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ORIGINAL RESEARCH

Knowledge, Counseling Practice, Perceived Barriers, and Clinical Decision-Making of Community Pharmacists in Saudi Arabia Regarding Glucagon-Like Peptide-1 Receptor Agonists and Sodium-Glucose Cotransporter 2 Inhibitors

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Purpose: Glucagon-like peptide-1 (GLP-1) receptor agonists and sodium-glucose cotransporter-2 (SGLT-2) inhibitors represent major advancements in the management of type 2 diabetes. However, many patients remain suboptimally managed with these therapies. This underutilization highlights the need for practical implementation strategies in real-world settings. Community pharmacists can play a crucial role in integrating these therapies into diabetes care. This study aimed to evaluate community pharmacists' knowledge, counseling practices, perceived barriers, and clinical decision-making regarding these therapies.

Methods: A cross-sectional, questionnaire-based survey was conducted among licensed community pharmacists in the Qassim region, Saudi Arabia.

Results: A total of 211 community pharmacists participated in this study. Of these, 83.4% were male and 16.6% were female. The participants' perceived levels of knowledge of the pharmacology and basic concepts of GLP-1 receptor agonists and SGLT-2 inhibitors were high, with mean scores (± SD) of 13.41 ± 2.43 and 13.36 ± 2.59, respectively, out of a maximum of 16. However, knowledge related to clinical therapeutics and evidence-based decision-making was low, with only 24.2%, 23.7%, and 32.2% of the participants correctly answering the three patient-based case scenarios. Many participants counseled and discussed these therapies in patients with type 2 diabetes. However, the participants reported several barriers, including high medication costs (67.3%), concerns about side effects (33.2%), challenges with patient adherence (28.4%), and limited time to engage in discussions with patients (22.7%). Notably, 88.2% of the participants indicated that continuing professional development in diabetes therapy is required.

Conclusion: Many participants had substantial gaps in their applied knowledge of clinical therapeutics and persistent barriers to clinical engagement remained. Targeted educational strategies and system-level support are crucial for enhancing the role of community pharmacists in managing type 2 diabetes.

Keywords: antidiabetic agents, access to medicines, community pharmacy, diabetes mellitus, health policy, primary care

Introduction

The increasing global prevalence of diabetes mellitus and the burden of its medical complications and economic implications make it a central public health concern.[1–4] Globally, the International Diabetes Federation estimated that there were 589 million adults (age, 20–79 years) with diabetes in 2024.[5] In Saudi Arabia, approximately 23.1% of adults aged 20–79 years had diabetes in 2024, representing approximately 5.3 million individuals.[5] The prevalence of diabetes mellitus among adults aged ≥65 years in Saudi Arabia reached 50.4% in a nationwide survey that included 10,827 individuals.[6] These findings indicate a substantial increase in disease burden with age and highlight the urgent need for targeted prevention and management

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strategies across all levels of care. Community pharmacists, in particular, have demonstrated a significant role in the management of chronic diseases, including diabetes, through patient education, medication optimization, vaccination services, and ongoing therapeutic support.[7–10] Additionally, the accessibility of community pharmacists serves as a valuable point of care for several disease states. Approximately 90% of the US population lives within 5 miles of community pharmacy.[11] Similarly, in Saudi Arabia, community pharmacies are highly accessible and have witnessed growth in recent years. They provide several services, including access to prescription medicines, over-the-counter medications, medical equipment, self-care therapeutics, and other health-related products. Moreover, other pharmaceutical services are provided, including medication counseling, health education and promotion, management of minor illnesses, and other public health activities.[12–17] The number of community pharmacists reached 21,648, working across 10,347 community pharmacies in 2022.[12]

Patients with diabetes mellitus are expected to manage various diabetes-related activities, including lifestyle and dietary choices, understanding their medications, and adhering to routine follow-up assessments.[18] These multifaceted demands led to the development of Diabetes Self-Management Education to enhance patient-centered care and support sustained self-management.[19] Nonetheless, a substantial proportion of patients encounter difficulties navigating the complexities of key components of diabetes care. For instance, one study found that only 18.4% of patients with diabetes in Saudi Arabia were able to correctly identify sugar-free foods.[20] Further evidence highlighting gaps in public awareness of diabetes medications comes from a national survey of 3,208 adults, which revealed that a majority were unaware of the potential adverse effects associated with commonly used therapies, such as metformin and insulin.[21] Although these medications have been available for decades, many patients continue to experience uncertainty in effectively following evidence-based standards of care. In recent years, the pharmacological management of diabetes mellitus has significantly evolved. Glucagon-like peptide-1 (GLP-1) receptor agonists and sodium-glucose cotransporter 2 (SGLT-2) inhibitors represent significant advancements in diabetes treatment algorithms with proven cardiovascular benefits.

The integration of emerging evidence into routine clinical practice often lags behind updated clinical guidelines, and the inclusion of newer effective therapies remains suboptimal.[22,23] In the Veterans Health Administration, USA, for instance, only 12% of eligible patients with type 2 diabetes mellitus and chronic kidney disease were prescribed SGLT-2 inhibitors.[24] This gap is partly attributable to limited familiarity with newer therapeutic classes and uncertainty regarding their place in therapy for emerging indications. Additionally, concerns regarding the safety profiles of these agents among healthcare providers and patients may further hinder their adoption in clinical practice. A national survey in China revealed that only 30–40% of physicians demonstrated a basic to moderate understanding of the mechanisms and clinical applications of GLP-1 receptor agonists and SGLT-2 inhibitors.[25]

Effective diabetes management requires a coordinated interdisciplinary care team capable of addressing the complex and evolving needs of patients.[26] Pharmacists, particularly those embedded in community settings, offer a critical layer of support within this collaborative framework.[19,27] Pharmacists in community settings have the potential to reduce clinical inertia and facilitate the translation of evidence-based guidelines into meaningful improvements in real-world patient outcomes.[27,28] Although the role of community pharmacists in chronic disease management has expanded in recent years, a notable gap remains in the literature regarding their understanding of emerging pharmacotherapies for diabetes. Based on extensive literature searches using several databases and search engines (ie, Web of Science, Scopus, PubMed, and Google Scholar), there is a paucity of data regarding this topic in Saudi Arabia and globally. One study from Jordan assessed community pharmacists' knowledge and practice regarding SGLT-2 inhibitors and reported moderate knowledge of these newer medications for diabetes among community pharmacists.[29] Therefore, given the limited literature on this topic, this study aimed to evaluate community pharmacists' knowledge, counseling practice, perceived barriers, and clinical decision-making regarding GLP-1 receptor agonists and SGLT-2 inhibitors in the management of type 2 diabetes mellitus. This will address the gap in the literature and help guide health policymakers in enhancing the roles of community pharmacists in primary care.

Material and Methods

Study Design, Setting, and Population

This cross-sectional, survey-based study recruited licensed community pharmacists practicing in Qassim, Saudi Arabia. The Qassim region is located in the central region of Saudi Arabia and has a total population of 1,336,179 as of 2022. Of

the population, 61.2% were male and 38.8% female.[30] In the Qassim region, various community pharmacies, including major chain pharmacies, operate and provide services to the community members.[13] This survey was administered between January and March 2025.

Sample Size Calculation and Sampling Procedure

According to published data from the Ministry of Health of Saudi Arabia, there were 512 community pharmacies in the Qassim region in 2023.[31] Using the Raosoft sample size calculator,[32] with a 5% margin of error, 95% level of confidence, and 50% level of variance, the estimated sample size for this study was approximately 220. Convenience sampling was adopted in this study because of practical and logistical barriers. Based on available resources, the research team recruited 211 community pharmacists across the Qassim region to participate in this study. This sample represented 41.2% of all community pharmacies in the region.

Development of the Study Questionnaire

A structured survey instrument was developed based on the key aspects identified in previous publications and consensus guidelines.[25,33,34] The initial draft of the questionnaire was reviewed to ensure face and content validity. Three experts with background and experience in this area of research provided a thorough review of the survey instrument. Based on their feedback, it was further refined, and modifications were made. Following this, pilot testing was conducted with five community pharmacists to ensure clear understanding and applicability of the questionnaire in community pharmacy settings. Their positive feedback demonstrated that the questionnaire was clear, suitable, and applicable to their practice settings. The reliability of the knowledge domain was assessed using the dataset of the first 30 participants, and Cronbach's alpha was 0.904. This indicates a reliable instrument with high internal consistency.[35]

The final questionnaire consisted of five sections. Section one included items related to the participants' demographics and characteristics. Section two assessed the participants' perceived level of knowledge and understanding of GLP-1 receptor agonists and SGLT-2 inhibitors, including their mechanism of action (MOA), indications and effectiveness, safety profile and side effects, and cost-effectiveness. This section included eight items (four items for each class). There were five response options: very well understood (4), understood (3), somewhat understood (2), understood a little (1), and not understood (0). Consequently, the knowledge scores ranged from 0 to 16 points for each medication class. Section three included items related to the frequency of counseling or discussion with patients with type 2 diabetes regarding these medications, perceived barriers to their use, and recommendations for patients with type 2 diabetes mellitus. Section four included the patient case-based scenarios. Patient case-based scenarios were designed to assess the community pharmacists' ability to apply evidence-based therapeutic recommendations to individuals with type 2 diabetes and commonly encountered comorbidities. Each scenario was constructed in accordance with the latest American Diabetes Association Standards of Care.[33,34] The cases were initially drafted by a board-certified pharmacotherapy specialist and independently reviewed by two pharmacists specializing in ambulatory care to ensure accuracy, clarity, and practical relevance to community pharmacy practice. The final version included three patient scenario-based questions simulating real-world decision-making situations commonly encountered in routine pharmacy settings. Each case scenario had five options, including "I am not sure" option with only one correct answer. The fifth section of the questionnaire assessed the perceived need for continuing professional development (CPD) in diabetes therapeutics. Responses to this question were rated on a 5-point Likert item, ranging from strongly agree to strongly disagree.

Data Collection Procedure and Administration of the Questionnaire

The final version of the questionnaire was converted into an online survey using Google Forms. Consequently, a quick response (QR) code linked to the online survey was generated. In addition, an invitation letter was prepared. The participants were recruited for this study through in-person visits to community pharmacy sites. In-person visits were conducted by five members of the research team after receiving appropriate orientation and training. The data collectors approached the community pharmacists and provided them with invitation letters with QR codes. The participants were provided with a brief description of the study and its objectives, and participation was strictly voluntary. Furthermore, the participants were informed that data collection via the online platform was anonymous and that the questionnaire

collected only non-identifiable demographic information, including age group, sex, and years of professional experience, without requesting any personally identifiable data, such as names or contact information. To ensure that every response received was complete, Google Forms was configured to require the participants to respond to all survey items before submitting their responses online. This was done to eliminate the issue of having incomplete responses or missing data.[36]

Data Management and Analysis

The collected data were downloaded as Microsoft Excel file from Google Forms. The data were then coded and entered into IBM SPSS Statistics version 30 for Windows for statistical analyses. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize the data. Inferential statistics were used to examine the associations and differences among the study variables. The independent samples *t*-test and one-way analysis of variance were used for continuous variables, whereas the chi-squared test was used for categorical variables. The significance level was set at a two-sided $P<0.05$.

Results

Participants' Demographic Data and Characteristics

In total, 211 community pharmacists participated in this study. Of these, 176 (83.4%) were male and 35 (16.6%) female. Slightly more than half of the participants (n=108, 51.2%) were aged ≤30 years, followed by those age group of 31–35 years (n=55, 26.1%), and those aged >40 years (n=26, 12.3%). The participants had varying years of practice experience as community pharmacists, ranging from <1 year (n=21, 10.0%) to >15 years (n=22, 10.4%). Most participants held a bachelor's degree in pharmacy as their highest level of education (n=152, 72.0%), whereas the rest held either a Doctor of Pharmacy degree (n=42, 19.9%) or an additional postgraduate qualification (n=17, 8.1%). The national service for e-prescriptions and medication dispensing (Wasfaty service) was provided in 146 pharmacies (69.2%). The demographic data and characteristics of the participants are summarized in Table 1.

Table 1 Participants' Demographic Data and Characteristics (Number=211)

Variable	Number (%)
Sex	
Male	176 (83.4)
Female	35 (16.6)
Age group (in years)	
≤30	108 (51.2)
31–35	55 (26.1)
36–40	22 (10.4)
>40	26 (12.3)
The number of years of practice as a community pharmacist	
<1 year	21 (10.0)
1–5 years	80 (37.9)
6–10 years	57 (27.0)
11–15 years	31 (14.7)
>15 years	22 (10.4)

(*Continued*)

Table 1 (Continued).

Variable	Number (%)
The highest degree or level of education	
Bachelor's degree in pharmacy	152 (72.0)
Doctor of Pharmacy	42 (19.9)
Postgraduate qualification	17 (8.1)
Provision of Wasfaty service in your pharmacy	
Yes	146 (69.2)
No	65 (30.8)

Participants' Perceived Level of Knowledge Regarding GLP-1 Receptor Agonists and SGLT-2 Inhibitors in the Management of Type 2 Diabetes Mellitus

In this section, the participants' perceived levels of knowledge and understanding of the pharmacology of GLP-1 receptor agonists and SGLT-2 inhibitors were assessed. These included the MOA, indications and effectiveness, safety profile and side effects, and cost-effectiveness in the management of type 2 diabetes mellitus.

The participants' total knowledge score of GLP-1 receptor agonists was 13.41±2.43 out of the maximum attainable score of 16. Most participants reported that they very well understood (n=97, 46%) or understood (n=98, 46.4%) the MOA of the GLP-1 receptor agonists. Similarly, most participants reported that they very well understood (n=109, 51.7%) or understood (n=86, 40.8%) the pharmacological indications and clinical effectiveness of these diabetes medications. In terms of the safety profile and side effects, 99 (46.9%) participants reported a very well understanding, whereas 92 (43.6%) reported that they understood the safety aspects of these medications.

Regarding SGLT-2 inhibitors, the participants' total knowledge score was 13.36±2.59 out of 16. Most participants reported that they very well understood (n=104, 49.3%) or understood (n=87, 41.2%) the MOA of the SGLT-2 inhibitors. Most participants reported that the pharmacological indications and clinical effectiveness of SGLT-2 inhibitors were very well understood (n=99, 46.9%) or understood (n=98, 46.4%). Of the participants, 95 (45.0%) reported a very well understanding, and 98 (46.4%) reported that they understood the safety and side effects of these medications.

Most participants reported a good understanding of the cost-effectiveness of GLP-1 receptor agonists and SGLT-2 inhibitors in managing diabetes mellitus. The results are summarized in Table 2.

Table 2 Participants' Perceived Level of Knowledge Regarding GLP-1 Receptor Agonists and SGLT-2 Inhibitors in the Management of Type 2 Diabetes Mellitus

Variable	Number (%)				
Perceived Level of understanding of GLP-1 receptor agonists	**Very well understood**	**Understood**	**Somewhat understood**	**Understood a little**	**Not understood**
Mechanism of action	97 (46.0)	98 (46.4)	12 (5.7)	3 (1.4)	1 (0.5)
Indications and clinical effectiveness	109 (51.7)	86 (40.8)	14 (6.6)	1 (0.5)	1 (0.5)
Safety profile and side effects	99 (46.9)	92 (43.6)	15 (7.1)	4 (1.9)	1 (0.5)
Cost-effectiveness	98 (46.4)	84 (39.8)	19 (9.0)	10 (4.7)	0 (0.00%)

(*Continued*)

Table 2 (Continued).

Variable	Number (%)				
Perceived level of understanding of SGLT-2 inhibitors	**Very well understood**	**Understood**	**Somewhat understood**	**Understood a little**	**Not understood**
Mechanism of action	104 (49.3)	87 (41.2)	16 (7.6)	3 (1.4)	1 (0.5)
Indications and clinical effectiveness	99 (46.9)	98 (46.4)	11 (5.2)	3 (1.4)	0 (0.00%)
Safety profile and side effects	95 (45.0)	98 (46.4)	11 (5.2)	6 (2.8)	1 (0.5)
Cost-effectiveness	95 (45.0)	88 (41.7)	18 (8.5)	9 (4.3)	1 (0.5)
Total knowledge score	**Mean ± standard deviation**				
Knowledge score of GLP-1 receptor agonists	13.41±2.43				
Knowledge score of SGLT-2 inhibitors	13.36±2.59				

Frequency of Counseling or Discussing the Medications for Patients with Type 2 Diabetes Mellitus

In this study, many participants reported that they counseled or discussed GLP-1 receptor agonists with patients 1–5 times per month (n=92, 43.6%) followed by 6–20 times per month (n=72, 34.1%), and 30 (14.2%) participants had counseling >20 times per month, whereas 17 (8.1%) never counseled or had any encounters with patients regarding these medications.

A similar trend was noted for SGLT-2 inhibitors, as 88 (41.7%) participants had counseling or discussions with patients 1–5 times per month, followed by 6–20 times per month (n=72, 34.1%). Of the participants, 39 (18.5%) reported >20 times per month, whereas 12 (5.7%) never had any counseling with patients regarding SGLT-2 inhibitors. The results are summarized in Table 3.

Barriers and Main Challenges or Concerns Held by Community Pharmacists

In this study, only 17 (8.1%) participants reported no challenges or issues regarding the use of medications for the management of type 2 diabetes mellitus in a community pharmacy setting. However, many participants reported several key barriers and concerns. These included issues related to medications, such as high cost (n=142, 67.3%), concerns

Table 3 Frequency of Counseling or Discussing the Medications for Patients with Type 2 Diabetes Mellitus

Variable	Number (%)
On average, how often per month do you counsel or discuss GLP-1 receptor agonists with patients?	
Never	17 (8.1)
1–5 times/month	92 (43.6)
6–20 times/month	72 (34.1)
>20 times/month	30 (14.2)
On average, how often per month do you counsel or discuss SGLT-2 inhibitors with patients?	
Never	12 (5.7)
1–5 times/month	88 (41.7)
6–20 times/month	72 (34.1)
>20 times/month	39 (18.5)

Table 4 Barriers and Main Challenges or Concerns When Discussing or Recommending GLP-1 Receptor Agonists and SGLT-2 Inhibitors to Patients with Type 2 Diabetes Mellitus

Variable	Number (%)*
High cost	142 (67.3%)
Concerns regarding side effects	70 (33.2%)
Challenges with patient adherence	60 (28.4%)
Limited time to engage in discussions with the patient about these therapies	48 (22.7%)
Limited access to training and educational resources about these medicines	26 (12.3%)
Limited availability of these medications (eg, not stocked, supply chain issues)	39 (18.5%)
Challenges in staying informed on new therapies and updated clinical guidelines	39 (18.5%)
Others	4 (1.9%)
None/no challenges	17 (8.1%)

Note: *This is a multiple-response question.

regarding side effects (n=70, 33.2%), and medication availability (n=39, 18.5%). Some issues were related to the patients, that is, challenges with patient adherence (n=60, 28.4%). Some barriers related to pharmacists included limited time to engage in discussions with patients (n=48, 22.7%), challenges in staying informed about new therapies and updated clinical guidelines (n=39, 18.5%), and limited access to training and educational resources on these medications (n=26, 12.3%). The results are summarized in Table 4.

Participants' Level of Knowledge of Clinical Therapeutics and Evidence-Based Practice

In this section, the participants' level of knowledge of clinical therapeutics and evidence-based practice regarding GLP-1 receptor agonists and SGLT-2 inhibitors was assessed. These included three scenarios. As shown in Table 5, less than one-quarter of the participants were able to correctly recommend the appropriate intervention for case 1 (24.2%) and case 2 (23.7%). Similarly, less than one-third of the participants correctly recommended the appropriate intervention in case 3 (32.2%).

Table 5 Participants Responses to the Hypothetical Case Scenarios

Variable	Number (%)
Case 1: A 60-year-old woman with type 2 diabetes mellitus and a history of myocardial infarction 1 year previously presents to the pharmacy with an HbA1c level of 8.2% and a BMI of 25 kg/m². Her current pharmacological management for glycemic control consists of metformin 500 mg twice daily. She is also on an optimized cardiovascular medication regimen addressing her history of myocardial infarction. The patient reports no known drug allergies and has not previously used other glucose-lowering agents. According to the best available evidence, which of the following is the most appropriate recommendation? **Case 1 responses:**	
a. No additional therapy is recommended at this time.	15 (7.1)
a. Recommend discussing an increased dose of metformin with her physician.	30 (14.2)
a. Recommend discussing the addition of a GLP-1 receptor agonist with her physician.*	51 (24.2)
a. Recommend discussing the addition of an SGLT-2 inhibitor with her physician.	85 (40.3)
a. I am not sure.	30 (14.2)

(*Continued*)

Table 5 (Continued).

Variable	Number (%)
Case 2: A 55-year-old man with newly diagnosed type 2 diabetes mellitus and a history of chronic kidney disease (CKD) presents to the pharmacy. The patient is unsure of his CKD stage but reports an HbA1c of 7.2% and a BMI of 23 kg/m². He is currently not taking any medications and reports no known drug allergies. According to the best available evidence, which of the following is the most appropriate recommendation? **Case 2 responses:**	
a. Recommend lifestyle modifications without pharmacological therapy.	33 (15.6)
a. Recommend discussing initiating metformin therapy with his physician.	59 (28.0)
a. Recommend discussing initiating a GLP-1 receptor agonist with his physician.	41 (19.4)
a. Recommend discussing initiating an SGLT-2 inhibitor with his physician.*	50 (23.7)
a. I am not sure.	28 (13.3)
Case 3: A 62 year-old woman with type 2 diabetes mellitus and a history of heart failure with preserved ejection fraction presents to the pharmacy. Her most recent HbA1c is 7.5%, and she reports a BMI of 24 kg/m². Current medications include metformin, 1000 mg once daily, and basal insulin. She has no known drug allergies and has not previously used other glucose-lowering agents. According to the best available evidence, which of the following is the most appropriate recommendation? **Case 3 responses:**	
a. Recommend discussing adjusting basal insulin dose with her physician.	38 (18.0)
a. Recommend discussing adjusting the metformin dose with her physician.	22 (10.4)
a. Recommend discussing initiating a GLP-1 receptor agonist with her physician.	32 (15.2)
a. Recommend discussing initiating an SGLT-2 inhibitor with her physician.*	68 (32.2)
a. I am not sure.	51 (24.2)

Note: The symbol * indicates the correct answer.

The Need for Education on Up-to-Date Therapeutics of Diabetes

Most participants strongly agreed (n=120, 56.9%) or agreed (n=66, 31.3%) that community pharmacists need to be provided with CPD tailored to their needs to keep up to date with the clinical therapeutics for type 2 diabetes mellitus. A few participants (n=24, 11.4%) were neutral, whereas only one (0.5%) participant disagreed with the statement. The results are shown in Figure 1.

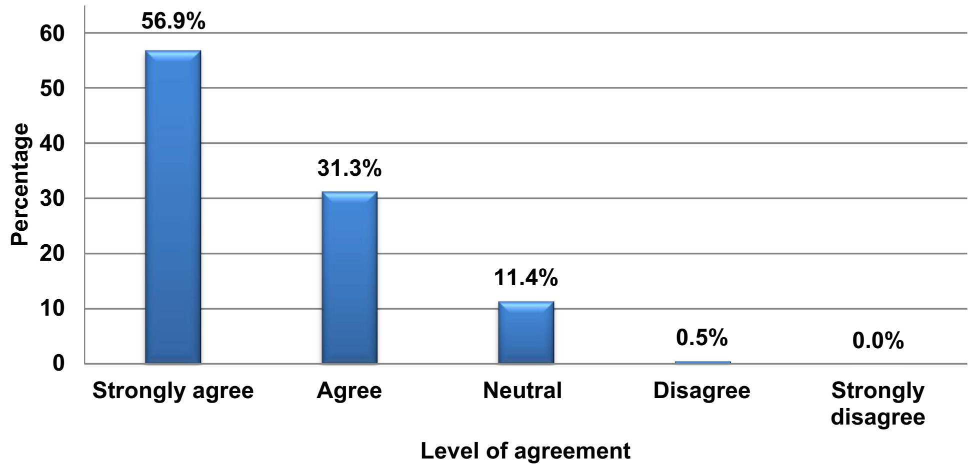

Figure 1 The need for education on up-to-date therapeutics of diabetes.

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Association Between Participants' Demographics and Characteristics and Their Perceived Level of Knowledge of GLP-1 Receptor Agonists and SGLT-2 Inhibitors

As shown in Table 6, there were no statistically significant differences among the participants' demographics and characteristics and their perceived level of knowledge of GLP-1 receptor agonists and SGLT-2 inhibitors.

Association Between Participants' Demographics and Characteristics and Their Responses to the Clinical Cases

As shown in Table 7, there were two statistically significant associations between the participants' demographic characteristics and their responses to clinical cases. For case-2, a higher proportion of female participants correctly answered the case than male participants (42.9% vs 19.9%, P=0.004). For case 3, a higher proportion of participants in the age group ≤30 correctly answered the case (43.50%) compared with other age groups of 31–35 years old (18.2%), 36–40 years old (22.7%), and >40 years old (23.1%) (P=0.004). No other significant associations were observed.

Table 6 Analysis of the Association Between Participants' Demographic and Characteristics and Their Perceived Level of Knowledge of GLP-1 Receptor Agonists and SGLT-2 Inhibitors

Variable	Knowledge Score of GLP-1 Receptor Agonists, Mean±SD	P Value*	Knowledge Score of SGLT-2 Inhibitors, Mean±SD	P Value*
Sex				
Male	13.52±2.38	0.139	13.45±2.55	0.240
Female	12.86±2.65		12.89±2.73	
Age group (in years)				
≤30	13.34±2.47	0.853	13.40±2.55	0.827
31–35	13.54±2.36		13.24±3.05	
36–40	13.14±2.90		13.05±2.15	
>40	13.65±2.08		13.69±2.04	
The number of years of practice as a community pharmacist				
<1 year	13.38±2.82	0.781	13.57±2.71	0.877
1–5 years	13.21±2.37		13.16±2.58	
6–10 years	13.39±2.58		13.30±3.08	
11–15 years	13.87±2.29		13.68±1.85	
>15 years	13.59±2.13		13.55±2.06	
The highest degree or level of education				
Bachelor's degree in pharmacy	13.37±2.43	0.332	13.38±2.50	0.128
Doctor of Pharmacy	13.24±2.60		12.86±3.01	
Postgraduate qualification	14.24±1.89		14.35±1.99	
Provision of Wasfaty service in your pharmacy				
Yes	13.53±2.37	0.276	13.55±2.48	0.105
No	13.14±2.57		12.92±2.79	

Notes: *Independent samples *t*-test and one-way analysis of variance; SD, standard deviation.

Table 7 Analysis of the Association Between Participants' Demographic and Characteristics and Their Responses to the Clinical Cases

Variable	Case 1, n (%) Correct Answer	P Value*	Case 2, n (%) Correct Answer	P Value*	Case 3, n (%) Correct Answer	P Value*
Overall (n=211)	51 (24.2%)		50 (23.7%)		68 (32.2%)	
Sex						
Male (n=176)	44 (25%)	0.528	35 (19.9%)	0.004[a]	52 (29.5%)	0.062
Female (n=35)	7 (20%)		15 (42.9%)		16 (45.7%)	
Age group (in years)						
≤30 (n=108)	23 (21.3%)	0.510	25 (23.1%)	0.836	47 (43.5%)	0.004[a]
31–35 (n=55)	17 (30.9%)		12 (21.8%)		10 (18.2%)	
36–40 (n=22)	6 (27.3%)		5 (22.7%)		5 (22.7%)	
>40 (n=26)	5 (19.2%)		8 (30.8%)		6 (23.1%)	
The number of years of practice as a community pharmacist						
<1 year (n=21)	4 (19.0%)	0.787	9 (42.9%)	0.197	10 (47.6%)	0.065
1–5 years (n=80)	19 (23.8%)		16 (20.0%)		30 (37.5%)	
6–10 years (n=57)	17 (29.8%)		14 (24.6%)		18 (31.6%)	
11–15 years (n=31)	6 (19.4%)		5 (16.1%)		4 (12.9%)	
>15 years (n=22)	5 (22.7%)		6 (27.3%)		6 (27.3%)	
The highest degree or level of education						
Bachelor's degree in pharmacy (n=152)	39 (25.7%)	0.687	31 (20.4%)	0.182	44 (28.9%)	0.224
Doctor of Pharmacy (n=42)	9 (21.4%)		13 (31.0%)		18 (42.9%)	
Postgraduate qualification (n=17)	3 (17.6%)		6 (35.3%)		6 (35.3%)	
Provision of Wasfaty service in your pharmacy						
Yes (n=146)	33 (22.6%)	0.425	37 (25.3%)	0.399	50 (34.2%)	0.347
No (n=65)	18 (27.7%)		13 (20.0%)		18 (27.7%)	

Notes: *Chi-squared test; n, number; [a] statistically significant at $P < 0.05$.

Discussion

The study findings showed that the participants had good general knowledge of the pharmacology and basic concepts of GLP-1 receptor agonists and SGLT-2 inhibitors (ie, MOA, indications, safety profile, and cost-effectiveness). These findings are similar to those of a study conducted among community pharmacists in Iraq that reported good knowledge of the use of GLP-1 receptor agonists for weight reduction.[37] Another study from Jordan reported moderate knowledge of community pharmacists regarding SGLT-2 inhibitors.[29] Community pharmacists' familiarity with these aspects can be attributed to several factors. These include the fact that nearly two-thirds of the participants in this study reported access to the Wasfaty e-prescription system, and the availability of these medications in their pharmacies was not reported as a key barrier. This finding suggests that most pharmacists dealt with and had routine access to newer antidiabetic therapies in their practice. However, the findings revealed significant knowledge gaps among community pharmacists regarding the clinical application of GLP-1 receptor agonists and SGLT-2 inhibitors in the management of type 2 diabetes and associated comorbidities. Approximately one-quarter of the participants correctly recommended the appropriate intervention in cases 1 (24.2%) and 2 (23.7%), and approximately one-third correctly recommended the appropriate intervention in case 3 (32.2%). Pharmacists aged ≤30 years demonstrated a significantly higher correct response rate in

the third clinical case. This is consistent with a previous study among community pharmacists, in which younger pharmacists were more up to date with guidelines owing to recent exposure before their graduation.[37] Moreover, female pharmacists had a significantly higher correct response rate in the second clinical case compared with male participants (42.9% vs 19.9%, respectively; P=0.004). This could also be explained by the fact that female pharmacists joined this sector in recent years following their graduation with a PharmD degree from local universities.[38,39] These findings suggest that those who more recently entered practice may have had greater exposure to updated guidelines and more frequent engagement with evolving evidence. Consequently, it is of paramount importance to provide pharmacists with advanced knowledge of clinical therapeutics and clinical skills to keep up to date with emerging therapies and evidence. This should build on their current foundational pharmacological knowledge and go beyond to involve individualized patient care interventions. This is particularly important because community pharmacists can bridge the gap between clinical efficacy and real-world effectiveness by identifying patients most likely to benefit from newer therapies. In addition, they play a central role in facilitating communication with prescribing physicians, improving glucose control, promoting adherence, and ensuring that prescribing aligns with evidence-based, cost-effective care.[40–43]

Community pharmacists provided counseling and discussions about these medications to patients with type 2 diabetes mellitus. However, the level of counseling practice and engagement with patients about these medications widely varied, with many participants discussing these medications less frequently and some participants never doing so. Community pharmacists' engagement in discussing newer antidiabetic therapies with patients with type 2 diabetes is influenced by several factors and barriers. The most frequently reported challenge in our study was the high cost (67.3%). As many of these medications are not yet available in generic formulations, their cost continues to be a significant barrier and is frequently reported as a primary reason for their underutilization across healthcare settings.[29,44–46] This barrier takes on greater significance, particularly for the insurance-based model of healthcare delivery, where the inclusion of newer antidiabetic therapies in insurance formularies is essential to ensuring equitable access and optimizing clinical outcomes.[47] Concerns about side effects (33.2%) and patient adherence (28.4%) were among the most frequently reported barriers to the use of newer antidiabetic therapies. However, these concerns are not unique to community pharmacists. Real-world prescribing data from Denmark show that patients with severe frailty are significantly less likely to be initiated on SGLT-2 inhibitors (hazard ratio [HR], 0.65; 95% confidence interval [CI], 0.60 to 0.71) and also less likely to receive GLP-1 receptor agonists (HR, 0.90; 95% CI, 0.82 to 0.99).[48] This pattern has been attributed to clinician concerns about safety, adverse events, and the complexity of managing comorbid conditions.[48] This highlights important gaps in practice that may be mitigated through structured, diabetes-focused continuing education tailored for community pharmacists to address these challenges and facilitate evidence-based practice. Another barrier identified in this study is that pharmacists' ability to apply this knowledge in practice could be hindered by operational challenges within community pharmacy settings. In our study, many pharmacists reported limited time to engage in patient discussions as a barrier. This is similar to the findings reported by a recent study from the United Arab Emirates, in which community pharmacists reported lack of time as a major barrier to providing pharmaceutical care to patients with type 2 diabetes.[49] This finding likely reflects the high patient volume and fast-paced nature of community pharmacy practice. Recent data indicate that >80% of community pharmacists report moderate to high levels of burnout driven by factors such as long working hours, high workloads, and limited support.[36] These factors may further limit pharmacists' capacity to initiate evidence-based discussions with patients and highlight the need for workforce support and structural reforms to enable patient-centered care.

The study findings showed that 88.2% of the participants indicated that CPD should be tailored to therapeutic updates in type 2 diabetes care (Figure 1). Evidence suggests that community pharmacists who participate in such training programs have significantly greater knowledge of new therapies for diabetes management.[50,51] This need was reinforced by our data, highlighting the need for further education and training in this area of practice.

This study has several implications for pharmacy education, practice, healthcare policies, and future research. Strategies and initiatives should be introduced to ensure that community pharmacists contribute meaningfully to the management of chronic diseases, such as type 2 diabetes mellitus. This includes empowering community pharmacists with the clinical knowledge and skills to provide up-to-date therapeutic interventions, recommendations, and counseling to patients using recent effective therapies. This can be achieved through tailored educational programs that address the

gaps identified in this study. Moreover, pharmacy colleges in Saudi Arabia should ensure that their curricula adequately cover the practical aspects of managing diabetes, including experiential education in community pharmacies and patient care-related activities. This is important to introduce practice-ready pharmacists who embrace patient care activities in community pharmacy settings.

For the healthcare system, the growing economic and medical burden of obesity and type 2 diabetes mellitus in Saudi Arabia necessitates thoughtful integration of newer therapies, such as SGLT-2 inhibitors and GLP-1 receptor agonists.[52] These newer therapies offer clinically meaningful benefits, such as weight loss, cardiovascular protection, and kidney risk reduction, all of which can potentially lower long-term costs associated with complications.[33,34] Real-world data also demonstrate that the integration of these agents into interprofessional collaborative care models for the management of type 2 diabetes mellitus can further enhance clinical outcomes.[53] A retrospective study conducted at a Federally Qualified Health Center in the United States, involving 194 patients with type 2 diabetes mellitus, found that 48.3% of patients were able to discontinue insulin therapy after initiating a GLP-1 receptor agonist and/or SGLT-2 inhibitor, with 93.1% of these cases occurring within a collaborative care setting. Additionally, the proportion of patients receiving excessive basal insulin doses (overbasalization) decreased from 61.1% to 17.5%, and the mean HbA1c was reduced by 2.9% in the collaborative care group compared with the 1.1% reduction observed in the standard care.[53] These findings highlight the importance of integrating community pharmacists into the management of type 2 diabetes mellitus, particularly in evaluating and identifying patients who are candidates for newer antidiabetic therapies. Such models not only improve clinical outcomes but also reduce the medication burden when supported by pharmacist-led interventions. Consequently, it would be helpful to introduce a collaborative practice model to engage pharmacists in the management of diabetes mellitus and other chronic conditions in collaboration with physicians practicing in other primary healthcare settings. This is important given the roles that community pharmacists could play in addressing the high prevalence of diabetes mellitus in Saudi Arabia. This can be facilitated by recent developments in community pharmacy practices in Saudi Arabia. The scope of practice has been expanded to include additional professional and patient care services, including point-of-care testing, patient assessment and monitoring services, medication therapy management, and immunization services.[13] However, as identified in this study, several key factors hinder the implementation, including inadequate clinical training and operational factors. Hence, a holistic approach involving all parties is required for community pharmacists to use their skills to improve patient care. Future studies should examine the impact of educational programs on practices. In addition, future studies should examine the optimal collaborative practice models that could be adopted in the community pharmacy sector in Saudi Arabia. Moreover, future studies could explore the best approaches to eliminating barriers to providing patient care services in community pharmacies and solutions that could have a greater impact.

Overall, this study provides valuable insights into the current perspectives of community pharmacists regarding newer antidiabetic therapies. It also provides valuable data and guidance for health policymakers to address challenges and enhance the role of community pharmacists in the effective management of type 2 diabetes mellitus and to implement initiatives to further improve evidence-based practice in community pharmacies. This is particularly important given the high prevalence of diabetes in Saudi Arabia and the crucial role that could be played by community pharmacists in the prevention and management of diabetes in primary care settings. This study has other strengths. The sample comprised approximately 41.2% of all the licensed community pharmacists in the region, offering good coverage and geographical diversity. All participants were recruited through in-person field visits to a wide range of community pharmacies and pharmacy chains across the region. This was performed to reduce the potential selection bias. In addition, to reduce any potential social desirability bias, the participants were informed that all responses were anonymous. However, this study has some limitations. This included convenience sampling, and this study was conducted in one region of Saudi Arabia. These factors may have affected the generalizability of the study findings to other regions. However, in Saudi Arabia, laws and regulations governing the professional scope of practice in community pharmacies are the same across the country (ie, at the national level). In addition, chain pharmacies operating in this region also operate in other regions.[13,54] Consequently, we believe that this study provides valuable data to healthcare policymakers to further advance the practice of community pharmacists and utilize this group of healthcare professionals to help address the increasing prevalence of diabetes and decrease the burden on primary care physicians.

Conclusion

The study provided insights into community pharmacists' knowledge, counseling practice, barriers, and clinical decision-making regarding the newer antidiabetic therapies, particularly GLP-1 receptor agonists and SGLT-2 inhibitors. The study also provided valuable data that could guide the strategies and initiatives to enhance the roles of community pharmacists in the management of type 2 diabetes mellitus. The study findings showed that many participants had substantial gaps in their applied knowledge of clinical therapeutics, and persistent barriers to clinical engagement remained. Consequently, these gaps and barriers should be addressed, as community pharmacists play an essential role in the collaborative diabetes care model, particularly in optimizing the appropriate use of new antidiabetic therapies to enhance clinical outcomes. As the indications for these agents continue to expand, pharmacists must remain up to date with current evidence-based guidelines to identify appropriate candidates and provide informed therapeutic recommendations. This can be achieved through tailored CPD and system-level support, which reinforces their role in patient-centered diabetes management.

Data Sharing Statement

The data associated with this study are available from the corresponding author upon reasonable request.

Ethics Approval and Informed Consent

The study was approved by the Regional Research Ethics Committee, Qassim region of Saudi Arabia (approval no. (607-46-7488). The study was implemented in accordance with the ethical principles of the Declaration of Helsinki. As the questionnaire was completed online, it included a consent statement indicating that by completing the survey and submitting the responses online, consent was provided to participate in this study.

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Author Contributions

Conceptualization: ISA and AAA (Alian A Alrasheedy); Data curation: ISA; Formal analysis: AAA (Alian A Alrasheedy); Funding acquisition AAA (Alian A Alrasheedy); Investigation: ISA, SAA, RFA, HSA, NSA, and AMA; Methodology: ISA, SAA, RFA, HSA, NSA, AMA, AAA (Abdulrahman A. Alsuhibani), and AAA (Alian A Alrasheedy); Project administration: ISA and AAA (Alian A Alrasheedy); Resources: ISA, SAA, RFA, HSA, NSA, and AMA; Software: ISA and AAA (Alian A Alrasheedy); Supervision: ISA; Validation: ISA and AAA (Abdulrahman A. Alsuhibani); Visualization: AAA (Abdulrahman A. Alsuhibani) and AAA (Alian A Alrasheedy); Writing – original draft: ISA, AAA (Alian A Alrasheedy), SAA, RFA, HSA, NSA, and AMA; Writing – review and editing: ISA, AAA (Abdulrahman A. Alsuhibani), and AAA (Alian A Alrasheedy); All authors have approved the final version of the article to be published and have agreed to take responsibility and be accountable for all aspects of the article. All authors have also agreed on the journal to which the article has been submitted.

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Disclosure

The authors report no conflicts of interest in this work.

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