 (8.7)	70 (43.5)	56 (34.8)	21 (13.0)
2	Assessing patient-reported symptoms after diabetes taking diabetes mellitus medications	0 (0.0)	0 (0.0)	98 (60.9)	42 (26.1)	21 (13.0)
3	Assessing patient-reported adverse drug reactions associated with diabetes mellitus medications	0 (0.0)	0 (0.0)	21 (13.0)	63 (39.1)	77 (47.8)
4	Assessing patients' routines in taking diabetes mellitus medications	1 (0.6)	17 (10.6)	71 (44.1)	53 (32.9)	19 (11.8)

Across Tables 2–4, the most salient gaps include predominant indirect assessment, limited diversification of adherence-support interventions (particularly digital/remote modalities), and suboptimal routine monitoring, especially ADR monitoring. These findings highlight areas for strengthening pharmaceutical care implementation in *Puskesmas*.

As shown in Table 5, the pharmacists encountered several major challenges. Limited time was a considerable obstacle, with 60.8% agreeing or strongly agreeing. The majority (69.5%) reported never having received pharmaceutical care training specifically focused on medication adherence in diabetes. Difficulties in obtaining patients' demographic and clinical information were also reported as barriers. In contrast, most pharmacists did not consider inter-professional collaboration with physicians as a major obstacle.

Table 5. Barriers to Supporting Medication Adherence

No	Indicators	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1	Time constraints	35 (21.7)	63 (39.1)	0 (0.0)	42 (26.1)	21 (13.0)
2	Lack of training in pharmaceutical care related to adherence to diabetes mellitus medications	7 (4.3)	105 (65.2)	7 (4.3)	35 (21.7)	7 (4.3)
3	Barriers to discussing diabetes mellitus medication adherence with healthcare providers	7 (4.3)	28 (17.4)	21 (13.0)	98 (60.9)	7 (4.3)
4	Lack of demographic and clinical data of patients	28 (17.4)	91 (56.5)	14 (8.7)	28 (17.4)	0 (0.0)
5	Difficulties in accessing patients' demographic and clinical information	56 (34.8)	66 (41.0)	39 (24.2)	0 (0.0)	0 (0.0)

Table 6. Needs to Support Medication Adherence

No	**Indicators**	**Strongly agree**	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**
1	The availability of a specific questionnaire instrument used to analyze medication adherence among patients with diabetes mellitus	57 (35.4)	88 (54.7)	16 (9.9)	0 (0.0)	0 (0.0)
2	The availability of guidelines for using a specific questionnaire to analyze medication adherence among patients with diabetes mellitus	56 (34.8)	72 (44.7)	33 (20.5)	0 (0.0)	0 (0.0)
3	The availability of medical records documenting diabetes mellitus medication	49 (30.4)	80 (49.7)	32 (19.9)	0 (0.0)	0 (0.0)
4	The accessibility of medication records for patients with diabetes mellitus	49 (30.4)	81 (50.3)	31 (19.3)	0 (0.0)	0 (0.0)
5	The availability of a pharmaceutical care implementation module to improve medication adherence among patients with diabetes mellitus	57 (35.4)	88 (54.7)	16 (9.9)	0 (0.0)	0 (0.0)
6	The availability of systematic guidelines for managing medication non-adherence among patients with diabetes mellitus	32 (19.9)	112 (69.6)	17 (10.6)	0 (0.0)	0 (0.0)
7	The availability of training programs in providing pharmaceutical care to improve medication adherence among patients with diabetes mellitus	57 (35.4)	64 (39.8)	40 (24.8)	0 (0.0)	0 (0.0)
8	The availability of training programs on the use of educational modules to improve medication adherence among patients with diabetes mellitus	40 (24.8)	48 (29.8)	73 (45.3)	0 (0.0)	0 (0.0)

Concerning the need to support pharmaceutical care in medication adherence, as illustrated in Table 6, respondents emphasized the importance of having structured instruments and guidelines. More than 90% agreed on the necessity of a dedicated questionnaire to assess adherence, access patients' medication records, and systematic guidance to address non-adherence. The majority also highlighted the need for training programs, both for the implementation of pharmaceutical care and the use of educational modules, indicating a strong demand for enhanced capacity and more structured system support.

DISCUSSION

The findings of this study suggest that pharmaceutical care services delivered by pharmacists in primary health centers have not been fully optimized to improve medication adherence among patients with diabetes mellitus. Although adherence assessments are commonly performed, they are generally based on indirect measures, such as prescription refill records, rather than structured and in-depth patient interviews. This pattern aligns with previous research showing that medication adherence evaluation in primary care settings frequently depends on administrative data and has not yet been systematically integrated with comprehensive clinical assessment approaches. (21-23).

In terms of interventions, pharmacists in primary health centers continue to rely mainly on conventional face-to-face counseling. The use of digital approaches, such as telephone consultations, social media communication, and mobile health applications, remains limited. This situation differs from findings reported in previous studies, which demonstrate the expanding role of telemedicine and digital health tools in the management of chronic diseases, including diabetes, particularly in improving medication adherence (24-26). The limited adoption of these technologies may be associated with several practical challenges, including inadequate infrastructure, insufficient professional training, and the lack of standardized guidelines to support digital health implementation in primary care settings (27).

Medication adherence monitoring and evaluation activities have also not been conducted optimally (28,29). Most pharmacists inquired about patients' blood glucose levels or experienced symptoms only occasionally, and nearly half of them had never explored drug side effects. However, pharmacist involvement in therapy monitoring has been shown to be crucial for the early detection of adherence problems and potential adverse effects, which may contribute to improved outcomes (30,31). In the context of *Puskesmas*, these findings indicate that monitoring activities could be improved by adopting a more proactive and structured approach in daily pharmaceutical practice.

Pharmacists working in *Puskesmas* reported several practical barriers that affect the delivery of pharmaceutical care, particularly the limited time, lack of specific training on medication adherence, and difficulties in accessing patients' demographic and clinical data (32). These barriers are consistent with reports from various studies in developing countries that highlight high workloads and limited infrastructure as factors hindering the full implementation of pharmaceutical care (33). Interestingly, most pharmacists did not consider collaboration with physicians as a major barrier, which may present an opportunity to strengthen inter-professional collaboration in supporting patient medication adherence (34-36).

Most pharmacists emphasized the importance of having assessment instruments, systematic guidelines, access to patients' medication records, and ongoing training programs (37,38). In the context of primary health centers, improving medication adherence cannot rely solely on individual pharmacists, but also requires supportive policies, infrastructure, and organizational systems. With the availability of educational modules, communication competency training, and the integration of digital technologies, pharmacists in primary care may be better supported to contribute improving medication adherence among patients with diabetes mellitus (39,40).

Overall, this study provides a real-world depiction of the gap between the potential role of pharmacists and their actual practice, and it is framed as an implementation-focused contribution to the pharmaceutical care and medication adherence literature in Indonesian primary care (*Puskesmas*). In the *Puskesmas* setting, pharmacists reported practical challenges such as relying mainly on indirect adherence assessment, limited use of digital or remote support, and inconsistent monitoring of adverse drug reactions. To improve the delivery of pharmaceutical care to support medication adherence among patients with diabetes mellitus in Indonesia, future implementation efforts may consider strengthening pharmacists' capacities, improving facilities and infrastructure, and developing supportive policies that may facilitate feasible innovations, including appropriate use of social media and digital technologies in pharmaceutical practice (41-44).

This study had several limitations. First, the cross-sectional design does not allow tracing causal relationships between variables, and thus, can only depict the situation at the time of the study. Second, the data were obtained through self-reported questionnaires, which may have been influenced by social desirability bias or respondents' subjectivity. Third, although the response rate was acceptable, we did not conduct a formal assessment of non-response bias; therefore, representativeness cannot be fully assured if non-respondents differed systematically from respondents. This may limit the external validity of the findings, and caution is warranted when generalizing the results beyond the participating pharmacists and the study context. Fourth, although the questionnaire demonstrated high internal consistency, we did not conduct formal construct validation; therefore, domain-level interpretations should be made cautiously, and the high alpha may indicate potential item redundancy. Nevertheless, this study makes an important contribution by systematically depicting the experiences, barriers, and needs of pharmacists in primary health centers regarding the implementation of pharmaceutical care to support medication adherence among patients with diabetes mellitus, which can serve as a basis for developing future intervention strategies.

CONCLUSION

This study describes how pharmaceutical care related to diabetes medication adherence is currently practiced in *Puskesmas* in Indonesia, including the challenges faced by pharmacists and the support they consider necessary. The findings show that adherence assessment is still largely indirect, intervention strategies remain limited, particularly in the use of telephone or social media, and routine monitoring, especially of adverse drug reactions, is not yet consistent. Pharmacists also reported practical constraints in their daily work, such as limited time, insufficient training, and restricted access to patients' clinical and medication records. Strengthening organizational support, improving access to patient information, and promoting the appropriate use of digital tools may help make medication adherence services more feasible in primary care settings.

AUTHOR'S CONTRIBUTION STATEMENT

All authors contributed significantly to this study. Riza Alfian was involved in the conception and design of the cross-sectional survey, supervised the research process, and drafted the initial manuscript. Muhammad Hafizh Abiyyu Fathin Fawwazi contributed to data collection, data management, and preliminary analysis. Wirawan Adikusuma supported the statistical analysis and interpretation of results, particularly in developing tables and figures. Yohane Vincent Abero Phiri conducted the literature review, assisted in manuscript writing, and performed the final revision to ensure the feasibility of publication. All authors have read and approved the final version of this manuscript.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

This manuscript was prepared, edited, and analyzed exclusively by the authors without the use of generative AI or AI-assisted technologies.

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