

Original Research

Pharmacists, knowledge and counseling practices regarding tirzepatide for obesity and type 2 diabetes management in the UAE

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Received (first version): 15-Apr-2026

Accepted: 04- Jun- 2026

Published online: 12-Aug-2026

Abstract

Objective: To assess UAE pharmacists' knowledge and counseling practices regarding tirzepatide for obesity and type 2 diabetes, and to identify barriers to dispensing and factors associated with better counseling. **Methods:** A cross-sectional, web-based survey (March–June 2024) of licensed community and hospital pharmacists across the UAE used a structured questionnaire covering demographics, a 54-item knowledge scale, a 15-item counseling frequency scale, and perceived barriers. Descriptive statistics summarized responses. Quantile regression examined associations of pharmacist characteristics and knowledge with counseling practices. **Results:** Of 405 respondents, 386 were analyzed. Most expressed willingness to engage in obesity management (95.1%). Mean knowledge score was 27.78/54, indicating overall insufficiency. Gaps included mechanism of action (49% incorrect/unknown), dosing and titration, renal/hepatic adjustments, dosage form, and recognition of adverse effects and contraindications. Median counseling score was 33/45 (IQR 25–42); frequently omitted topics included missed-dose management (54.7%), schedule modifications (53.9%), treatment duration (51.6%), hypoglycemia risk (51.0%), and expected outcomes (50.8%). Key barriers were medication cost (78%), limited patient knowledge (73.6%), and drug shortages (68.4%), with additional concerns about injections and perceived efficacy/necessity. In regression, higher knowledge was associated with better counseling ($\beta=0.492$; 95% CI 0.291–0.693; $p<0.001$), as was working in chain pharmacies ($\beta=5.183$; 95% CI 1.650–8.716; $p=0.004$). Serving 31–60 patients/day predicted higher knowledge versus $>60/\text{day}$ ($\beta=2.593$; 95% CI 0.672–4.514; $p=0.008$). Reluctance to engage in obesity care predicted lower knowledge ($\beta=-4.148$; 95% CI -7.703 to -0.593 ; $p=0.022$). **Conclusions:** UAE pharmacists showed strong willingness but suboptimal knowledge and counseling about tirzepatide. Targeted education, practical counseling tools, and system support (availability, affordability) are needed to optimize pharmacist-led care.

Keywords: Pharmacists, Tirzepatide, knowledge, counseling, diabetes, obesity

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INTRODUCTION

Obesity and type 2 diabetes mellitus (type 2 diabetes) are accelerating public-health crises that increasingly co-occur and called “diabesity”. In 2022, 2.5 billion adults were overweight and 890 million were living with obesity, 16% of adults globally, with prevalence more than doubling since 1990^{1,2}. In the United Arab Emirates (UAE), the prevalence of adult obesity in 2018 adults was as high as 27.8%³. In Dubai, 57.6% of adults were overweight/obese and 17.8% had obesity. National estimates around 2017–2018 place adult obesity near 28%. Obesity is a leading modifiable driver of type 2 diabetes mellitus (type 2 diabetes). Globally, an estimated 589 million adults ($\approx 11.1\%$) live with diabetes, projected to reach ~ 853 million by 2050 (IDF 2025)⁴. Independent modelling from the Global Burden of Disease estimates >1.31 billion people with diabetes by 2050, reflecting differences in methodology and age ranges. In the UAE, adult diabetes prevalence has been reported around $\sim 15\%$ nationally (e.g., IDF 2019 estimate 15.4%), with higher figures in some Emirates and subgroups⁵. It causes multiple comorbidities and vascular complications known as microvascular (such as chronic kidney disease, retinopathy, and diabetic neuropathy) as well as macrovascular complications (such as atherosclerotic cardiovascular diseases)⁶. These represent a



major source of morbidity, mortality⁷, and reduced quality of life in patients⁸. Substantial weight reduction (10% of body weight) in obese patients is associated with improved control of type 2 diabetes and hypertension (HTN). Consensus guidance indicates 5-10% weight loss improves glycemia and cardiometabolic risk, while ≥ 10 -15% can be disease modifying for type 2 diabetes in some individuals⁹.

Tirzepatide, a novel subcutaneous dual glucose-dependent insulinotropic polypeptide (GIP) and glucagon-like peptide-1 (GLP-1) receptor agonist (GLP-1 RA)¹⁰, has shown robust efficacy in both type 2 diabetes and obesity¹¹. It has consistently proven superior efficacy in terms of glycemic control and weight loss¹². In SURPASS phase 3 clinical trials done on diabetic patients, Tirzepatide efficacy and safety have been proven to be superior in terms of glycemic control and HbA1c levels compared to other antidiabetic agents, including insulin^{13,14}. For example, SURPASS-2 showed greater HbA1c and weight reductions vs semaglutide 1 mg; SURPASS-4 suggested slower eGFR decline and lower albuminuria vs insulin glargine¹⁵. Beyond glycemic control, it also demonstrated multiple cardiometabolic benefits, such as favorable effects on non-alcoholic fatty liver disease¹⁶, blood pressure control¹⁷, lipid profiles¹⁸, atherosclerotic cardiovascular risk¹⁹, and chronic kidney disease²⁰. During the study period, tirzepatide was approved in the UAE for the treatment of type 2 diabetes mellitus²¹; however, a formal regulatory approval for obesity as a standalone indication had not yet been established. Its use in the obesity management was therefore based on emerging clinical evidence and evolving international guidance rather than UAE-specific labeling²².

In modern medical practice, the role of pharmacists goes beyond simply dispensing medications; it has evolved to be a team-based, collaborative, patient-centered role that includes patient education, counseling, and collaborating with health care providers to ensure better pharmaceutical care²³. As the most accessible health care providers, pharmacists play an essential role in sharing information to strengthen pharmacist-patient relationships and supporting chronic disease management^{24,25}. International FIP/WHO Good Pharmacy Practice standards explicitly position pharmacists to deliver medication counseling, device training, medication review, and collaborative care²⁶. Their interventions in obesity and type 2 diabetes have consistently shown significant improvement in treatment adherence and clinical outcomes^{27,28}. As well as patients' knowledge and awareness²⁹. The contribution of pharmacists in the management of diabetic and obese patients involves patient education, drug information services, device training, lifestyle counseling, adherence optimization, and integration within interdisciplinary teams. Numerous studies confirm that pharmacist-led interventions, including GLP-1 RA- based therapies, improve weight loss outcomes, HbA1c, and lipid parameters^{30,31}. For example, one study showed that 82.5% of patients in a pharmacist-co-managed group achieved treatment success, compared with 33.3% in a physician-only group³⁰. These findings strongly support the inclusion of pharmacists as integral members of multidisciplinary teams

managing obesity and type 2 diabetes. To fulfill this role effectively, pharmacists must be equipped with the knowledge and skills required for evidence-based care. Collectively, the evidence highlights an urgent need for pharmacists to develop the competencies necessary to manage complex chronic diseases such as type 2 diabetes and obesity.

Despite the growing clinical use of tirzepatide and its expanding role in the management of type 2 diabetes and obesity, there is limited evidence regarding pharmacists' preparedness to support its safe and effective use in real-world practice, particularly in the UAE. Tirzepatide requires complex patient counselling related to injectable administration, dose titration, long-term treatment expectations, adverse effect monitoring, and evolving regulatory indications for obesity³². However existing research has largely focused on clinical efficacy and physician-led care, with little attention given to pharmacists' knowledge, counselling practices, and perceived barriers related to dual GIP/GLP-1 receptor agonists. This gap is especially important in the UAE, where pharmacists are highly accessible healthcare professionals and play key role in chronic disease management. Addressing this knowledge and practice gap is essential to optimize patient education, medication safety, adherence, and equitable use of tirzepatide. Therefore the aim of this study is to assess the UAE pharmacists' knowledge and practices of Tirzepatide and its role in DM and obesity management, in addition to the barriers faced when dispensing Tirzepatide. The findings of this study will inform pharmacist-led service design, education, and policy to optimize safe, equitable use of dual GIP/GLP-1 therapy in the UAE.

METHODS

Study design, setting, and participants

This cross-sectional study was conducted between March 1 and October 30, 2024, among licensed community and hospital pharmacists practicing across the UAE. Data was collected using a structured, self-administered questionnaire distributed electronically via Google Forms. Participants were recruited using a convenience sampling frame through professional networks, pharmacy groups, and social media platforms. Eligible participants were those who had graduated from academic institutions accredited by the UAE Ministry of Higher Education and held active licensure from the UAE Ministry of Health. Participants who indicated that they were unfamiliar with tirzepatide were excluded from the final analysis immediately after providing informed consent and answering the initial screening question; therefore, they did not complete the remainder of the questionnaire. To promote honest responses and maintain confidentiality, no personal identifiers were collected. Confidentiality and anonymity were emphasized in all communication, and participation remained entirely voluntary. The survey opened with an information sheet explaining the study's objectives, ethical considerations, and the voluntary nature of participation. Informed consent



was obtained electronically through a required confirmation statement "I have read the study information and agree to participate". The questionnaire took 10 to 15 minutes to complete.

Study Instrument

The questionnaire used in this study was developed following a comprehensive review of the literature on pharmacist knowledge and practices related to emerging antidiabetic and weight management therapies, particularly Tirzepatide^{33,34}. The demographic section gathered information on age, gender, emirate of practice, pharmacy type (chain, independent, or hospital), academic qualifications, job role, years of experience, average number of patients served, prescriptions dispensed daily, and willingness to participate in obesity management. The knowledge scale comprised 54 statements covering clinical aspects such as indications, mechanisms of action, dosing, formulation, administration, contraindications, adverse effects, and patient counselling. Responses were provided in a true/false/I don't know format, with one point awarded for each correct answer and zero points for incorrect or unknown responses, yielding a total possible score of 54. Based on expert guidance and clinical relevance. Counselling practices were assessed through 15 items evaluating the frequency of counselling in areas such as dosage adjustment, side effects, administration, storage, and expected outcomes, using a three-point frequency scale (always, sometimes, never), with a maximum score of 45. Perceived barriers to dispensing Tirzepatide, such as high cost, limited availability, and patient hesitancy, were also explored, along with pharmacists' willingness and frequency of engagement in obesity management using Likert-type scales. The instrument underwent content validation by a panel of experts including academic pharmacists, a clinical endocrinologist, and a pharmacy practitioner, who reviewed it for relevance and clarity. A pilot test was conducted with 10 pharmacists to ensure comprehensibility and applicability; their responses were excluded from the final analysis. Reliability testing showed acceptable internal consistency, with a Cronbach's alpha of 0.71 for the counselling practices scale.

Sample size calculation

To determine the required sample size, the following formula was applied:

$$n = (Z^2 \times p \times (1 - p)) / d^2 \quad 35.$$

In this equation, p denotes the estimated population proportion, which was set at 0.5 to maximize variability. A margin of error (d) of 0.05 was chosen, along with a Z-score of 1.96, corresponding to a 95% confidence interval. Using these values, the minimum sample size needed for the study was calculated to be 385 participants.

Ethical Approval

The study was approved by the Research Ethics Committee at Al Ain University – Abu Dhabi Campus (Reference #: COP/AREC/AD/28), dated February 8, 2024.

Statistical analysis

Descriptive statistics were used to summarize the demographic and professional characteristics of the participating pharmacists. Categorical variables such as gender, type of pharmacy, job role, and willingness to engage in obesity management were reported as frequencies and percentages, while continuous variables such as age were described using means and standard deviations (SD). Knowledge scores were calculated by summing the number of correct responses, with a maximum possible score of 54. These were expressed as mean (SD) values. Counselling practice scores were similarly calculated out of a maximum of 45 and reported as medians with interquartile ranges (IQR), given their skewed distribution. To explore associations between pharmacists' characteristics and their knowledge or counselling practices, regression analyses were performed. Quantile regression was selected as it is robust to skewed outcome distributions. Independent variables included demographic and professional characteristics such as type of pharmacy, education level, patient load, and willingness to engage in obesity management. Results were reported as regression coefficients with corresponding 95% confidence intervals (CIs) and p-values. All statistical analyses were conducted using SPSS version 27, and a p-value of <0.05 was considered statistically significant.

RESULTS

A total of 405 pharmacists participated in the study. 19 (4.7%) of participants were excluded as they did not know what Tirzepatide is, ending up with 386 participants filling out the survey. As shown in Table 1, the mean (SD) age of participants was 31.45 ± 5.56 years. Most of the participants were females (56%), worked in Abu Dhabi (92.3%), worked in chain pharmacies (65.3%), held bachelor's degrees in pharmacy (79.3%), were employee pharmacists (98.2%), had experience of 6 months to 1 year (67.6%), served 31-60 patients (36.3%), and dispensed 10-30 prescriptions per day (45.4%). Most pharmacists showed a willingness to provide advice and actively participate in obesity management (95.1%) and 65.9% agreed or strongly agreed that they share responsibility of obesity management alongside other healthcare providers. Furthermore, 37.6 % reported frequently receiving requests for advice on obesity management with responses indicating such interactions occur daily, several times a week, or once a week.

Pharmacists scored an average of 27.78 (SD = 9.74) out of 54, indicating generally insufficient knowledge about Tirzepatide meaning that, on average, pharmacists correctly answered only about half the knowledge items, suggesting substantial gaps in understanding key clinical aspects of the medication. While most pharmacists (93.3%) were aware that Tirzepatide is approved for the treatment of type 2 diabetes (type 2



Table 1. Sociodemographic and job-related characteristics of participating pharmacists (n=386)		
Variable	Frequency (%)	
Gender	Female	227 (58.8%)
	Male	159 (41.2%)
Highest education attained	Bachelor's in pharmacy (B Pharm)	306 (79.3%)
	Doctor of Pharmacy (PharmD)	39 (10.1%)
	Postgraduate (master's or PhD)	41 (10.6%)
Type of pharmacy	Chain community pharmacy	252 (65.3%)
	Hospital pharmacy	36 (9.3%)
	Independent community pharmacy	98 (25.4%)
Job role	Pharmacist In-charge/Employee pharmacist	379 (98.2%)
	Pharmacy owner	7 (1.8%)
In which emirate do you work?	Abu Dhabi	374 (96.9%)
	Dubai and North Emirates	12 (3.1%)
How many years of experience do you have as a community pharmacist?	6 months to 1 year	261 (67.6%)
	1-10 years	70 (18.1%)
	More than 10 years	55 (14.2%)
Average number of patients served per day	Less than 10 patients	14 (3.6%)
	10 -30 patients	123 (31.9%)
	31-60 patients	140 (36.3%)
	More than 60 patients	109 (28.2%)
Average number of prescriptions dispensed per day	Less than 10 prescriptions	143 (37%)
	10 -30 prescriptions	175 (45.3%)
	More than 30 prescriptions	68 (17.6%)
I am willing to provide advice and engage in obesity management for individuals seeking weight control	No	19 (4.9%)
	Yes	367 (95.1%)
As a pharmacist, I share responsibility with other healthcare providers in obesity management	Strongly disagree	29 (7.6%)
	Disagree	6 (1.6%)
	Neutral	96 (25%)
	Agree	176 (45.8%)
	Strongly agree	77 (20.1%)
How often do you receive requests for advice on obesity management?	Daily	27 (7%)
	Several times a week	54 (14%)
	Once a week	64 (16.6%)
	Rarely	121 (31.3%)
	Never	120 (31.1%)

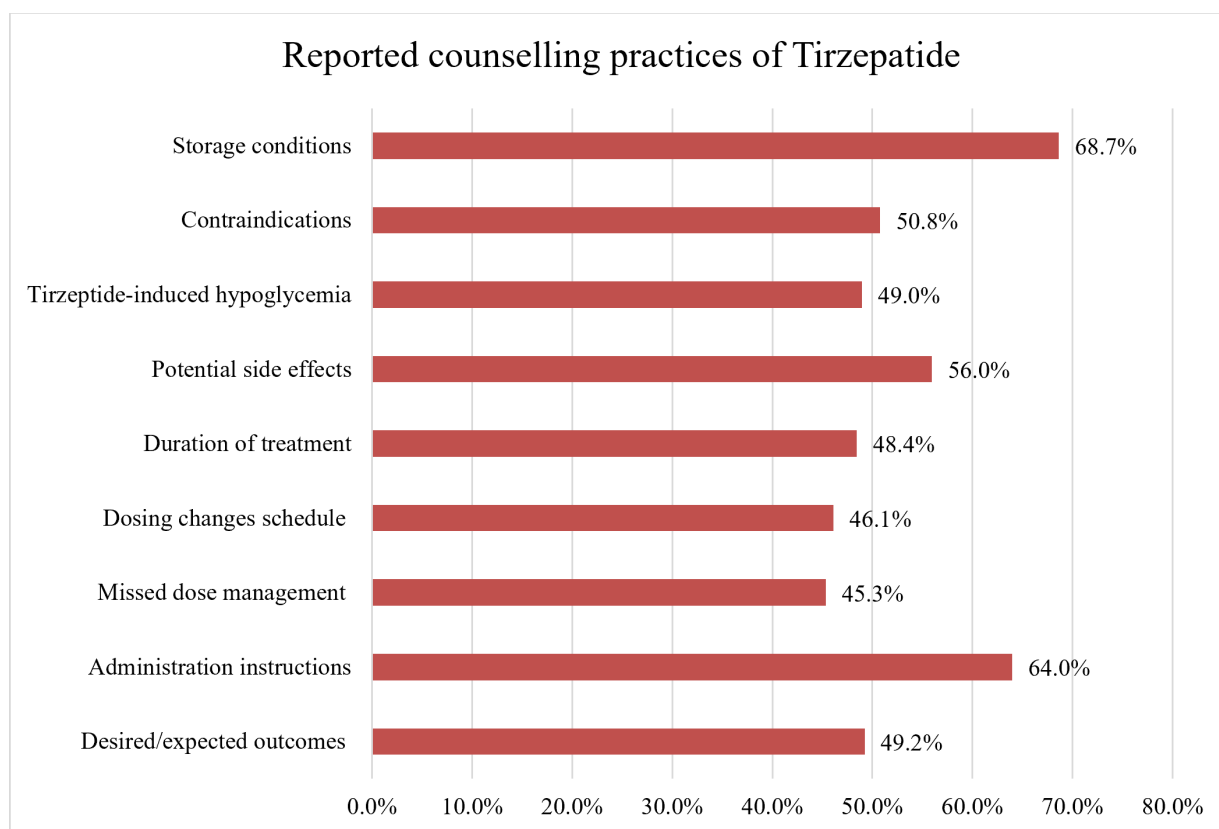


Figure 1. Reported counseling practices of Tirzepatide

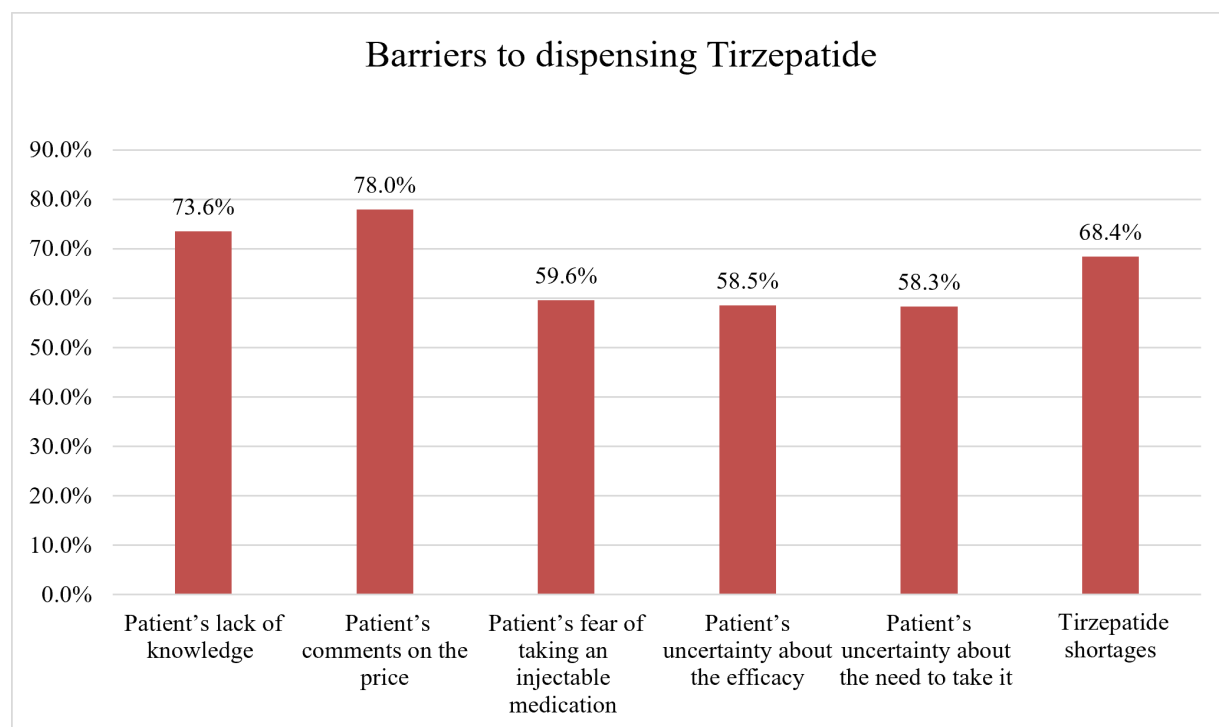


Figure 2. Barriers encountered while dispensing Tirzepatide.

diabetes), over a third (35.5%) were unaware of its approval for weight management. Nearly half (49%) did not understand its mechanism of action, highlighting a significant knowledge gap (Supplementary table 1). The most identified gaps included a lack of awareness that Tirzepatide is not available as a multi-dose injection (82.4%), knowledge of the minimum effective dose (only 19.7%), and appropriate timing for dose titration (67.4%). Awareness of required dose adjustments was also low, only 17.6% and 15.8% correctly indicated that no changes are needed for patients with renal or hepatic impairment, respectively. Recognition of serious side effects was limited. Diabetic retinopathy (36.3%) and gallbladder disease (40.7%) were poorly identified as risks, and only 37.6% were aware that an increased heart rate is a potential side effect. Furthermore, most respondents did not know that Tirzepatide is contraindicated in end-stage renal disease (83.9%) and hepatic impairment (84.5%). Only 42.7% of pharmacists knew how to advise on administration with meals, while just 18.9% understood how to manage missed doses or appropriate storage at room temperature (9.6%). Regarding Tirzepatide's role in obesity, only 40.7% identified it as a first-line treatment, and just 11.1% were aware that it is a chronic medication intended for lifelong use. Few pharmacists knew the expected weight loss goals (17.6%) or the risk of weight regaining after discontinuation (56.7%).

Out of a maximum score of 45, pharmacists achieved a median counselling practices score of 33 (IQR: 25–42), indicating acceptable engagement, which refers to pharmacists reporting regular counseling on most, but not all, of the assessed counseling items, while revealing notable gaps across all measured areas. As shown in Figure 1, the most frequently neglected topics were missed dose management and dosing schedule modifications, which were not addressed by 54.7% and 53.9% of pharmacists, respectively. Similarly, more than half did not provide counselling on treatment duration (51.6%), hypoglycaemia risk (51.0%), and expected therapeutic outcomes (50.8%). Additionally, 49.2% and 44.0% failed to counsel on contraindications and potential side effects, respectively. Moreover, administration instructions were omitted by 36.0% of pharmacists, while 31.3% did not provide guidance on proper storage conditions—making it the most addressed topic, yet still leaving room for improvement.

As shown in figure 2, the most frequently reported obstacles to provide counseling included high cost of the medication (78%) lack of patient knowledge (73.6%), and drug shortages (68.4%). Other notable barriers included patient fear of injectable treatments (59.6%), uncertainty about the drug's efficacy (58.5%), and doubt regarding the necessity of the medication (58.3%).

Quantile regression showed that pharmacists who served 31 to 60 patients reported higher knowledge scores compared to those who served more than 60 patients daily (Coefficient = 2.593; 95%-CI: 0.672 - 4.514; $p=0.008$). In contrast, pharmacists who were not willing to provide advice and engage in obesity

management reported lower knowledge scores compared to their counterparts (Coefficient = -4.148; 95%-CI: -7.703 - -0.593; $p=0.022$) (Table 2). Regarding counseling practices, increased knowledge score (coefficient = 0.492; 95%CI: 0.291 - 0.693; $p<0.001$) and working in chain community pharmacy (coefficient = 5.183; 95%CI: 1.650 - 8.716; $p=0.004$) were associated with improved counseling practices. In contrast, pharmacists who had Pharm D degrees reported fewer counseling practices compared to those who had Master's or PhD degrees (coefficient = -8.268; 95%-CI: -14.723 - -1.813; $p=0.012$) (Table 3).

DISCUSSION

Obesity and type 2 diabetes are growing global concerns, requiring multidisciplinary management approaches. Pharmacists, as frontline healthcare providers, are increasingly recognized for their role in managing these conditions. Given the high prevalence of obesity and type 2 diabetes in the UAE, pharmacists are increasingly likely to encounter patients using or inquiring about tirzepatide, underscoring the importance of ensuring adequate knowledge and counseling capacity in everyday practice. Our study explored the UAE pharmacists' knowledge, practices, and dispensing barriers related to Tirzepatide therapy. This study reveals important knowledge gaps among pharmacists regarding Tirzepatide therapy. Many lack familiarity with its role in obesity management, dosing details, formulations, storage requirements, contraindications, dose adjustments in renal and hepatic impairment, serious side effects such as diabetic retinopathy and gallbladder, and Tirzepatide's role in obesity treatment, such as treatment duration, expected outcomes, and BMI thresholds. These findings align with earlier research showing limited knowledge among healthcare professionals about newer anti-diabetic and anti-obesity drugs³⁶⁻³⁸. The rapid clinical adoption of Tirzepatide may have outpaced continuing education, especially in community and outpatient settings where pharmacists have less clinical exposure, restricting their understanding of eligibility criteria, long-term treatment, and guidelines. Concerning, as pharmacists play a vital role in identifying these patient-specific factors. It may also reflect the traditional separation of obesity management from routine pharmacy practice. Additionally, the regulatory status of tirzepatide in the UAE during the study period likely contributed to these gaps. Although tirzepatide was approved for the treatment of type 2 diabetes mellitus, a formal obesity-specific indication had not yet been established locally; consequently, pharmacists' counseling related to obesity likely reflected off-label use and emerging international evidence rather than UAE-specific labeling^{21,22}. Despite obesity now being recognized as a chronic disease that may require pharmacological intervention³⁹, many pharmacists still view it mainly as a lifestyle issue. On a positive note, most were aware of its use in type 2 diabetes mellitus (type 2 diabetes), acknowledged Tirzepatide's superior efficacy and preference in patients with type 2 diabetes and obesity, showing openness to adopting new therapies when informed. However, limited awareness of its place in treatment guidelines stresses the



Table 2. Quantile regression analysis of the factors associated with knowledge score

Parameter	Coefficient	P value	95% Confidence Interval	
			Lower Bound	Upper Bound
(Intercept)	22.481	0	14.68	30.283
Age (years)	0.148	0.097	-0.027	0.323
Gender				
Female	0.074	0.928	-1.531	1.679
Male	0 ^c	.	.	.
Highest education attained: B pharm	1.333	0.294	-1.162	3.829
Highest education attained: PharmD	1.667	0.326	-1.666	5
Highest education attained: MSc or PhD	0 ^c	.	.	.
Type of pharmacy you work in: Chain community pharmacy	-0.519	0.577	-2.343	1.306
Type of pharmacy you work in: Hospital pharmacy	-1.222	0.414	-4.162	1.718
Type of pharmacy you work in: Independent community pharmacy	0 ^c	.	.	.
How many years of experience do you have as a community pharmacist? 6 months to 1 year	1.37	0.346	-1.488	4.228
How many years of experience do you have as a community pharmacist? 1-10 years	0.148	0.934	-3.353	3.65
How many years of experience do you have as a community pharmacist? More than 10 years	0 ^c	.	.	.
I am willing to provide advice and engage in obesity management for individuals seeking weight control: No	-4.148	0.022	-7.703	-0.593
I am willing to provide advice and engage in obesity management for individuals seeking weight control: Yes	0 ^c	.	.	.
Average number of patients served per day: < 30 patients	1.407	0.166	-0.586	3.401
Average number of patients served per day: 31-60 patients	2.593	0.008	0.672	4.514
Average number of patients served per day: > 60 patients	0 ^c	.	.	.
As a pharmacist, I share responsibility with other healthcare providers in obesity management: No	3.89E-15	1	-1.635	1.635
As a pharmacist, I share responsibility with other healthcare providers in obesity management: Yes	0 ^c	.	.	.

Table 3. Quantile regression analysis of the factors associated with counseling practices score

Parameter	Coefficient	P value	95% Confidence Interval		
			Lower Bound	Upper Bound	
(Intercept)	20.284	0.013	4.264		36.304
Knowledge score	0.492	0	0.291		0.693
Age (years)	-0.121	0.485	-0.46		0.219
Gender					
Female	-1.005	0.525	-4.112		2.102
Male	0 ^c	.	.		.
Highest education attained: B pharm	-1.123	0.648	-5.954		3.709
Highest education attained: pharm D	-8.268	0.012	-14.723		-1.813
Highest education attained: MSc or PhD	0 ^c	.	.		.
Type of pharmacy you work in: Chain community pharmacy	5.183	0.004	1.65		8.716
Type of pharmacy you work in: Hospital pharmacy	1.189	0.682	-4.51		6.888
Type of pharmacy you work in: Independent community pharmacy	0 ^c	.	.		.
How many years of experience do you have as a community pharmacist? 6 months to 1 year	0.29	0.918	-5.243		5.822
How many years of experience do you have as a community pharmacist? 1-10 years	0.902	0.794	-5.885		7.689
How many years of experience do you have as a community pharmacist? More than 10 years	0 ^c	.	.		.
I am willing to provide advice and engage in obesity management for individuals seeking weight control: No	0.289	0.935	-6.643		7.221
I am willing to provide advice and engage in obesity management for individuals seeking weight control: Yes	0 ^c	.	.		.
Average number of patients served per day: < 30 patients	-3.238	0.1	-7.097		0.622
Average number of patients served per day: 31-60 patients	-2.658	0.162	-6.387		1.071
Average number of patients served per day: > 60 patients	0 ^c	.	.		.
As a pharmacist, I share responsibility with other healthcare providers in obesity management: No	2.929	0.07	-0.237		6.094
As a pharmacist, I share responsibility with other healthcare providers in obesity management: Yes	0 ^c	.	.		.

need for targeted educational programs. Pharmacy education at both undergraduate and continuing professional levels should emphasize emerging therapies, focusing on practical counseling, patient eligibility, long-term management, and strategies for maintaining up-to-date clinical knowledge. In the UAE, where diabetes and obesity are prevalent^{3,40}, empowering pharmacists with current knowledge about Tirzepatide could substantially improve patient care. Given pharmacists' frontline role in chronic disease management, strengthening their competencies is essential to reduce healthcare burdens²⁸.

Pharmacists with lighter workloads demonstrated higher knowledge scores, consistent with studies showing heavy workloads hinder performance⁴¹. This may be explained by the reduced workload, which affords them more time to stay current with clinical updates, engage in professional development activities, and deepen their understanding of emerging therapies. With less time pressure, these pharmacists are likely to be better positioned to read literature, attend training, and reflect on best practices, which ultimately contributes to enhanced knowledge retention. Those reluctant to counsel or engage in obesity care had lower knowledge, possibly due to limited role awareness, confidence, or biases, compounded by educational and institutional gaps.

The results highlight notable gaps in pharmacists' counseling practices concerning Tirzepatide, particularly in areas critical to safe and effective long-term use. While counseling on basic administration and storage was relatively more common, support for more nuanced or situational aspects, such as managing missed doses or setting expectations for outcomes, was often lacking. These shortcomings likely stem from a combination of factors. First, as seen in the knowledge findings, many pharmacists may simply lack sufficient understanding of Tirzepatide's full clinical profile, especially regarding its role in obesity management, chronic dosing strategies, and the importance of long-term adherence. Without a solid knowledge base, effective counseling becomes inherently challenging⁴². Second, time constraints and workload pressures in many community and outpatient pharmacy settings remain a barrier to thorough patient education⁴³. In fast-paced environments where dispensing remains the priority, pharmacists may not have the flexibility or institutional support needed to engage in detailed discussions about newer therapies. Additionally, some pharmacists lack confidence in their evolving role in chronic diseases management⁴⁴. Some pharmacists might feel uncertain or uncomfortable initiating conversations around weight management, especially in the absence of formal counseling protocols or specific training. This hesitation may also reflect a broader cultural sensitivity around discussing weight-related issues with patients. The lack of structured continuing professional development programs focused on metabolic and anti-obesity therapies further compounds the issue. Without ongoing education and practical training on how to counsel on new treatments, pharmacists may default to discussing only the most basic information, missing opportunities to address adherence strategies, lifestyle integration, and long-term

expectations.

Improving this situation will require a multifaceted approach. Beyond increasing awareness of Tirzepatide's clinical uses, there must be greater emphasis on building pharmacists' practical counseling skills, particularly around newer therapeutic areas. Training initiatives should go beyond theoretical updates and incorporate real-world counseling scenarios, communication techniques, and confidence-building strategies for discussing sensitive topics like weight loss. Moreover, institutional support is essential. Pharmacies and healthcare organizations should create environments that value patient counseling; through allocated time, standardized protocols, and clinical documentation tools that reinforce pharmacist involvement. Clear guidance on how and when to counsel on newer therapies can help pharmacists embrace a more active role in managing chronic conditions. Pharmacists represent an untapped resource in efforts to improve patient outcomes. By equipping them with the knowledge, tools, and confidence to counsel patients effectively on therapies like Tirzepatide, healthcare systems can strengthen their front-line response to these public health challenges.

Higher knowledge correlated with better counseling practices, emphasizing the importance of confidence and mastery in patient education⁴⁵. Chain pharmacy pharmacists performed better in counseling than those in independent settings, likely due to standardized protocols, routine training, and resource access⁴⁶. Independent pharmacies may improve care by adopting similar models. National guidelines could help standardize counseling, though some studies show no difference between pharmacy types, reflecting contextual variations^{46,48}. Unexpectedly, pharmacists with PharmD degrees had lower counseling scores than those with master's or PhD qualifications, this trend may stem from differences in curriculum focus or experience⁴⁹. Postgraduate education often emphasizes research skills, clinical application, and evidence-based practice more intensively, potentially better equipping those individuals to deliver high-quality counseling. Tailored educational programs and mentorship may help translate knowledge into counseling skills, and thereby, improve patient outcomes in obesity and diabetes care.

Concerning barriers, the high cost of Tirzepatide was the most frequently cited obstacle to dispensing, consistent with prior research identifying cost as a major barrier to medication acquisition^{50,51}. Medication shortages were also commonly reported despite strong demand⁵², reflecting the drug's perceived value among patients and providers managing emotionally and socially burdensome chronic conditions. Nonetheless, high costs limit access for many patients^{50,51}, underscoring the need for expanded insurance coverage, subsidy programs, or price negotiations to improve equity and access to Tirzepatide. Patient-level barriers, such as limited awareness of the medication and hesitancy toward injectable therapy, also hinder its uptake. These findings align with regional studies from Saudi Arabia and others highlighting public



knowledge gaps about anti-obesity treatments⁵³. Overcoming these multifaceted challenges requires coordinated efforts: public health campaigns to improve awareness and trust, enhanced pharmacist training to support patient education, and routine integration of obesity counseling into clinical encounters. Improving both access and understanding is essential to maximize the public health impact of emerging therapies like Tirzepatide.

Study Limitations

Causal inference is not possible due to the cross-sectional design; associations only represent correlations at a single moment in time. Self-reported knowledge and behaviors are susceptible to social-desirability and recall biases. Convenience sampling could have favored pharmacists with higher levels of motivation. The sample composition further restricts generalizability as most respondents were from Abu Dhabi, working in chain pharmacies, and were early-career pharmacists.

CONCLUSION

Among UAE pharmacists surveyed, knowledge and counseling on Tirzepatide were suboptimal despite strong willingness to engage in obesity care. Gaps spanned dosing, contraindications, and adverse effects, constrained by cost and shortages. Higher knowledge and chain-pharmacy practice predicted better

counseling. Targeted education and system support could enhance effective pharmacist-led obesity management.

AUTHORS' CONTRIBUTION

ASJ conceived and designed the study, conducted research, provided research materials, supervised the project, and wrote initial and final draft of article. JA designed the study, collected, organized, analysed and interpreted data, and wrote initial and final draft of the article. WA conceived and designed the study, validated instruments, organized, analysed and interpreted data and reviewed the manuscript. AZAM conceived and designed the study, analysed data, and wrote initial and final draft of article. QA conceived and designed the study, analysed data and reviewed the final draft of the manuscript. YNA conceived and designed the study, reviewed the first and the final draft, and provided logistic support. MK conceived and designed the study and reviewed the first and the final draft. SA conceived the study and research methods, interpreted data, reviewed the final draft of the manuscript and co-supervised the project. All authors have critically reviewed and approved the final draft of the study and agreed to be accountable for all aspects of the work.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest to declare.

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Supplementary Table 1. Knowledge assessment questionnaire			
Questions		Choices	Count(%)
What is/are the labeled (approved) indications of Tirzepatide ?	Type 2 diabetes mellitus, treatment	I don't know	6 (1.6%)
		NO	20(5.2%)
		Yes*	360 (93.3%)
	Weight management	I don't know	28 (7.3%)
		No	109 (28.2%)
		Yes*	249 (64.5%)
What is the mechanism of action of Tirzepatide ?		Glucagon-Like Peptide (GLP-1) Receptor Agonist	120 (31.1%)
		Glucose-Dependent Insulinotropic Polypeptide (GIP) agonist	29 (7.5%)
		Glucose-Dependent Insulinotropic Polypeptide (GIP) agonist + Glucagon-Like Peptide (GLP-1) Receptor Agonist (ie; dual mechanism of action)*	197 (51%)
		I don't know	36 (9.3%)
		Lipase Inhibitor	4 (1%)
What is/are the available route/s of administration of Tirzepatide?	Subcutaneous (single-dose device)	I don't know	22 (5.7%)
		No	101 (26.2%)
		Yes*	263 (68.1%)
	Subcutaneous (multiple-dose device)	I don't know	28 (7.3%)
		No*	68 (17.6%)
		Yes	290 (75.1%)
	Intravenous	I don't know	41 (10.6%)
		No*	319 (82.6%)
		Yes	26 (6.7%)
	Intramuscular	I don't know	45 (11.7%)
		No*	290 (75.1%)
		Yes	51 (13.2%)
	Oral	I don't know	46 (11.9%)
		No*	315 (81.6%)
		Yes	25 (6.5%)
What is the initial dose (i.e; starting dose) of Tirzepatide?		10 mg	4 (1%)
		2.5 mg*	349 (90.4%)
		5 mg	8 (2.1%)
		I don't know	5 (1.3%)
		It is dosed according to the weight of the patient	20 (5.2%)
What is the minimum effective dose of Tirzepatide? (Assuming the same frequency as the initial dose)		10 mg	7 (1.8%)
		2.5 mg	227 (58.8%)
		5 mg*	76 (19.7%)
		I don't know	14 (3.6%)

		It is dosed according to the weight of the patient	62 (16.1%)
What is the maximum dose of Tirzepatide?		10 mg	21 (5.4%)
		15 mg*	295 (76.4%)
		30 mg	21 (5.4%)
		I don't know	15 (3.9%)
		It is dosed according to the weight of the patient	34 (8.8%)
What is the frequency of administration of Tirzepatide?		I don't know	5 (1.3%)
		Once daily	9 (2.3%)
		Once monthly	6 (1.6%)
		Once weekly*	352 (91.2%)
		Twice daily	10 (2.6%)
		Twice weekly	4 (1%)
The initial/starting dose of Tirzepatide should be titrated after of the initial/starting dose		2 weeks	44 (11.4%)
		3 months	18 (4.7%)
		4 weeks*	260 (67.4%)
		I don't know	64 (16.6%)
The dose of Tirzepatide should be adjusted in case of renal failure		FALSE*	68 (17.6%)
		TRUE	243 (63%)
		I don't know	75 (19.4%)
The dose of Tirzepatide should be adjusted in case of hepatic failure.		FALSE*	61 (15.8%)
		TRUE	252 (65.3%)
		I don't know	73 (18.9%)
Which of the following is/are significant/serious side effects of Tirzepatide?	Gallbladder disease	I don't know	121 (31.3%)
		No	108 (28%)
		Yes*	157 (40.7%)
	Diabetic retinopathy	I don't know	111 (28.8%)
		No	135 (35%)
		Yes*	140 (36.3%)
	Hypoglycemia	I don't know	38 (9.8%)
		No	44 (11.4%)
		Yes*	304 (78.8%)
	Pancreatitis	I don't know	99 (25.6%)
		No	64 (16.6%)
		Yes*	223 (57.8%)
	Acute kidney injury	I don't know	97 (25.1%)
		No	105 (27.2%)
		Yes*	184 (47.7%)
	Hypersensitivity reactions	I don't know	80 (20.7%)
		No	60 (15.5%)
		Yes*	246 (63.7%)
Which of the following is/are common/expected side effects of Tirzepatide?	Constipation	I don't know	66 (17.1%)
		No	79 (20.5%)
		Yes*	241 (62.4%)

	Diarrhea	I don't know	65 (16.8%)
		No	78 (20.2%)
		Yes*	243 (63%)
	Increased heart rate	I don't know	116 (30.1%)
		No	125 (32.4%)
		Yes*	145 (37.6%)
	Hypoglycemia	I don't know	37 (9.6%)
		No	46 (11.9%)
		Yes*	303 (78.5%)
	Nausea and vomiting	I don't know	26 (6.7%)
		No	21 (5.4%)
		Yes*	339 (87.8%)
	Dizziness	I don't know	42 (10.9%)
		No	54 (14%)
		Yes*	290 (75.1%)
	Decreased appetite	I don't know	28 (7.3%)
		No	19 (4.9%)
		Yes*	339 (87.8%)
Which of the following is/are contraindications to Tirzepatide?	Personal history of medullary thyroid carcinoma	I don't know	81 (21%)
		No	32 (8.3%)
		Yes*	273 (70.7%)
	Family history of medullary thyroid carcinoma	I don't know	94 (24.4%)
		No	46 (11.9%)
		Yes*	246 (63.7%)
	Breastfeeding	I don't know	79 (20.5%)
		No	57 (14.8%)
		Yes*	250 (64.8%)
	Pregnancy	I don't know	55 (14.2%)
		No	43 (11.1%)
		Yes*	288 (74.6%)
	End stage renal disease	I don't know	77 (19.9%)
		No*	62 (16.1%)
		Yes	247 (64%)
	ever hepatic impairment	I don't know	80 (20.7%)
		No*	60 (15.5%)
		Yes	246 (63.7%)
Which of the following medications has the potential for drug-drug interaction with Tirzepatide?	Insulin (All types of insulin)	I don't know	82 (21.2%)
		No	69 (17.9%)
		Yes*	235 (60.9%)
	Glucagon-Like Peptide (GLP-1) Receptor Agonist	I don't know	72 (18.7%)
		No	55 (14.2%)
		Yes*	259 (67.1%)
	Oral hormonal contraceptives	I don't know	109 (28.2%)
		No	81 (21%)

		Yes*	196 (50.8%)
	Sulfonylureas	I don't know	91 (23.6%)
		No	78 (20.2%)
		Yes*	217 (56.2%)
Regarding the administration of Tirzepatide			
What is the best timing with regards to meals ?		I don't know	23 (6%)
		On empty stomach	88 (22.8%)
		Regardless of meals*	165 (42.7%)
		With / after meals	110 (28.5%)
The patient can take the missed dose of Tirzepatide, otherwise the dose should be skipped and continue with the normal schedule		I don't know	53 (13.7%)
		within 1 day after the missed dose	169 (43.8%)
		within 2 days after the missed dose	41 (10.6%)
		within 4 days after the missed dose*	73 (18.9%)
		within one week after the missed dose	50 (13%)
Regarding the storage conditions of Tirzepatide :		Can be stored at room temperature or in the refrigerator*	37 (9.6%)
		I don't know	15 (3.9%)
		Stored only at room temperature (20-25°C)	20 (5.2%)
		Stored only in the refrigerator (2-8°C)	314 (81.3%)
Regarding the storage conditions of Tirzepatide :	Refrigerator	For 21 days	18 (4.7%)
		For 28 days	33 (8.5%)
How long can you store Tirzepatide in the following conditions ?	Room temperature	I don't know	28 (7.3%)
		Not applicable	4 (1%)
		Until the expiration date*	303 (78.5%)
		For 21 days*	107 (27.7%)
		For 28 days	114 (29.5%)
		I don't know	61 (15.8%)
		Not applicable	81 (21%)
		Until the expiration date	23 (6%)
Tirzepatide is one of the first line pharmacological options for overweight or obesity management after attempts of lifestyle modification		FALSE	195 (50.5%)
		TRUE*	157 (40.7%)
		I don't know	34 (8.8%)
What is the duration of treatment of obesity using Tirzepatide?		1 - 3 years (according to the body mass index (BMI) of the patient)	71 (18.4%)
		3 - 6 months (according to the body mass index (BMI) of the patient)	214 (55.4%)
		I don't know	58 (15%)

		Lifelong since obesity is a chronic problem*	43 (11.1%)
Discontinuation of Tirzepatide is associated with weight regain		FALSE	96 (24.9%)
		TRUE*	219 (56.7%)
		I don't know	71 (18.4%)
What is the goal of Tirzepatide therapy in obesity management?		A minimum weight loss of 10 to 15 percent of body weight after 12 weeks of therapy	100 (25.9%)
		A minimum weight loss of 20 percent of body weight after 12 weeks of therapy	36 (9.3%)
		A minimum weight loss of 4 to 5 percent of body weight after 12 weeks of therapy*	68 (17.6%)
		I don't know	62 (16.1%)
		Personalized	120 (31.1%)
In nondiabetic individuals, what is the body mass index (BMI) cut point at which Tirzepatide can be initiated for weight management?		Any patient seeking weight loss regardless of body mass index	16 (4.1%)
		Body mass index (BMI) more than 27 kg/m ²	34 (8.8%)
		Body mass index (BMI) more than 30 kg/m ² *	111 (28.8%)
		Body mass index (BMI) more than 35 kg/m ²	58 (15%)
		Body mass index (BMI) more than 40 kg/m ²	45 (11.7%)
		I don't know	122 (31.6%)
In diabetic individuals, what is the body mass index (BMI) cut point at which Tirzepatide can be initiated for weight management?		Any patient seeking weight loss regardless of body mass index	17 (4.4%)
		Body mass index (BMI) more than 27 kg/m ² *	88 (22.8%)
		Body mass index (BMI) more than 30 kg/m ²	69 (17.9%)
		Body mass index (BMI) more than 35 kg/m ²	36 (9.3%)
		Body mass index (BMI) more than 40 kg/m ²	35 (9.1%)
		I don't know	141 (36.5%)
Between : Tirzepatide , Liraglutide [Saxenda®/ Victoza®] and Semaglutide [Ozempic®]	Which one is more effective for obesity and overweight management ?	Comparable	28 (7.3%)
		I don't know	19 (4.9%)
Choose the correct answer regarding its role in obesity and type 2 diabetes management	Which one is safer?	Liraglutide	29 (7.5%)
		Semaglutide	24 (6.2%)
		Tirzepatide*	286 (74.1%)
		Comparable*	52 (13.5%)
		I don't know	50 (13%)
		Liraglutide	47 (12.2%)
		Semaglutide	61 (15.8%)
		Tirzepatide	176 (45.6%)

	Which one is more expensive?	Comparable	8 (2.1%)
		I don't know	28 (7.3%)
		Liraglutide	20 (5.2%)
		Semaglutide	15 (3.9%)
		Tirzepatide*	315 (81.6%)
Tirzepatide is one of the options for management of type 2 diabetes in patients with the following comorbidities :	Chronic kidney disease (CKD)	I don't know	104 (26.9%)
		No	144 (37.3%)
		Yes*	138 (35.8%)
	Obesity	I don't know	42 (10.9%)
		No	15 (3.9%)
		Yes*	329 (5.2%)