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Survey on drug utilization in outpatient treatment of type 2 diabetes: A cross-sectional study at a medical center, Vietnam, 2024 - 2025

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ABSTRACT

Background: The increasing prevalence of type 2 diabetes rates emphasizes the need to assess outpatient drug utilization patterns and potential drug-drug interaction (DDIs). Objective: This study aimed to determine the antidiabetic drug utilization patterns, assess the prevalence of potential drug-drug interactions, and analyze factors associated with DDIs in outpatient prescriptions for type 2 diabetes mellitus (T2DM). Materials and methods: A cross-sectional descriptive study was conducted using retrospective data from outpatients with T2DM treated at the District 5 Medical Center, Ho Chi Minh City, between August 2024 and February 2025. Prescriptions were analyzed for drug utilization patterns and screened for potential DDIs using Drugs.com and Medscape databases. Patient demographics and comorbidities were assessed as determinants of DDIs. Results: A total of 415 outpatient prescriptions were reviewed. The male-to-female ratio was 1:1.20, with more than half of the patients aged ≥ 65 years (52.8%). Dual therapy predominated (67.7%), and biguanides were prescribed in 90.8% of cases. Potential DDIs were identified in 68.9% of prescriptions via Drugs.com and 74.7% via Medscape, the majority classified as moderate. Hypertension, cardiovascular disease, renal impairment, and biguanide use were significantly associated with an increased risk of DDIs. Conclusion: Antidiabetic prescribing at the district level is characterized by widespread use of dual therapy and a high prevalence of potential DDIs. Strengthening clinical pharmacy services and implementing systematic prescription reviews are essential to optimize T2DM management and minimize the risks associated with drug interactions.

Keywords: *type 2 diabetes mellitus, drug-drug interactions, outpatient, prescription patterns*

1. INTRODUCTION

Type 2 Diabetes Mellitus (T2DM) is a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or a combination of both [1]. Glycemic control plays a crucial role in preventing chronic complications such as cerebrovascular disease, myocardial ischemia, retinopathy, and peripheral neuropathy. According to the International Diabetes Federation (IDF), the global diabetes prevalence in 2019 is estimated to be 9.3% (463 million people), rising to 10.2% (578 million) by 2030 and 10.9% (700 million) by 2045 [2].

In Vietnam, the prevalence of diabetes remained low in the 1990s, with only 1.2%. However, by 2012, a study conducted by the National Endocrinology Hospital reported that the prevalence of diabetes among adults nationwide had risen to 5.42%, with as many as 63.6% of cases remaining undiagnosed [3]. Furthermore, the prevalence of impaired glucose tolerance was reported at 7.3% in 2003 [4]. Data from the Ho Chi Minh City Center for Disease Control indicated a sharp increase in the number of diabetic patients attending follow-up visits and receiving

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medications at 43 commune health stations, rising from 706 patients in January 2023 to 3,500 patients in October 2023, with treatment coverage increasing from 15% to 63%. This highlights the growing demand for diabetes care at the primary healthcare level [5].

Investigating prescribing patterns for T2DM at health facilities is crucial, as it may reveal potential issues such as overuse of certain drug classes, underuse of newer therapies, or gaps in guideline adherence that might otherwise go unnoticed. Understanding local prescribing behaviors can also inform interventions including staff training, supply chain adjustments, and insurance formulary decisions to optimize diabetes care. This is particularly important in Ho Chi Minh City, where district hospitals manage large patient volumes, and even minor inefficiencies can place considerable strain on the healthcare system. Despite this central role, there is a paucity of evidence on diabetes pharmacotherapy at the district level. In District 5 specifically, no prior research has assessed antidiabetic prescribing patterns or the prevalence of potential drug-drug interactions (DDIs) in outpatient care. Therefore, this cross-sectional study was conducted at the District 5 Medical Center to investigate antidiabetic drug utilization, evaluate the occurrence and determinants of DDIs, and generate evidence to support the optimization of diabetes management at the primary healthcare level.

2. MATERIALS AND METHOD

2.1. Study subject

Prescriptions of patients diagnosed with T2DM according to ICD 10 (E11) attending outpatient care at District 5 Medical Center from August 2024 to February 2025 were included.

Inclusion criteria

- Prescriptions which are prescribed at least 1 antidiabetic medication.
- Prescription with complete data of medication information, patient information including age, sex, ethinicity and diagnosis.

Exclusion criteria

- Prescriptions with unclear diagnosis, illegible or smudged medication names.

2.2. Study design

Sample size

The sample size was determined using the following formula:

$$n \geq \frac{Z^2_{1-\alpha/2}\ x\ p\ x\ (1-p)}{d^2}$$

Where:

n = sample size.

Z = 1.96 is the critical value corresponding to a 95% confidence level.

d = 5% represents the acceptable margin of error.

α = 0.05 is the statistical significance level.

P = 0.215 the estimated proportion of potential DDI in medication uses in treatment for T2DM outpatients, based on the study of Nguyễn Tố Uyên et al. (2024) [6]. By substituting these values into the formula, the minimum sample size required for the study was calculated as n = 260.

Sampling method

A simple random sampling technique was employed.

Study variables

Collected variables included:

Patient characteristics: Demographic factors (age, gender, ethnicity) and clinical factors (presence and type of comorbidities).

Prescription characteristics: Number of medications, route of administration, treatment regimen (monotherapy or combination therapy), and utilization rate of each antidiabetic drug class.

Drug-drug interactions (DDIs): Prevalence, mechanisms, and severity of potential DDIs, as well as concordance between the Drugs.com and Medscape databases.

Associated factors: Relationships between patient characteristics, comorbidities, and the presence of DDIs.

2.3. Statistical analysis

Data were entered into Microsoft Excel 2010 and analyzed using SPSS version 20. Descriptive and inferential statistics were applied, and statistical significance was considered at a 95% confidence interval with $p < 0.05$.

Regarding drug interactions, drug pairs were treated as unordered combinations, meaning that each pair (for example, drug A-drug B) was counted only once, regardless of order.

In terms of concordance of Drug Interaction Results Between Data Sources, this study mapped Drugs.com 'Major' and Medscape 'Serious' to Severe; Drugs.com 'Moderate' and Medscape 'Monitor Closely' to Moderate; Minor interactions were excluded from main analyses.

2.4. Ethical approval

The study protocol was reviewed and approved by the Biomedical Research Ethics Committee of Hong Bang International University under Decision No. 166/PCT-HĐĐĐ-SDH.

3. RESULTS

3.1. Patient characteristics in the study sample

A total of 415 outpatient prescriptions for T2DM were analyzed at District 5 Medical Center between August 2024 and February 2025. The patient characteristics are presented in Table 1.

Table 1. Patient characteristics of study sample (n = 415)

Characteristics		Frequency (Percentage)
Gender	Male	189 (45.54%)
	Female	226 (54.46%)
Age group	< 45	19 (4.58%)
	45 - 65	177 (42.65%)
	> 65	219 (52.77%)
Ethnicity	Kinh	337 (81.20%)
	Chinese	78 (18.80%)
Number of comorbidities	No	6 (1.45%)
	1	4 (0.96%)
	≥ 2	405 (97.59%)
Type of comorbidities	Hypertension	356 (85.78%)
	Cardiovascular diseases	305 (73.49%)
	Dyslipidemia	239 (57.59%)
	Renal impairment	35 (8.43%)
	Musculoskeletal disorders	14 (3.37%)
Age	Mean ± SD	64.63 ± 10.89

Note: SD - Standard deviation

According to Table 1, the mean age of patients was 64.63 ± 10.89 years, with aged ≥ 65 years comprising the largest group (52.77%). The majority were female (54.64%), and most participants were of Kinh ethnicity (81.2%). Nearly all patients (98.55%) had at least one comorbidity, among whom those with two or more comorbid conditions accounted for the majority (97.59%). The most common comorbidity was hypertension, observed in 85.78% of patients.

3.2. Utilization rate of antidiabetic drugs and treatment regimens for type 2 diabetes mellitus

Table 2. Characteristics of treatment regimens (n = 415)

Characteristics	Frequency/Percentage
Regimen	
Monotherapy	126 (30.36%)
Dual therapy	281 (67.71%)
Triple therapy	8 (1.93%)
Administration	
Injectable drugs	6 (1.45%)
Oral drugs	393 (94.69%)
Oral drugs + injectable drugs	16 (3.86%)
Antidiabetic drugs classes	
Insulin (injection)	22 (5.30%)
Biguanide	377 (90.84%)
Sulfonylurea	313 (75.42%)

As shown in Table 2, dual therapy was the most commonly used treatment regimen, accounting for 67.71%. Biguanides were the most frequently prescribed drug class, present in 90.84% of all prescriptions. Oral medications were predominant, used in 94.94% of the cases.

3.3. Drug-drug interactions and concordance between two data sources

Table 3. Drug Interactions and Levels of Interaction Severity (n = 415)

Characteristics		Drugs.com	Medscape
Drug interactions	Yes	286 (68.92%)	310 (74.70%)
	No	129 (31.08%)	105 (25.30%)
Severity of Drug Interactions	Moderate	283 (98.95%)	308 (99.35%)
	Serious	3 (1.05%)	2 (0.65%)

The study identified 286 prescriptions with drug interactions according to the Drugs.com database, accounting for 68.92%. Meanwhile, the Medscape database reported 310 prescriptions with drug interactions, representing 74.70%. Moderate-level interactions overwhelmingly predominated, comprising 98.95% of cases identified by Drugs.com and 99.35% by Medscape.

Table 4. Characteristics of drug-drug interaction pairs (n = 87)

Mechanism		Drugs.com	Medscape
Moderate interactions	Pharmacodynamic	20 (33.33%)	10 (17.86%)
	Pharmacokinetic	26 (43.33%)	27 (48.21%)
	Pharmacodynamic + Pharmacokinetic	1 (1.67%)	
	Mechanism Unknown	11 (18.33%)	18 (32.14%)
Severe interactions	Pharmacodynamic	1 (1.66%)	
	Pharmacokinetic	1 (1.66%)	1 (1.79%)
Concordance of drug interaction results between data sources			
Moderate interactions	Number of concordant interaction pairs	25	28.74%
	Number of discordant interaction pairs	60	68.97%
Severe Interactions	Number of concordant interaction pairs	1	1.15%
	Number of discordant interaction pairs	1	1.15%

The study found that pharmacokinetic mechanisms accounted for the highest proportion of interactions in both data sources, with 60 interaction pairs (43.33%) identified in the Drugs.com database and 56 pairs (48.21%) in the Medscape database.

Across all 87 pairs, discordant cases accounted for 70.1%. Specifically, Among 85 moderate interaction pairs, 70.6% were discordant.

3.4. Factors associated with drug-drug interactions

Table 5. Factors associated with drug-drug interactions

Characteristics		Drugs.com		Medscape	
		OR (95% CI)	p	OR (95% CI)	p
Comorbidities					
Hypertension	Yes	4.558 (2.565-8.099)	< 0.01	17.812 (9.060-35.021)	< 0.01
	No				
Cardiovascular disease	Yes	1.355 (0.853-2.151)	0.198	2.373 (1.477-3.812)	< 0.01
	No				
Renal impairment	Yes	3.709 (1.281-10.741)	0.010	1.703 (0.687-4.224)	0.246
	No				

Characteristics		Drugs.com		Medscape	
		OR (95% CI)	p	OR (95% CI)	p
Therapeutic drug classes					
Biguanide	Yes	1.200 (0.593-2.429)	0.613	2.353 (1.185-4.675)	0.012
	No				
Sulfonylurea	Yes	1.583 (0.990-2.531)	0.054	1.239 (0.750-2.046)	0.402
	No				
Insulin	Yes	1.531 (0.552-4.244)	0.410	1.160 (0.417-3.227)	0.775
	No				

Note: OR - Odds ratio, 95% CI - 95% Confidence interval

According to Table 5, patients with hypertension had a significantly higher risk of drug-drug interactions, with statistical significance observed in both databases: Drugs.com (OR = 4.558, 95% CI: 2.565 - 8.099, p < 0.01) and Medscape (OR = 17.812, 95% CI: 9.060 - 35.021, p < 0.01). For cardiovascular disease, only Medscape demonstrated a significant association (OR = 2.373, 95% CI: 1.477 - 3.812, p < 0.01). Regarding renal impairment, a statistically significant association was detected in Drugs.com (OR = 3.709, 95% CI: 1.281 - 10.741, p = 0.01), but not in Medscape. With respect to drug classes, biguanides were significantly associated with DDIs in Medscape (OR = 2.353, 95% CI: 1.185 - 4.675, p = 0.012), whereas sulfonylureas and insulin did not show significant differences in either database.

4. DISCUSSION

This cross-sectional analyzed 415 outpatient prescriptions of patients with T2DM at the District 5 Medical Center from August, 2024, to February, 2025. The mean age of patients was 64.63 ± 10.89 years, with the majority belonging to the > 65 age group (52.77%). Female patients accounted for 54.46% of the cohort. Nearly all patients (98.55%) presented with comorbidities, most commonly hypertension (85.78%), cardiovascular disease (73.49%), and dyslipidemia (57.59%). Polytherapy was the predominant treatment strategy (69.64%), with oral antidiabetic agents-particularly metformin and sulfonylureas-being most frequently prescribed. Potential DDIs were highly prevalent, ranging from 68.92% (Drugs.com) to 74.7% (Medscape), with pharmacokinetic interactions being the most common. Antihypertensives, lipid-lowering agents, and biguanides were the main drug classes implicated in interactions.

The prescribing patterns observed in this study is consistent with previous findings in Vietnam, where polytherapy remains the predominant approach in T2DM management. Van Em Nguyen et al. (2024)[7] reported similar polytherapy rates (65%), while oral agents accounted for 93.2% of prescriptions, with metformin serving as the first-line therapy. The preference for oral antidiabetic agents reflects their accessibility, cost-effectiveness, and convenience for long-term use in outpatient care. In addition to glycemic control, polytherapy also targets cardiovascular risk factors such as hypertension, dyslipidemia, and obesity, which were highly prevalent in this patient population. These findings underscore the alignment of prescribing practices with guideline-based recommendations that emphasize metformin and combination therapy in patients with multiple metabolic and cardiovascular risk factors.

The high prevalence of potential DDIs found in this study aligns with previous studies both in Vietnam (Hong Tham Pham et al. 2024) [8] and internationally (Rana et al. 2020) [9]. Pharmacokinetic interactions were the most common, particularly involving commonly used agents such as antihypertensives (amlodipine, bisoprolol, nifedipine, losartan), lipid-lowering agents (atorvastatin, fenofibrate), and antidiabetic drugs (metformin, glimepiride). Pathological factors such as hypertension and renal disease, as well as the use of biguanides, significantly increased the risk of DDIs. The strong association between hypertension and DDIs is consistent with reports by Van Em Nguyen et al. (2024) [7] and Kothari (2014) [10], which emphasize the polypharmacy

burden in patients with both diabetes and hypertension. The coexistence of hypertension and cardiovascular disease in patients with T2DM significantly increases the complexity of pharmacotherapy and elevates the risk of DDIs. For example, Labib Al-Musawe et al. (2021) found that those with hypertension were disproportionately represented among those exposed to clinically relevant DDIs, largely because of the enhanced use of cardiovascular agents alongside antidiabetics [11]. Moreover, in patients with established CVD, polypharmacy is almost universal-with one US study reporting that 77.5% had at least one severe potential DDI, and many of the implicated medications were cardiovascular drugs (with hypertension present in approximately 75% of cases) [12]. Thus, in T2DM populations where hypertension and/or CVD is common, the interplay of multiple drug classes (antihypertensives, lipid-lowering agents, antiplatelets/anticoagulants, antidiabetics) creates a fertile ground for pharmacokinetic and pharmacodynamic interactions. These findings highlight the importance of routine medication reconciliation and integration of drug interaction-checking tools into prescribing workflows to enhance medication safety in T2DM management. For renal disease, statistical significance was detected only in Drugs.com. Previous studies, such as that of Thi Bao Nhi Dinh et al. (2025) [13] in Buon Ma Thuot, also reported an association between DM complicated with renal impairment and increased risk of drug-drug interactions. Papotti (2021) [14] further discussed that renal impairment alters drug pharmacokinetics, thereby increasing the likelihood of drug-drug interactions, particularly in patients with diabetic nephropathy, and emphasized the need for dose adjustment and systematic interaction monitoring in this population.

With regard to drug classes, only biguanides showed a statistically significant association in Medscape, while sulfonylureas and insulin did not demonstrate significance in either database. This suggests that the use of biguanides, particularly metformin, may increase the risk of drug-drug interactions. However, variations across studies may depend on the data source, analytical methods, and patient characteristics. These findings are not consistent with those of Thi Bao Nhi Dinh et al. (2025) in Buon Ma Thuot [13]. This discrepancy may be attributed to differences in sample size, study period, and sampling methods between the two studies.

A notable strength of this study is its focus on district-level healthcare facilities, where the majority of T2DM patients in Vietnam receive ongoing management. Investigating prescribing patterns and DDIs in this setting provides locally relevant data that may not be captured in studies conducted at tertiary hospitals. Furthermore, the use of two independent databases (Drugs.com and Medscape) for DDI screening enhances the reliability of results and minimizes potential bias from a single data source. By integrating clinical, demographic, and pharmacological variables, this study offers a comprehensive overview of real-world prescribing patterns and safety issues in a primary care context.

However, several limitations should be acknowledged. First, the study was conducted at a single medical center in District 5, which may limit the generalizability of findings to other districts in Ho Chi Minh City or to rural areas with different healthcare resources. Second, the cross-sectional design prevents the assessment of causality and long-term outcomes of prescribing practices or DDIs. Third, the analysis relied on database screening for potential DDIs without direct clinical validation, which may overestimate or underestimate the actual clinical relevance. Additionally, lifestyle factors, adherence to treatment, and socioeconomic determinants were not captured, although these may strongly influence prescribing practices and outcomes.

Despite these limitations, the findings have important implications for clinical practice and health policy. The high prevalence of polytherapy and potential DDIs highlights the need for continuous education and training of healthcare providers on rational prescribing, particularly in primary care settings. Integration of electronic prescribing systems with automated DDI screening tools could reduce risks and optimize therapy. At the policy level, these data can inform formulary decisions, supply chain planning, and insurance coverage to ensure access to effective and safe treatments. More broadly, this study underscored the critical role of district hospitals in managing the

growing burden of T2DM in Ho Chi Minh City, where even small improvements in prescribing efficiency may have a substantial impact due to high patient volumes.

5. CONCLUSION

These findings highlight a high burden of potential DDIs among outpatients with T2DM, reflecting the complexity of polypharmacy in this population. Strengthening clinical pharmacy involvement and implementing systematic medication reconciliation and prescription review processes are essential to minimize DDI-related risks and optimize pharmacotherapy at the district healthcare level. Future studies should include clinical outcome assessments and multi-center data to validate the real-world impact of DDIs on patient safety.

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Khảo sát tình hình sử dụng thuốc trong điều trị ngoại trú đái tháo đường tuýp 2: Nghiên cứu cắt ngang tại một trung tâm y tế Việt Nam giai đoạn 2024 - 2025

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TÓM TẮT

Đặt vấn đề: Tỷ lệ mắc đái tháo đường (ĐTĐ) type 2 ngày càng gia tăng nhấn mạnh nhu cầu đánh giá mô hình sử dụng thuốc ngoại trú và nguy cơ tương tác thuốc - thuốc tiềm ẩn. Mục tiêu nghiên cứu: Nghiên cứu nhằm xác định tình hình sử dụng các nhóm thuốc điều trị đái tháo đường, đánh giá tỷ lệ tương tác thuốc - thuốc (Drug - Drug Interactions - DDIs) tiềm ẩn và phân tích các yếu tố liên quan đến DDIs trong đơn thuốc ngoại trú của bệnh nhân ĐTĐ type 2. Đối tượng và phương pháp nghiên cứu: Nghiên cứu mô tả cắt ngang dựa trên dữ liệu hồi cứu của bệnh nhân ngoại trú ĐTĐ type 2 được điều trị tại Trung tâm Y tế Quận 5, TP.HCM, trong giai đoạn từ tháng 8/2024 đến tháng 02/2025. Các đơn thuốc được phân tích về mô hình sử dụng thuốc và được sàng lọc DDIs tiềm ẩn bằng cơ sở dữ liệu Drugs.com và Medscape. Đặc điểm nhân khẩu học và bệnh kèm của bệnh nhân được đánh giá như các yếu tố quyết định nguy cơ DDIs. Kết quả: Tổng cộng 415 đơn thuốc ngoại trú được phân tích. Tỷ lệ nam:nữ là 1:1.20, với hơn một nửa bệnh nhân ≥ 65 tuổi (52.8%). Liệu pháp phối hợp hai thuốc chiếm ưu thế (67.7%), trong đó biguanide được kê trong 90.8% trường hợp. DDIs tiềm ẩn được phát hiện trong 68.9% đơn thuốc theo Drugs.com và 74.7% theo Medscape, chủ yếu ở mức độ trung bình. Tăng huyết áp, bệnh tim mạch, suy thận và việc sử dụng biguanide có liên quan có ý nghĩa thống kê đến tăng nguy cơ DDIs. Kết luận: Việc kê đơn thuốc điều trị đái tháo đường tại cơ sở y tế đặc trưng bởi việc sử dụng phổ biến liệu pháp phối hợp hai thuốc và tỷ lệ cao DDIs tiềm ẩn. Cần tăng cường dịch vụ dược lâm sàng và triển khai quy trình rà soát đơn thuốc có hệ thống nhằm tối ưu hóa điều trị ĐTĐ típ 2 và giảm thiểu rủi ro liên quan đến tương tác thuốc.

Từ khóa: *đái tháo đường type 2, tương tác thuốc, ngoại trú, tình hình kê đơn*

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