

APPROPRIATENESS OF GUIDELINE-RECOMMENDED STATIN THERAPY AND LDL-C GOAL ATTAINMENT AMONG PATIENTS WITH TYPE 2 DIABETES MELLITUS IN AN INDONESIAN PRIMARY CARE CLINIC

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ABSTRACT

Introduction: Patients with type 2 diabetes mellitus (T2DM) have a substantially increased risk of developing atherosclerotic cardiovascular disease (ASCVD). Current clinical guidelines recommend statin therapy according to cardiovascular risk stratification to reduce LDL-C levels and prevent cardiovascular events. However, evidence regarding the appropriateness of statin therapy and LDL-C goal attainment in Indonesian primary care settings remains limited, particularly in the context of National Formulary (Formularium Nasional/Fornas) policy constraints.

Purpose: To evaluate the appropriateness of statin therapy according to current clinical guideline recommendations and assess LDL-C goal attainment among patients with type 2 diabetes mellitus at a primary care clinic.

Method: A retrospective observational study was conducted using medical records of 270 T2DM patients aged ≥ 40 years with complete lipid profile data at Primary Care Clinic "X" between January 2025 and April 2026. Cardiovascular risk was assessed using the ASCVD Risk Estimator and stratified according to the Indonesian Society of Cardiology (PERKI) 2022 guideline. Statin therapy appropriateness was evaluated based on the ADA 2026, ACC/AHA 2018, and PERKENI 2024 guidelines, while LDL-C goal attainment was assessed according to cardiovascular risk category.

Result: Of 270 patients, the mean age was 60.7 ± 7.9 years, and 63.3% were female. Based on ASCVD risk stratification, 196 patients (72.6%) were recommended to receive high-intensity statins, and 74 patients (27.4%) were recommended to receive moderate-intensity statins. However, only 60 patients (22.2%) received any statin therapy – all simvastatin, predominantly at 10 mg (low-intensity). No patient received high-intensity statin therapy (0%). LDL-C goals were achieved in only 22 patients (8.1%), with the lowest attainment in the very high-risk group (target <55 mg/dL: 0.9%).

Conclusion: A substantial gap exists between guideline-recommended statin therapy and actual prescribing practice in primary care, with extremely low LDL-C goal attainment. This gap is attributed to structural barriers from the National Formulary policy, therapeutic inertia, and limited clinical pharmacist involvement. National Formulary reform based on cardiovascular risk stratification and strengthened roles of clinical pharmacists in medication review and therapy advocacy are urgently needed to improve ASCVD prevention in T2DM patients.

Keywords: ASCVD, LDL-C, primary care, statin, type 2 diabetes mellitus

INTRODUCTION

Type 2 diabetes mellitus (T2DM) is a chronic disease with increasing prevalence and a major challenge to health systems worldwide. IDF (2025) reported that approximately 589 million adults were living with diabetes in 2025, with projections rising to 853 million by 2050. Indonesia ranks among the countries with the highest number of people with diabetes globally, making the prevention of diabetes complications a priority in healthcare services.

Cardiovascular complications are the leading cause of morbidity and mortality in patients with T2DM. Chronic hyperglycemia, dyslipidemia, hypertension, and other metabolic risk factors accelerate atherosclerosis, increasing the risk of myocardial infarction, stroke, and cardiovascular death. This risk can be two to four times higher compared to the population without diabetes (ADA, 2026). Therefore, prevention of atherosclerotic cardiovascular disease (ASCVD) is a key component of T2DM management (PERKI, 2022).

In the pathogenesis of ASCVD, low-density lipoprotein cholesterol (LDL-C) plays a central role. Excess LDL-C particles undergo oxidation and trigger inflammatory responses, macrophage infiltration, and atherosclerotic plaque formation, ultimately leading to plaque rupture and major cardiovascular events (Grundy et al., 2019). Epidemiological studies and clinical trials have consistently demonstrated a linear correlation between LDL-C levels and cardiovascular risk, establishing LDL-C as the primary target of lipid-lowering therapy in both international and national clinical

guidelines (ADA, 2026); (PERKENI, 2024).

Statins are the first-line therapy for lowering LDL-C. These agents inhibit 3-hydroxy-3-methylglutaryl-coenzyme A (HMG-CoA) reductase, reducing hepatic cholesterol synthesis and increasing LDL receptor expression in the liver (Grundy et al., 2019). In addition to LDL-C lowering, statins exert pleiotropic effects including improved endothelial function, reduced vascular inflammation, and atherosclerotic plaque stabilization (PERKENI, 2024). Large clinical trials, including meta-analyses by the Cholesterol Treatment Trialists' (CTT) Collaboration, have demonstrated that each 39 mg/dL (1 mmol/L) reduction in LDL-C with statin therapy is associated with a 21% reduction in major vascular events (CTT Collaboration, 2015); (CTT Collaboration, 2019). ADA (2026), *American College of Cardiology/ American Heart Association* (ACC/AHA), and the Indonesian Society of Endocrinology (PERKENI, 2024) recommend statin therapy based on cardiovascular risk stratification, with high-intensity statins for patients at high or very high ASCVD risk, and progressively lower LDL-C targets according to risk category.

Despite clear clinical guideline recommendations, the implementation of statin therapy in patients with T2DM in Indonesia faces various challenges. Widyahening et al. (2014) reported that adherence to clinical guidelines among physicians in primary care settings remains low, with gaps between knowledge and daily clinical practice. Barriers such as limited consultation time, lack of reminder systems for periodic therapy evaluation, and inadequate

documentation of cardiovascular risk have been identified as obstacles to evidence-based therapy implementation (Irawati et al., 2020); (Khunti et al., 2018). Furthermore, qualitative studies in Indonesia have revealed that unclear guidelines and concerns regarding administrative aspects influence statin prescribing decisions by physicians in primary care facilities (Irawati et al., 2020). These conditions may contribute to a gap between scientific recommendations and actual clinical practice.

Several studies in Indonesia have identified inappropriate statin use in patients with T2DM. Isandora et al. (2021) reported that some patients with high ASCVD risk had not received appropriate statin therapy. Bakhtiar et al., (2023) in Samarinda found that among 11 T2DM patients, there were 4 Drug Related Problems (DRPs) related to statins, including 3 cases of medication not indicated and 1 case of underdose. Rahayu and Simanjuntak (2024) in Bandung also reported that most patients with dyslipidemia and diabetes only received simvastatin 10 mg without dose escalation, despite not achieving LDL-C targets.

However, most of these studies only evaluated statin prescribing patterns or therapy appropriateness based on specific guidelines without linking them to LDL-C goal attainment as a clinical outcome indicator. Yet the success of statin therapy is determined not only by appropriate intensity selection but also by whether LDL-C targets are achieved according to cardiovascular risk level. Evaluations integrating both aspects—statin therapy appropriateness based on ASCVD risk stratification and LDL-C goal attainment—in primary care settings remain very limited (Widyahening et al., 2014).

Consequently, the magnitude of the gap between guideline recommendations and actual practice in primary care, and its impact on clinical outcomes in T2DM patients in Indonesia, remains unknown.

Based on the above, it remains unclear whether statin therapy provided to T2DM patients in primary care settings aligns with clinical guideline recommendations and achieves LDL-C targets according to cardiovascular risk. This study was conducted to answer the following questions:

1. Is statin therapy in T2DM patients at the Primary Care Clinic appropriate according to clinical guideline recommendations based on ASCVD risk stratification?
2. What is the level of LDL-C goal attainment in T2DM patients based on cardiovascular risk category?

Unlike previous studies in Indonesia that evaluated statin prescribing patterns or therapy appropriateness separately, this study evaluates the relationship between guideline-recommended therapy based on ASCVD risk stratification, actual implementation, and LDL-C goal attainment simultaneously in T2DM patients in primary care. This integrative approach enables more comprehensive identification of gaps between clinical guidelines and clinical outcomes achieved.

This study aims to evaluate the appropriateness of statin therapy based on clinical guidelines and LDL-C goal attainment in T2DM patients at the Primary Care Clinic. The findings are expected to provide an overview of lipid-lowering therapy implementation in primary care practice and serve as a basis for improving ASCVD prevention strategies in T2DM patients.

LITERATURE REVIEW

International and national guidelines consistently recommend statin therapy in patients with type 2 diabetes mellitus (T2DM) based on cardiovascular risk stratification. . The ADA (2026) recommends moderate-intensity statins for T2DM patients aged ≥ 40 years without additional risk factors, and high-intensity statins for those with one or more ASCVD risk factors, with a target LDL-C reduction of $\geq 50\%$ and achievement of LDL-C < 70 mg/dL in the high-risk group, and < 55 mg/dL in the very high-risk group. Similar recommendations are found in the American College of Cardiology/American Heart Association (ACC/AHA) 2018 guidelines and the Indonesian Society of Endocrinology (PERKENI) 2024 guidelines, which emphasize statin intensity selection based on cardiovascular risk level rather than baseline cholesterol levels alone (Grundy et al., 2019); (PERKENI, 2024). LDL-C targets become progressively stricter with increasing risk: < 70 mg/dL for high risk and < 55 mg/dL for very high risk (PERKI, 2022).

Despite clear guideline recommendations, statin therapy implementation in various countries faces significant gaps. The DA VINCI study in Europe showed that most high-risk patients had not achieved recommended LDL-C targets, with lack of therapy intensification as the main cause (Ray et al., 2021). Similar findings were reported by the SANTORINI study, showing that very high-risk patients in Europe remained far from recommended LDL-C targets (Ray et al., 2023). The DYSIS II study also revealed that despite guideline recommendations for statin therapy in high-risk patients, implementation in primary care settings remains low, with significant underutilization (Gitt et

al., 2017). This gap between guideline recommendations and clinical practice occurs not only in developed countries but also poses a challenge in developing countries including Indonesia.

In Indonesia, several studies have identified inappropriate statin use in T2DM patients. Isandora et al. (2021) reported that some patients with high ASCVD risk had not received appropriate statin therapy, with low levels of adherence. Bakhtiar et al. (2023) in Samarinda found that among 11 T2DM patients, there were 4 Drug Related Problems (DRPs) related to statins, including medications not indicated and underdose. The study also showed that patients with high ASCVD risk ($\geq 20\%$) should have received high-intensity statins but instead received simvastatin 20 mg, which is classified as moderate-intensity. A study in Bandung reported that most patients with dyslipidemia and diabetes only received simvastatin 10 mg without dose escalation, despite not achieving LDL-C targets (Rahayu & Simanjuntak, 2024).

Qualitative studies in Indonesia have revealed several factors contributing to the gap in statin therapy implementation. Irawati et al. (2020) found that unclear guidelines, lack of clinical guideline dissemination, and concerns about administrative aspects influenced statin prescribing decisions by physicians in primary care facilities. Furthermore, Widyahening et al. (2014) showed that adoption of clinical guidelines by physicians in Indonesia remains low, with gaps between knowledge and daily clinical practice. Therapeutic inertia—failure to initiate or intensify therapy despite clinical indications being met—has also been reported as a major contributor to low implementation of cardiovascular prevention therapy in

diabetic patients (Khunti et al., 2018); (Schmittziel et al., 2008).

Although various studies have identified inappropriate statin use in T2DM patients in Indonesia, most of these studies only evaluated statin prescribing patterns or therapy appropriateness based on specific guidelines without linking them to LDL-C goal attainment as a clinical outcome indicator. Evaluations integrating both aspects—statin

therapy appropriateness based on ASCVD risk stratification and LDL-C goal attainment—in primary care settings remain very limited. Consequently, the magnitude of the gap between guideline recommendations and actual practice in primary care, and its impact on clinical outcomes in T2DM patients in Indonesia, remains unknown.

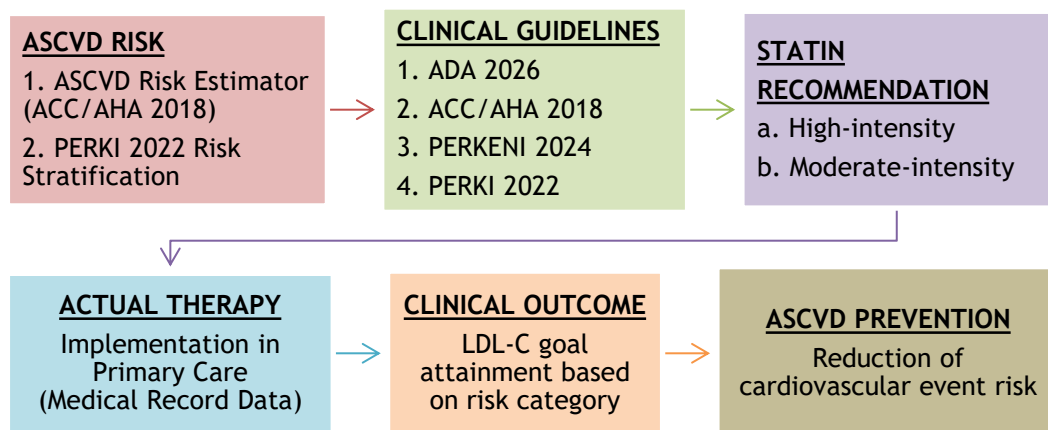


Figure 1. *Conceptual Framework*

Based on this conceptual framework, this study follows the flow from ASCVD risk assessment, therapy recommendations based on clinical guidelines, actual therapy implementation in primary care, to clinical outcomes in the form of LDL-C goal attainment. By linking these four stages, this study is expected to identify gaps in ASCVD prevention therapy implementation in T2DM patients in primary care.

METHODS

This was an observational study with a descriptive-analytic design using a retrospective approach. Data were obtained from medical records of type 2 diabetes mellitus (T2DM) patients receiving care at Primary Care Clinic "X". A retrospective approach was chosen to evaluate the appropriateness of statin therapy based on clinical

guideline recommendations and LDL-C goal attainment based on documented clinical data.

The study population was all T2DM patients who underwent lipid profile examinations at Primary Care Clinic "X" during the period January 2025 to April 2026. The sample was selected using total sampling, where all patients meeting inclusion criteria and not meeting exclusion criteria were included in the study.

Inclusion criteria were T2DM patients aged ≥ 40 years, having complete lipid profile data, and having clinical data required for ASCVD risk assessment. A total of 270 patients met all criteria and were analyzed in the study.

Variables observed included patient characteristics (age, sex, history of coronary heart disease, antihypertensive therapy use, and

smoking status), laboratory parameters (total cholesterol, HDL-C, and LDL-C), ASCVD risk category, recommended statin intensity based on guidelines, actual statin therapy, statin therapy appropriateness, and LDL-C goal attainment.

Cardiovascular risk was calculated using the ASCVD Risk Estimator based on age, sex, systolic blood pressure, total cholesterol, HDL-C, smoking status, and antihypertensive therapy use. Patients were then grouped according to PERKI 2022 risk stratification to determine LDL-C targets.

Statin therapy appropriateness was evaluated by comparing the statin intensity received by patients with PERKENI 2024 recommendations. Therapy was categorized as appropriate when the actual statin intensity matched the recommended intensity based on the patient's risk level, and inappropriate when the intensity given was lower than or did not match the recommendation.

The main outcomes of this study were:

1. Appropriateness of statin therapy based on clinical guideline recommendations.
2. LDL-C goal attainment based on cardiovascular risk category according to PERKI 2022.

Data were analyzed descriptively using frequency distributions, percentages, means, and standard deviations. Results were presented in tables describing patient characteristics, cardiovascular risk distribution, statin therapy recommendations, statin prescribing patterns, therapy appropriateness, and LDL-C goal attainment.

This study received ethical approval from the Health Research Ethics Committee of Universitas Surabaya (No. 830/KE/IV/2026) prior to data collection. All medical record data were anonymized to maintain patient confidentiality in accordance with health research ethics principles.

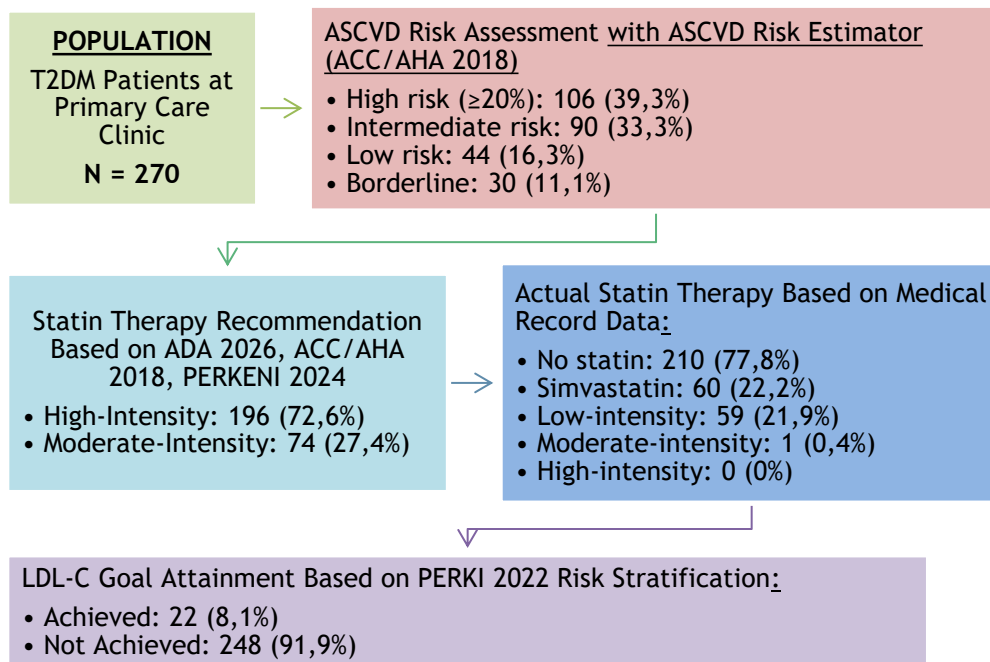


Figure 2. Study Flow and Key Findings

RESULT

A total of 270 T2DM patients met the inclusion criteria. The mean age was 60.7 ± 7.9 years (range 41-74 years). The majority were female (63.3%). A total of 162 patients

(60.0%) were on antihypertensive therapy, 72 patients (26.7%) had a history of coronary heart disease, and 40 patients (14.8%) had a history of smoking (Table 1).

Table 1. Characteristics of Type 2 Diabetes Mellitus Patients

Variable	n (%) / Mean $\pm$ SD
Total patients	270
Age (years)	60.7 ± 7.9
Male	99 (36.7)
Female	171 (63.3)
Antihypertensive use	162 (60.0)
History of CHD	72 (26.7)
Smoking	40 (14.8)

Lipid Profile

Mean baseline LDL-C was 121.1 ± 46.5 mg/dL, while mean follow-up LDL-C was 136.2 ± 42.6 mg/dL. Mean baseline HDL-C was

36.9 ± 11.1 mg/dL and decreased to 30.0 ± 8.6 mg/dL. Mean baseline total cholesterol was 186.5 ± 52.6 mg/dL and increased to 191.9 ± 47.2 mg/dL (Table 2).

Table 2. Lipid Profile of Patients

Parameter	Mean $\pm$ SD (mg/dL)
Baseline LDL-C	121.1 ± 46.5
Follow-up LDL-C	136.2 ± 42.6
Baseline HDL-C	36.9 ± 11.1
Follow-up HDL-C	30.0 ± 8.6
Baseline total cholesterol	186.5 ± 52.6
Follow-up total cholesterol	191.9 ± 47.2

ASCVD Risk and Statin Therapy Recommendations

Based on the ASCVD Risk Estimator, 106 patients (39.3%) were classified as high risk ($\geq 20\%$), 90 patients (33.3%) as intermediate risk (7.5%- $<20\%$), 44 patients (16.3%) as

low risk ($<5\%$), and 30 patients (11.1%) as borderline risk (5%- $<7.5\%$). Accordingly, 196 patients (72.6%) were recommended for high-intensity statins, while 74 patients (27.4%) were recommended for moderate-intensity statins (Table 3).

Table 3. Recommended Statin Intensity Based on ASCVD Risk

Recommended Statin Intensity	n	%
Moderate-intensity	74	27.4
High-intensity	196	72.6

Total	270	100.0
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Statin Prescribing Patterns

Of 270 patients, only 60 patients (22.2%) received statin therapy, while 210 patients (77.8%) received no statin. All statins used were simvastatin, with 59 patients (21.9%) receiving simvastatin 10 mg

and 1 patient (0.4%) receiving simvastatin 20 mg. Based on therapy intensity, 59 patients (21.9%) received low-intensity statins, 1 patient (0.4%) received moderate-intensity statins, and no patient received high-intensity statins (0%) (Table 4).

Table 4. Statin Prescribing Patterns

Variable	n	%
No statin therapy	210	77.8
Received statin	60	22.2
Simvastatin	60	22.2
Simvastatin 10 mg	59	21.9
Simvastatin 20 mg	1	0.4
Low-intensity statin	59	21.9
Moderate-intensity statin	1	0.4
High-intensity statin	0	0.0

Appropriateness of Statin Therapy

Among the 196 patients recommended for high-intensity statins, 152 patients (77.6%) received no statin, 44 patients (22.4%) received only low-intensity statins, and no patients (0%) received high-intensity statins.

Among the 74 patients recommended for moderate-intensity statins, 58 patients (78.4%) received no statin, 15 patients (20.3%) received low-intensity statins, and 1 patient (1.4%) received moderate-intensity statins (Table 5).

Table 5. Appropriateness of Statin Therapy by ASCVD Risk

Recommended Intensity	No Statin	Low-Intensity	Moderate-Intensity	High-Intensity	Total
Moderate	58	15	1	0	74
High	152	44	0	0	196
Total	210	59	1	0	270

LDL-C Goal Attainment

Overall, 22 patients (8.1%) achieved their LDL-C goal according

to risk category, while 248 patients (91.9%) did not (Table 6).

Table 6. LDL-C Goal Attainment

Outcome	n	%
Achieved	22	8.1
Not achieved	248	91.9
Total	270	100.0

Based on LDL-C goal categories, in the very high-risk group (target <55 mg/dL), 1 of 106 patients (0.9%) achieved the goal; in the high-risk group (target <70 mg/dL), 5 of 91 patients (5.5%)

achieved the goal; in the moderate-risk group (target <100 mg/dL), 12 of 59 patients (20.3%) achieved the goal; and in the low-risk group (target <116 mg/dL), 4 of 14 patients (28.6%) achieved the goal (Table 7).

Table 7. LDL-C Goal Attainment by Risk Category

LDL-C Goal	Achieved	Not Achieved	Total
<55 mg/dL	1 (0.9%)	105 (99.1%)	106
<70 mg/dL	5 (5.5%)	86 (94.5%)	91
<100 mg/dL	12 (20.3%)	47 (79.7%)	59
<116 mg/dL	4 (28.6%)	10 (71.4%)	14
Total	22 (8.1%)	248 (91.9%)	270

DISCUSSION

Appropriateness of Statin Therapy in Patients with Type 2 Diabetes Mellitus

This study revealed a concerning finding: among 196 patients (72.6%) recommended to receive high-intensity statins based on ASCVD risk stratification, no patients received this therapy. Instead, 77.8% of patients received no statin at all, and those who received statins only received simvastatin at 10-20 mg doses – classified as low to moderate intensity.

This finding demonstrates a substantial evidence-practice gap between clinical guideline recommendations and primary care practice. This gap is much larger compared to previous studies in Indonesia. Isandora et al. (2021) reported that 68.08% of T2DM patients with high ASCVD risk only received low-intensity statins. Bakhtiar et al. (2023) in Samarinda found that patients with high ASCVD risk ($\geq 20\%$) who should have received high-intensity statins instead received simvastatin 20 mg, classified as moderate-intensity. A study in Iran by Kargar et al. (2024) involving 500 diabetic patients showed that although 80.8% of patients received statins, only 29.4% received doses according to

guidelines—a substantially higher rate than in the present study. International studies such as DA VINCI and SANTORINI reported that even in Europe, most high-risk patients had not achieved LDL-C targets due to a lack of therapy intensification (Ray et al., 2021; Ray et al., 2023). However, compared to all these studies, the degree of inappropriateness in this study was most severe due to the complete absence of high-intensity statin use.

Several factors may explain this finding. First, the limited variation of statins available in primary care facilities may influence therapy choices. Irawati et al. (2020) revealed that unclear guidelines and concerns about administrative aspects influence statin prescribing decisions by physicians in primary care facilities. Second, ASCVD risk stratification has not become routine in primary care practice, so therapy decisions are more often based on clinical habits rather than risk-based recommendations (Widyahening et al., 2014). Third, therapeutic inertia—failure to initiate or intensify therapy despite clinical indications being met—may still be present (Khunti et al., 2018). Similar conditions have been reported as a major contributor to low implementation of cardiovascular prevention therapy in

diabetic patients (Schmitt diel et al., 2008).

Clinically, low appropriateness of statin therapy means patients remain at high risk for preventable ASCVD events. Based on the CTT Collaboration (2015) meta-analysis, each 39 mg/dL reduction in LDL-C is linearly associated with a 21% reduction in major vascular events. Thus, the failure to provide high-intensity statins to these 196 high-risk patients may increase the burden of preventable major cardiovascular events in this population. Therefore, efforts to improve adherence to clinical guidelines through healthcare professional education, optimization of cardiovascular risk assessment processes, and strengthening the role of clinical pharmacists in conducting medication review and providing evidence-based therapy recommendations are needed (PERKI, 2022).

LDL-C Goal Attainment in Patients with Type 2 Diabetes Mellitus

The consequence of low statin therapy appropriateness is reflected in low LDL-C goal attainment: only 8.1% of patients achieved targets according to risk category. In other words, more than 9 out of 10 T2DM patients at this Primary Care Clinic did not achieve recommended lipid control targets. This figure is below expected standards and indicates that lipid management in T2DM patients in primary care facilities remains suboptimal.

This finding is consistent with Bakhtiar et al. (2023) who reported that among 11 T2DM patients, the highest ASCVD risk group reached 58.02%, indicating a significant cardiovascular risk burden in the diabetic population. Rahayu and Simanjuntak (2024) in Bandung also

found that most patients with dyslipidemia and diabetes only received simvastatin 10 mg without dose escalation. The DYSIS II study also showed that despite clinical guidelines recommending statin therapy in high-risk patients, implementation in primary care facilities remains low, with significant underutilization (Gitt et al., 2017). This confirms that low LDL-C goal attainment is not a local phenomenon but a global problem.

Analysis by LDL-C goal category showed a consistent pattern: the higher the patient's cardiovascular risk (the stricter the LDL-C goal), the lower the proportion achieving the goal. In the very high-risk group with a target of <55 mg/dL, only 0.9% of patients achieved the goal. In contrast, in the low-risk group with a target of <116 mg/dL, 28.6% of patients achieved the goal. This pattern indicates that patients at the highest cardiovascular risk—who would benefit most from intensive statin therapy—are the group with the lowest achievement of therapy targets. This finding aligns with the DA VINCI and SANTORINI studies, which showed that high- and very high-risk patients often fail to achieve LDL-C targets, partly due to insufficiently intensive lipid-lowering therapy (Ray et al., 2021); (Ray et al., 2023).

The low LDL-C goal attainment in this study is likely related to low statin therapy appropriateness, although other factors such as patient adherence, dietary patterns, and disease progression may also play a role. Almost all patients who required high-intensity statins did not receive therapy according to recommendations, so the expected LDL-C reduction may be difficult to achieve. Large clinical trials, including the Cholesterol Treatment

Trialists' (CTT) Collaboration meta-analysis, have demonstrated that LDL-C reduction is directly proportional to reduction in major cardiovascular event risk (CTT Collaboration, 2015). Each 39 mg/dL (1 mmol/L) reduction in LDL-C with statins is associated with a 21% reduction in major vascular event risk (CTT, 2019). Thus, the absence of high-intensity statin provision in these 196 high-risk patients may reduce the opportunity for cardiovascular risk reduction in this population.

The findings of this study reinforce the concept that statin therapy evaluation should not be limited to assessing whether patients receive statins or not. Therapy outcomes must be evaluated through LDL-C goal attainment according to cardiovascular risk level (PERKENI 2024); (PERKI, 2022). The DA VINCI study by Ray et al. (2021) also showed that the gap between guideline recommendations and clinical practice in various countries is largely due to lack of therapy intensification and limited access to high-intensity lipid-lowering therapy.

Overall, the findings of this study indicate that the gap between clinical guideline recommendations, actual therapy implementation, and LDL-C goal attainment remains substantial in primary healthcare. These findings confirm that optimizing ASCVD prevention requires not only the availability of clinical guidelines but also consistent risk stratification implementation, appropriate therapy intensification, and interprofessional collaboration to improve the quality of care for patients with type 2 diabetes mellitus.

Clinical Implications

The findings of this study demonstrate a substantial evidence-practice gap, indicating that ASCVD prevention implementation in T2DM patients in primary healthcare still requires fundamental improvement. Several clinical implications can be formulated based on these findings.

First, implementation of ASCVD risk-based medication review by clinical pharmacists can be a strategy to identify patients requiring statin therapy intensification, thereby improving LDL-C goal attainment. Pharmacists in primary care can play a role in conducting routine cardiovascular risk screening using the ASCVD Risk Estimator, evaluating the appropriateness of statin type and intensity prescribed, and providing evidence-based therapy recommendations to physicians. This approach aligns with the clinical pharmacist's role in pharmaceutical care, which emphasizes identification, prevention, and resolution of Drug Related Problems (DRPs) in patients at high cardiovascular risk.

Second, clinical pharmacists can initiate interprofessional collaboration with physicians in developing statin therapy algorithms based on ASCVD risk stratification in primary care facilities. This collaboration may include developing integrated clinical pathways, establishing reminder systems for periodic therapy evaluation, and structured documentation of therapy outcomes. This is important given that the study findings indicate ASCVD risk stratification has not become routine in primary care practice.

Third, clinical pharmacists have a strategic role in patient education and counseling regarding statin therapy adherence and lifestyle modification.

Comprehensive education on the benefits of statin therapy, potential side effects, and the importance of regular lipid monitoring can improve patient adherence and ultimately increase LDL-C goal attainment. This study showed that of 60 patients receiving statins, the majority (98.3%) only received simvastatin 10 mg—indicating that education on therapy intensification also needs to be provided to patients so they understand the need for periodic therapy evaluation.

Fourth, clinical pharmacists can act as policy advocates at the facility level by promoting the availability of a more diverse range of statin options aligned with clinical guideline recommendations. These findings can serve as a basis for pharmacists to advocate for the availability of moderate- to high-intensity statins in primary care, so that patients with high ASCVD risk do not need to be referred solely to receive appropriate statin therapy.

Thus, the role of clinical pharmacists extends beyond the patient level (medication review, education, counseling) to the system level (interprofessional collaboration and policy advocacy). This integrated approach is expected to bridge the gap between clinical guideline recommendations and actual therapy implementation, ultimately improving the quality of ASCVD prevention in T2DM patients in primary care facilities.

Study Limitations

This study has several limitations that should be considered when interpreting the results.

First, this study used a retrospective design with secondary data from medical records, so the analysis is highly dependent on the completeness and accuracy of documentation. Important variables such as patient adherence to statin

therapy, dietary patterns, physical activity, and socioeconomic factors could not be evaluated as they were not documented in the medical records.

Second, this study was conducted at a single primary care clinic, so the results may not be generalizable to all primary care facilities in Indonesia, which may have different patient characteristics, medication availability, and prescribing patterns. Multicenter studies are needed to strengthen these findings.

Third, this study did not evaluate the clinical reasons behind the non-provision of statins or failure to intensify therapy, such as contraindications, side effects, or patient preferences. Furthermore, this study did not assess health system factors such as medication availability, financing mechanisms, or local policies that may influence prescribing practices.

Fourth, this study did not evaluate patient adherence to statin therapy, which is an important factor influencing LDL-C goal attainment. Additionally, lifestyle factors such as dietary patterns and physical activity were not assessed, although both contribute significantly to LDL-C levels and overall cardiovascular risk.

Despite these limitations, this study provides important insights into the gap between clinical guideline recommendations and actual therapy implementation in primary care facilities. The Recommended → Actual → Outcome flow used in this study provides a valuable contribution to understanding clinical pharmacy implementation in primary care and can serve as a basis for further research using prospective or mixed-method designs.

CONCLUSION

This study demonstrates that the appropriateness of statin therapy in patients with type 2 diabetes mellitus at the Primary Care Clinic remains low compared to clinical guideline recommendations. Most patients recommended for high-intensity statins did not receive appropriate therapy, and the majority received no statin therapy at all. This was accompanied by low LDL-C goal attainment, indicating that cardiovascular risk management in the study population remains suboptimal.

These findings indicate the need to improve clinical guideline implementation in selecting statin intensity according to patient cardiovascular risk level. Optimization of ASCVD risk stratification, periodic therapy evaluation, and collaboration between physicians and pharmacists in primary care facilities are expected to improve therapy accuracy and LDL-C goal attainment as part of cardiovascular disease prevention efforts in patients with type 2 diabetes mellitus.

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