

PHARMACIST INVOLVEMENT IN DIABETES MANAGEMENT

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Abstract

The present study investigated the responsibilities and activities carried out by pharmacists in community pharmacies in Romania for patients diagnosed with diabetes mellitus. The research used a cross-sectional survey for data collection. The study began in 2021, so treatment problems caused by the COVID-19 pandemic were also discussed. Because diabetes management is an advanced pharmaceutical care service, specific necessary competencies were also considered. The results showed that, in addition to dispensing the necessary drugs, the pharmacists provide several other services: counselling and performing glycaemic measurement, interpreting lab results, advising on a balanced diet and regular physical activity, informing patients about possible adverse reactions, frequent interactions, possible associated complications and about using food supplements as adjuvants to improve glycaemic control. It can be concluded that community pharmacists who have the necessary training and experience will play an important role in diabetes therapeutic management.

Rezumat

Prezentul studiu a investigat responsabilitățile și activitățile desfășurate de farmaciștii din farmaciile comunitare din România pentru pacienții diagnosticați cu diabet zaharat. Cercetarea a folosit un sondaj transversal pentru colectarea datelor. Studiul a început în 2021, astfel au fost discutate și problemele de tratament cauzate de pandemia COVID-19. Deoarece managementul diabetului zaharat este un serviciu avansat de îngrijire farmaceutică, au fost luate în considerare și competențe specifice necesare. Rezultatele au arătat că, pe lângă eliberarea medicamentelor necesare, farmaciștii oferă și alte servicii: consiliere și efectuarea măsurătorilor glicemice, interpretarea rezultatelor de laborator, consiliere pentru o dietă echilibrată și activitate fizică regulată, informarea pacienților despre posibile reacții adverse, interacțiunile frecvente, posibilele complicații asociate și despre utilizarea suplimentelor alimentare ca adjuvant pentru îmbunătățirea controlului glicemic. Se poate concluziona că farmaciștii care își desfășoară activitatea în farmaciile cu circuit deschis, având pregătirea și experiența necesară vor juca un rol important în managementul terapeutic al diabetului.

Keywords: diabetes, community pharmacy, pharmacists, competencies, COVID-19 pandemic

Introduction

Diabetes mellitus is a non-communicable disease responsible for over 2 million deaths worldwide, including those due to kidney disease [14]. It is considered one of the most prevalent causes of morbidity and mortality because it affects populations of all ages, genders and geographical locations [18]. Diabetes has a multifaceted etiopathogenesis, comprising genetic, physiological, metabolic (such as overweight/obesity and high blood glucose levels) and behavioural risk factors (including unhealthy diets and insufficient physical activity). If it is not efficiently controlled, diabetes may develop several chronic complications like cardiovascular disease, nephropathy, neuropathy, retinopathy and even stroke [12, 37]. According to the International Diabetes Federation [19], in 2021, diabetes affected 537 million adults aged 20 - 79, and the number is expected to increase to 643 million by 2030 and 783 million by 2045.

Due to scientific advances, the pharmaceutical market has experienced significant development over the years

at the national and international levels. In 2021, average retail pharmaceutical expenditures *per capita* reached USD 614 (adjusted to differences in purchasing power) in the Organization for Economic Cooperation and Development (OECD) countries [7, 31, 42]. Regarding diabetes, the global economic burden was estimated at approximately USD 966 billion in 2021 and is projected to reach USD 1,054 billion by 2045 [13, 41]. The World Health Organization (WHO) has alerted about the increasing prevalence of diabetes, which has expanded to epidemic proportions in both developing and developed countries. This is why public health considers it a critical emerging issue that needs to be addressed immediately.

Diabetes therapeutic management has become very complex in recent years, with a wide range of authorised and marketed antidiabetic agents [3]. There has been a shift towards individualised, patient-centred treatment plans [38, 45]. Therefore, healthcare professionals should consider both clinical aspects and patient socio-demographic characteristics, needs, and lifestyle [27, 49]. Treatment adherence represents a primary goal for

improving the patients' quality of life [47]. Nevertheless, non-adherence to therapy is a significant problem, as studies show that nearly 50% of prescriptions for long-term medication have not been filled [5]. The medication for diabetes treatment may have adverse reactions, particularly if the patient has other underlying medical conditions. According to WHO, pharmacists are the most accessible professionals to the patients [48]. Recent studies have underlined the role of pharmacists in preventive care (health screenings, immunisations), smoking cessation and/or the management of chronic diseases like diabetes [40]. Pharmacists can provide the pharmaceutical care needed by patients through their competencies and community accessibility. In recent years, Romania's pharmaceutical legislation has undergone significant changes. Law No. 243/2020 amended and supplemented the Pharmacy Law No. 266/2008 by defining pharmaceutical services [33]. Furthermore, the methodology for the implementation of pharmaceutical services, along with the Nomenclature of Pharmaceutical Services were approved by the Ministry of Health Order No. 2382/2021. Pharmaceutical services were divided into two categories: essential and advanced [26]. One of the Advanced Pharmaceutical Services concerns the Management of the chronic, diabetic patient (code SFA02-2) and involves the assessment of medication and vital functions/biological parameters, where necessary, verification of treatment adherence, as well as the assessment of patients without drug treatment through counselling (referring the patient to a medical consultation, hygiene-dietary regimen, etc.) and monitoring. This provision encourages community pharmacists to enhance their skills, provide a comprehensive service to patients with diabetes, and raise public awareness of the disease. The primary objectives of this research were to investigate the role of the Romanian pharmacist in diabetes management, including various types of interventions, present the hurdles encountered during the COVID-19 period, and identify the specific competencies required.

Materials and Methods

Study design

A quantitative non-experimental research was conducted in Romania between 2021 and 2023, utilising an online questionnaire administered to pharmacists. The survey included dichotomic, Likert-scale and open-ended questions that allowed responders to provide their opinions on counselling in diabetes management. The questionnaire comprised 32 questions, covering general information (4), activities in pharmacies (2) and interactions with patients diagnosed with diabetes mellitus (26). The first item concerned informed consent regarding the processing of personal data. The basic information included questions on gender, age, work environment, professional degree, type of function

(execution or management) and seniority as a pharmacist.

Attitudes toward diabetes management were assessed from 3 points of view: (i) monthly number of patients and the various situations encountered in the community pharmacy concerning glycaemic monitoring and treatment of diabetes; items were answered on a Likert scale ranging from 1 (Never) to 5 (Always); (ii) specific hurdles during the COVID pandemic; (iii) specialisations and new competencies necessary for pharmacists in the labour market. The questionnaire was distributed *via* the Internet (e-mail, social networks). Google Forms was used to create the questionnaire and store the collected data.

The study was approved by the Ethical Committee of "Carol Davila" University of Medicine and Pharmacy, Bucharest, Romania (No. 7486/21.03.2022).

Respondents

A representative sample size of 378 was calculated based on the number of pharmacists in Romania (approximately 22,600) [11, 35] with a 95% confidence level and a 5% margin of error. The general sample size calculation formula was used:

$$S = \frac{Z^2 p(1-p)}{M^2}$$

where the symbols have the following significations: S = sample size for infinite population, Z = Z score (Z = 1.96 for a 95% confidence level), p = population proportion (assumed to be 50% = 0.5), M = margin of error (generally, 0,05).

The study included community pharmacists working in Romania who provided their voluntary consent. The exclusion criteria were not consenting to the processing of the data and being a health professional other than a pharmacist.

Data analysis

The collected data were analysed using IBM SPSS Statistics version 27. Sociodemographic characteristics were determined using descriptive statistical tests, including frequencies and percentages for categorical variables, mean values with standard deviations, and ranks for numerical variables. The significance level was considered at $p < 0.005$. Cronbach's alpha coefficient was used to assess the reliability of the instruments.

Results and Discussion

Sample size and demographic data

The study collected and analysed 482 responses. All responses met the inclusion criteria, and none were discarded.

Regarding gender, 92% of the respondents were women, and only 8% were men. This fact is explicable considering the predominance of female students in pharmacy education and training programs. From an age perspective, the majority of survey participants

of both sexes (305) were under 40 years old, with 155 participants under 29 years old and 150 between 30 and 39 years old, likely due to the electronic distribution of the questionnaire (Figure 1).

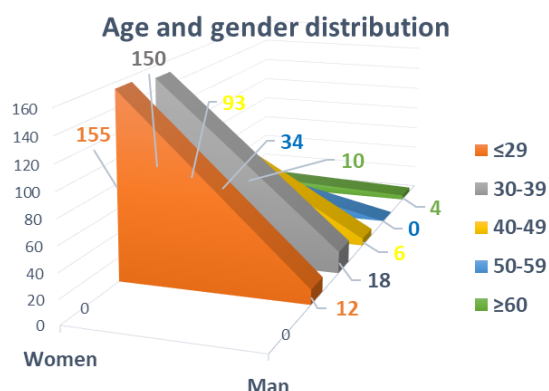


Figure 1.

Respondents' age and gender

As observed in the collected results, 93% of respondents came from urban areas, primarily from the capital and the southern regions: 57% from Bucharest. Data concerning the distribution of men and women pharmacists between urban and rural areas indicated that in 2021, the respondents were 155 women and 14 men, who were distributed 163 in the metropolitan area and 6 in the rural area. The number of respondents was elevated in 2022 (197 women and 17 men, with 188 pharmacies in urban and 26 in rural environments). The smallest number of questionnaires was obtained in 2023 (90 women, 9 men, 95 in urban areas and 4 in rural areas) (Figure 2).

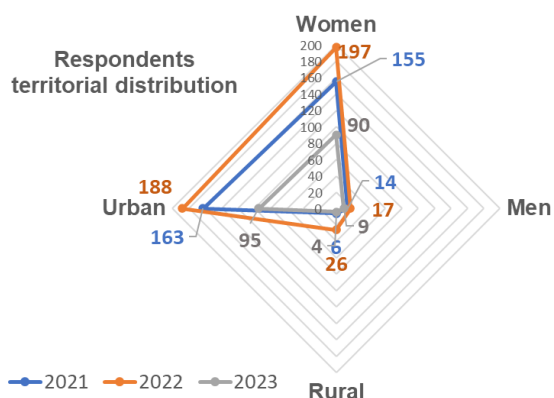


Figure 2.

Distribution according to gender and territorial area of survey participants

The low number of participants (36) from the rural areas underlines the need for pharmaceutical care in the rural settlements. Even if the Law of Pharmacy [24, 32] permits the opening of pharmacies or similar units, such as local pharmaceutical offices, in rural areas, there is still a stringent need for medical units to provide health services to individuals. A systematic review study showed a shortfall of health professional

workforce, including pharmacists, in rural areas at the global level, focusing on identifying the challenges and factors associated [44]. In reality, people have to seek specialised assistance with diabetes and with the necessary treatments and tests in major cities. This process is cost- and time-inefficient, which leads the majority of patients to discontinue treatment or reduce the frequency of administration. In the absence of a nearby professional who can dispense medicines and medical devices, help monitor biological parameters, and offer counselling, the disease may worsen, and complications that impact the patient's quality of life may arise, sometimes even causing death.

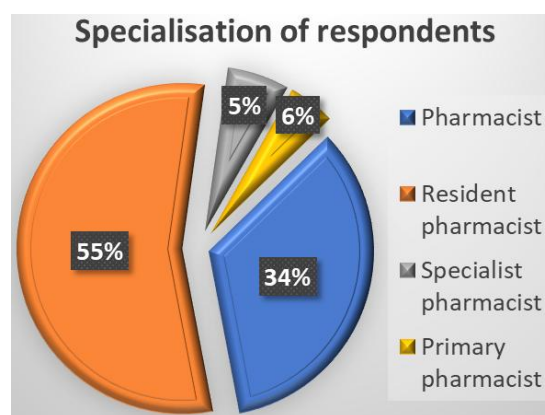


Figure 3.

Distribution of respondents according to specialisation

Survey respondents were mainly (55%) pharmacists in postgraduate training (residents); the next percentage was for pharmacists (34%), and the last results concerned specialist pharmacists and principal pharmacists (in almost equal percentages), as shown in Figure 3. This aspect is essential, as it shows that many community pharmacists, regardless of specialisation, are aware of the burden of this disease and are interested in expanding their knowledge in this field, including through discussions with other specialists while sharing information by participating in surveys in this field.

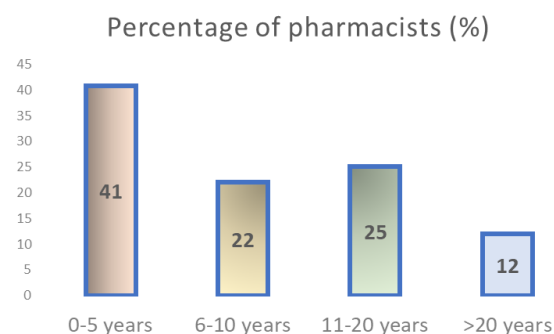


Figure 4.

Repartition of respondents after seniority

According to seniority (Figure 4), the results confirmed that most participants were experienced pharmacists

with 6 to 20 years of practice in community pharmacy services (they represent 47% of the sample), making their contributions in this survey more important and relevant to our profession. 41% of respondents had up to 5 years of practice, and 12% over 20 years. Most of the interviewed pharmacists affirmed that they hold an executive position (function), with 39% holding this role, while only 26% are managers. 36% inferred that they do not know the type of function that they have in pharmacy.

The mean number of prescriptions dispensed for diabetes was around 100 *per* month (SD = 80.19).

Pharmacists' involvement in the therapeutic management of diabetes

The pharmacists' responses to the following 12 items were statistically analysed regarding reliability and decision-making. The results are displayed in Table I. The scale has a reliability of 0.87 (measured by Cronbach's alpha coefficient), indicating that the questions were clear for 87% of the respondents. The result is statistically significant. For each item, the score was compared to the weighted average. It was found that six items were considered of high importance by the community pharmacists, while the other six were of lower importance (Table I).

Table I

Responses on pharmacists' perceptions of the occurrence of the situations in community pharmacy

No	Items*	A (%)	F (%)	O (%)	R (%)	NV (%)	Mean	SD	D
1	Do you counsel patients on glycaemic monitoring and the use of glucometers?	152 (31.5)	127 (26.3)	124 (25.7)	66 (13.7)	13 (2.7)	3.7	1.13	HP
2	Do you measure glycaemic levels in the pharmacy?	12 (2.5)	11 (2.3)	26 (5.4)	43 (8.9)	390 (80.9)	1.01	1.12	LP
3	Do you counsel on interpreting lab results, such as glycated haemoglobin or other parameters?	64 (13.3)	89 (18.5)	116 (24.3)	150 (31.1)	62 (12.9)	2.88	1.23	LP
4	Do you advise patients on the importance of a balanced diet and regular physical exercise?	254 (52.6)	126 (26.1)	76 (15.8)	17 (3.5)	9 (1.9)	4.24	0.96	HP
5	Do you warn patients on the necessity of daily diabetes administration and associated comorbidities treatment?	314 (65.1)	104 (21.6)	38 (7.9)	18 (3.7)	8 (1.7)	4.45	0.91	HP
6	Do you inform patients of hypoglycaemic or hyperglycaemic symptoms?	153 (31.7)	140 (29)	118 (24.5)	58 (12)	13 (2.7)	3.75	1.10	HP
7	Do you identify possible causes of hypoglycaemia or hyperglycaemia?	88 (18.3)	131 (27.2)	164 (34)	79 (16.4)	20 (4.1)	3.39	1.08	LP
8	Do you counsel patients on pharmacologic treatment in diabetes mellitus?	282 (58.5)	112 (23.2)	60 (12.4)	17 (3.5)	11 (2.3)	4.32	0.97	LP
9	Do you counsel patients on potential interactions between medications and food supplements?	228 (47.3)	152 (31.5)	68 (14.1)	26 (5.4)	8 (1.7)	4.17	0.97	HP
10	Do you counsel patients on possible drug-drug interactions and other complications?	70 (14.5)	137 (28.4)	171 (35.5)	78 (16.2)	26 (5.4)	3.3	1.07	LP
11	Have your patients had adverse reactions or complications during their treatment?	10 (2.1)	45 (9.3)	183 (38)	191 (39.6)	53 (11)	2.52	0.88	LP
12	Have your patients requested food supplements to lower their glycaemic levels?	96 (19.9)	207 (42.9)	125 (25.9)	29 (6)	25 (5.2)	3.66	1.02	HP

N = 482; A = Always; F = Frequent; O = Often; R = Rarely; NV = Never; SD = Standard Deviation; HP = High Perception; LP = Low Perception; D (Decision) = weighted average = 3.45

The data analysis revealed that the majority of the respondents (83.5%) advise patients on the optimal glycaemic monitoring and the correct use of the glucometers. Only 2.7% do not consider such action. In Romania, the National Health Insurance House oversees 16 national curative health programs, including the National Diabetes Program, which is funded by the National Single Health Insurance Fund. The program has addressed key aspects of diabetes management, such as monitoring through glycated haemoglobin (HbA1c) testing, ensuring access to antidiabetic medicines and medical devices, and encouraging patient self-

monitoring (by glycaemic self-monitoring tests) [15]. In 2024, the National Diabetes program introduced significant changes, offering eligible patients free access to insulin pumps and insulin pump systems with sensors for continuous glucose monitoring [25]. This will increase patients' access to modern technologies, enabling better disease control. However, it will also need the provision of patients' education. Pharmacists can be a valuable resource, collaborating with physicians to educate patients, but also their families. Additionally, 98% felt it is essential to emphasise to the patient the importance of a balanced diet and

regular physical exercise. And 98,3% insisted on the necessity of daily treatment administration for the primary pathology and associated comorbidities.

Furthermore, 97.2% consider it necessary to inform patients of symptoms associated with hypoglycaemia or hyperglycaemia. A higher percentage (98.3%) think it is important to also inform patients about potential interactions between medicines and food supplements in diabetes. These findings are significant, taking into consideration that diabetes is a chronic, progressive disease, with many comorbidities and associated with severe acute (hypoglycaemia, ketoacidosis, lactic acidosis) and chronic complications (cardiovascular disease, retinopathy, neuropathy, foot ulcer, kidney failure) [22]. Healthcare interventions involving patient education, medication management, risk factor screening and encouraging treatment self-monitoring have been shown to improve clinical outcomes for patients with diabetes [6, 30, 36, 46]. According to a meta-analysis, the most common pharmacist-led interventions for managing diabetes therapy were education (69%) and treatment management (61%). These interventions resulted in reduced HbA1c levels [23].

In 94.7% of cases, pharmacists registered patients' requests for food supplements intended to lower their glycaemic levels. On the other hand, 80.9% of respondents considered that the pharmacy setting, in terms of space and resources, did not allow for the actual measurement of glycaemic levels in sterile and secure conditions. Nevertheless, only 12.9% of pharmacists never interpreted laboratory results, specifically glycated haemoglobin, for patients.

In 4.1% of cases, patients were unwilling to discuss the identification and possible causes of hypo- or hyperglycaemia in pharmacies (their reasoning was that they were in a hurry and already knew this information); also, in 2.3% of situations, they did not want to be counselled by the pharmacist on their diabetes treatment.

Pharmacists felt they were not prepared to counsel patients on medication interactions and complications of diabetes in 5.4% of situations and about adverse reactions in 11% of cases. The problem may be that the current general framework attributes too many tasks and pressures to pharmacists, who try to fulfil them while respecting ethical and deontological aspects [43]. Patients seek a proficient and responsible provider who cares for them individually and ensures that the dispensing process is both cost- and time-efficient. Only after considering the pharmacist as a trustworthy person will the patient feel comfortable addressing personal concerns about illness, adverse reactions, and complications. On the other hand, the stringent provisions that pharmacists must adhere to make providing comprehensive pharmaceutical services to patients with diabetes challenging enough.

The main complications associated with diabetes found at the community pharmacy level were foot ulcers in

patients with diabetes (58%), diabetic polyneuropathy (27%), diabetic retinopathy (13%) and diabetic nephropathy (3%).

The study also examined the dispensing of both diabetes medication and other medicines. The solicited drugs could be classified into five therapeutic classes: non-steroidal anti-inflammatory drugs (45%), antidepressants (25%), opioid analgesics (16%), tranquillisers (7%), and muscle relaxants (7%). This aspect suggests that in those patients, complications of the disease had already occurred. These results are similar to the data from the Romanian National Institute of Public Health report regarding the evolution of diabetes in the period 2012 - 2021. It revealed that diabetes was associated with many chronic complications, the highest rates being indicated for stroke and polyneuropathy (14.6% - 17.1%), followed by retinopathy (12.2% - 22.7%) [29]. The approach to address complications and comorbidities can lead to polypharmacy, using various medicines from different classes, with the risk of drug-drug interactions (DDIs) [4, 17].

The most frequently asked food supplements were based on blueberry, white mulberry, bitter cucumber, chromium and cinnamon, used in various combinations. The tea's formulations appear to be predominant (56%), but the large variety of capsules and tablets (44%) follows closely in terms of user preferences. These findings were consistent with previous studies involving food supplements [39].

Problems during the COVID-19 pandemic concerning the treatment of diabetes

Since the research began during the COVID-19 pandemic, specific aspects were also considered, including the supply procedure, limited patient interaction, and the prevalence of patient referrals to pharmacies. The main problem encountered in 75% of the cases was the deficit of medicines (like pharmaceutical products based on metformin). These results are in line with the data reported by the Romanian National Agency for Medicines and Medical Devices concerning medicine discontinuation notifications [28]. In recent years, drug shortages have become a challenge for healthcare systems and the pharmaceutical industry worldwide, increasing significantly during the COVID-19 pandemic. Therefore, measures were adopted to prevent and prepare in case of medicine supply disruptions in future health crises. Based on Regulation (EU) 2022/123, EMA has the role of monitoring critical medicine shortages in collaboration with the European Commission and EU Member States. Various working groups were formed, and they were responsible for monitoring and coordinating shortages of medicinal products and medical devices and providing guidance in case of major events and public health emergencies (The Medicines Shortages Steering Group – MSSG). The Medicine Shortages Single Point of Contact (SPOC) Working Party have to oversee and communicate events that may impact the availability of medicines

across the European Union [8, 9]. In addition, in line with the regulation, the European Shortages Monitoring Platform (ESMP) was created. From 2 February 2025, it is mandatory for marketing authorisation holders to submit a report through the platform [10].

Another challenge encountered by Romanian pharmacists was the limited time of patient interaction (16%), and 9% of participants pointed out that patients are turning more to the pharmacy in the context of limited contact with their current doctor.

Competencies for community pharmacists in diabetes management

The respondent's pharmacists agree that deepening knowledge of the pathology is helpful, as it will enable them to be actively involved in the management of

diabetes mellitus. The response rate ranged from 80% to 100%. According to the respondents, the main measures that community pharmacists can undertake are monitoring glycaemia in the pharmacy and instructing patients on a healthy lifestyle, including physical exercise and a balanced diet.

In the last question (number 32), participants were asked to select what they thought were the most important competencies for a pharmacist in managing diabetes. They were given four choices: communication, digitalisation, ethics and nanotechnologies. Thus, 38% of respondents ranked the necessary competencies in the following order: communication (17%), digitalisation (10%), nanotechnologies (8%) and ethics (4%) (Figure 5).

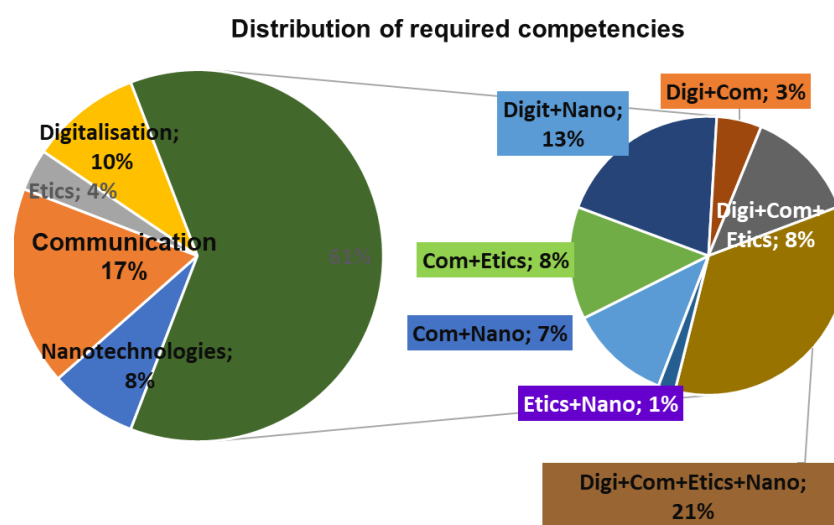


Figure 5.
Competencies required by the community pharmacists

The majority of the survey respondents appreciated the importance of a combination of such skills. 21% of pharmacists affirmed they need all four types of abilities (digital, communication, ethics and nanotechnologies). On the other hand, 13% considered both the digital and the competencies from the applied sciences, such as nanotechnologies and bioanalytical, to be important. Moreover, 8% seem to value the communication abilities and ethical skills (as well as digital ones), and only 1% consider ethical knowledge and applied sciences important for patient interaction. Through their activities correlated with professional competencies, Romanian pharmacists can contribute to diabetes care by educating patients on medicines and complications, optimising therapy plans and preventing medicine-related problems that can affect treatment adherence. Therefore, they should be part of multidisciplinary teams focused on offering integrated care to diabetes patients. American Diabetes Association (ADA) guidelines published in 2025 mentioned the significant role of a patient-centred approach and integrated care model for the management of diabetic

patients [2]. Patient-centred pharmaceutical services have been implemented worldwide, including in European countries, the United States of America and Canada. For example, the Medicines Use Review (MUR) service was introduced in the United Kingdom, enabling trained pharmacists to analyse the treatment of polypharmacy patients to identify adherence, dosage and drug interaction issues [16]. In Denmark, a therapy initiation service was introduced in 2016 for patients diagnosed with a new condition or who started a new treatment [1]. Studies have shown that the implementation of pharmaceutical services and pharmacist interventions has contributed positively to the management of chronic conditions, including diabetes [20, 21, 34].

Study strengths, weaknesses and future directions

This study examined the responsiveness of community pharmacists in the management of diabetes. An important strength of this study is that it analyses the perception of practicing professionals about treating patients diagnosed with diabetes from a general point of view (dispensing medicines, counselling on the laboratory parameters, instructing on the use of specific

medical devices and informing the patient on possible drug to drug and/or drug to food supplement interaction and about the frequent complications and adverse reactions). A potential weakness of the study might be that participants have accessed the survey only through online media platforms. Mostly, young, city-residing pharmacists primarily completed the questionnaire.

We believe that the present research can and should be continued through a nationwide distribution of the survey, which will enable more pharmacists to participate, share their experiences, and expand their competencies to better inform patients about the burden and necessary measures for living a good life with this disease.

Conclusions

Pharmacists should be aware of their crucial role in managing diabetes, which helps reduce the burden of this debilitating disease for both individual patients and the healthcare system. Through continuous training and refinement, they can develop new and current, useful skills for better communication with involved patients and other healthcare professionals, such as medical doctors, and also acquire the knowledge and abilities to use the latest medical devices and interpret specific tests. By applying their knowledge and considering the ethical implications of their actions, pharmacists can provide efficient services that significantly improve the quality of life for patients diagnosed with diabetes.

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Conflict of interest

The authors declare no conflict of interest.

References

1. Abrahamsen A, Burghle AH, Rossing C, Pharmaceutical care services available in Danish community pharmacies. *Int J Clin Pharm.*, 2020; 42(3): 315-320.
2. American Diabetes Association Professional Practice Committee, Summary of Revisions: Standards of Care in Diabetes – 2025. *Diabetes Care*, 2025; 48(1): S6–S13.
3. Atănăsoie AM, Ancuceanu RV, Krajnović D, Waszyk-Nowaczyk M, Skotnicki M, Tondowska D, Petrova G, Niculae AM, Tăerel AE, Approved and Commercialized Antidiabetic Medicines (Excluding Insulin) in Seven European Countries – A Cross-Sectional Comparison. *Pharmaceuticals*, 2024; 17(6): 793.
4. Bicheru M, Preoteasa CT, Zamfirescu A, Capisizu A, Melescanu Imre M, Preoteasa E., Relation of Polypharmacy to Systemic and Oral Health Related Factors. *Revista de Chimie (Bucharest)*, 2018; 69(11): 3115-3117.
5. Brown MT, Bussell JK, Medication adherence: Who cares?. *Mayo Clin. Proc.*, 2011; 86(4): 304-314.
6. Costa S, Horta MR, Santos R, Mendes Z, Jacinto I, Guerreiro J, Cary M, Miranda A, Helling DK, Martins AP, Diabetes policies and pharmacy-based diabetes interventions in Portugal: a comprehensive review. *J Pharm Policy Pract.*, 2019; 12: 5.
7. Craciun P, Pana M, Lupuliasa D, Craciun MD, Taerel AE, Prescription drug (RX) evolution in Romania between 2010 and 2020. *Farmacia*, 2021; 69(5): 980-987.
8. European Parliament and the Council of the European Union, Regulation (EU) 2022/123 of the European Parliament and of the Council of 25 January 2022 on a reinforced role for the European Medicines Agency in crisis preparedness and management for medicinal products and medical devices, 2022.
9. European Medicines Agency, Mandate, objectives and rules of procedure for the Medicine Shortages SPOC Working Party, 2022; www.ema.europa.eu/en/documents/.
10. European Shortages Monitoring Platform, <https://esmp.ema.europa.eu/>.
11. Eurostat, Healthcare personnel statistics, <https://ec.europa.eu/eurostat/statistics-explained/>.
12. Farmaki P, Damaskos C, Garmpis N, Garmpi A, Savvanis S, Diamantis E, Complications of the Type 2 Diabetes Mellitus. *Curr Cardiol. Rev.*, 2020; 16(4): 249-251.
13. GBD 2021 Diabetes Collaborators, Global, regional, and national burden of diabetes from 1990 to 2021, with projections of prevalence to 2050: a systematic analysis for the Global Burden of Disease Study 2021. *Lancet*, 2023; 402: 203-234.
14. Global Burden of Disease Collaborative Network, Global Burden of Disease Study 2021 (GBD 2021) Results. 2024. Institute for Health Metrics and Evaluation – IHME, <https://vizhub.healthdata.org/gbd-results/>.
15. Government of Romania, Decision no. 423 of March 25, 2022 on the approval of national health programs. *Official Journal*, 2022; no. 305 of March 30, (available in Romanian).
16. Hindi AMK, Schafheutle EI, Jacobs S, Patient and public perspectives of community pharmacies in the United Kingdom: A systematic review. *Health Expect.*, 2018; 21(2): 409-428.
17. Hîncu S, Apetroaei MM, Ștefan G, Făcă AI, Arsene AL, Mahler B, Drăgănescu D, Tăerel AE, Stancu E, Hîncu L, Zamfirescu A, Udeanu DI, Drug-Drug Interactions in Nosocomial Infections: An Updated Review for Clinicians. *Pharmaceutics*, 2024; 16(9): 1137.
18. Hossain MJ, Al-Mamun M, Islam MR, Diabetes mellitus, the fastest growing global public health concern: early detection should be focused. *Health Sci Rep.*, 2024; 7(3): e2004.
19. International Diabetes Federation (IDF), Diabetes Atlas. 10th edition. Brussels: International Diabetes

- Federation; 2021; <https://idf.org/about-diabetes/what-is-diabetes/>.
20. International Pharmaceutical Federation (FIP), Diabetes prevention, screening, and management: A handbook for pharmacists. The Hague: International Pharmaceutical Federation; 2021.
 21. Jódar-Sánchez F, Malet-Larrea A, Martín JJ, García-Mochón L, López Del Amo MP, Martínez-Martínez F, Gastelurrutia-Garralda MA, García-Cárdenas V, Sabater-Hernández D, Sáez-Benito L, Benrimoj SI, Cost-utility analysis of a medication review with follow-up service for older adults with polypharmacy in community pharmacies in Spain: the conSIGUE program. *Pharmacoeconomics*, 2015; 33(6): 599-610.
 22. Lombardo F, Maggini M, Gruden G, Bruno G, Temporal Trend in Hospitalizations for Acute Diabetic Complications: A Nationwide Study, Italy, 2001-2010. *PLoS One*, 2013; 8(5): e63675.
 23. Machado M, Bajcar J, Guzzo GC, Einarson TR, Sensitivity of patient outcomes to pharmacist interventions. Part I: systematic review and meta-analysis in diabetes management. *Ann Pharmacother.*, 2007; 41(10): 1569-1582.
 24. Ministry of Health, Order no. 444/2019 for the approval of the Rules on the establishment, organization and operation of pharmaceutical units. *Official Journal*, no. 270/09.04.2019, (available in Romanian).
 25. Ministry of Health, Order no. 1292 / 28.08.2024 for amending and supplementing the Technical Norms for the implementation of national curative health programs, approved by Order of the President of the National Health Insurance House, no. 180/2022, (available in Romanian).
 26. Ministry of Health, Order no. 2382/2021: Approval of the Methodology for the Development and Implementation of Pharmaceutical Services and the National List of Pharmaceutical Services. *Official Journal*, no. 1061/05.11.2021 amended and supplemented, (available in Romanian).
 27. Murdan S, Wei L, van Riet-Nales DA, Gurmur AE, Usifoh SF, Täerel AE, Yıldız-Peköz A, Krajnović D, Azzopardi LM, Brock T, Fernandes AI, Dos Santos ALS, Anto BP, Vallet T, Lee EE, Jeong KH, Akel M, Tam E, Volmer D, Douss T, Shukla S, Yamamura S, Lou X, van Riet BHG, Usifoh CO, Duwiejua M, Ruiz F, Furnham A, Association between culture and the preference for, and perceptions of, 11 routes of medicine administration: A survey in 21 countries and regions. *Explor Res Clin Soc Pharm.*, 2023; 12: 100378.
 28. National Agency for Medicines and Medical Device, Drug discontinuation notifications, www.anm.ro/medicamente-de-uz-uman/autorizare-medicamente/notificari/.
 29. National Institute of Public Health, National Center for Public Health Statistics, Evidence of the evolution of diabetes mellitus in the period 2012-2021, 2022.
 30. Nau DP, Ponte CD, Effects of a Community Pharmacist-Based Diabetes Patient-Management Program on Intermediate Clinical Outcome Measures. *J Manag Care Pharm.*, 2002; 8(1): 48-53.
 31. Organization for Economic Cooperation and Development (OECD), *Health at a Glance 2023: OECD Indicators*. Paris: OECD Publishing; 2023.
 32. Parliament of Romania, Pharmacy Law no. 266/2008. *Official Journal*, no. 85/2.02.2015 amended and supplemented, (available in Romanian).
 33. Parliament of Romania, Law no. 243 of November 6, 2020 on the approval of Government Ordinance no. 4/2018 amending and supplementing Pharmacy Law no. 266/2008. *Official Journal*, no. 1042 of November 6, 2020, (available in Romanian).
 34. Presley B, Groot W, Pavlova M, Pharmacy-led interventions to improve medication adherence among adults with diabetes: A systematic review and meta-analysis. *Res Social Adm Pharm.*, 2019; 15(9): 1057-1067.
 35. Rais C, Täerel AE, Soroceanu V, Atănăsoie AM, Stancu E, Trends in the evolution of the number of Romanian and foreign pharmacists working in Romania during the time frame of 2018 to 2027. *Farmacia*, 2023; 70(4): 865-870.
 36. Risoy AJ, Kjome RLS, Sandberg S, Solvik U, Risk assessment and HbA1c measurement in Norwegian community pharmacies to identify people with undiagnosed type 2 diabetes – A feasibility study. *PLoS One*, 2018; 13(2): e0191316.
 37. Scărlătescu AI, Voicu SN, Pițuru MT, Apetroaei MM, Velescu BS, Udeanu DI, Nedeia MI, Arsene AL, Probiotic effects on oxidative stress pathways in diabetes. *Farmacia*, 2024; 72(6): 1437-1449.
 38. Inzucchi SE, Bergenstal RM, Buse JB, Diamant M, Ferrannini E, Nauck M, Peters AL, Tsapas A, Wender R, Matthews DR, Management of Hyperglycemia in Type 2 Diabetes: A Patient-Centered Approach: Position Statement of the American Diabetes Association (ADA) and the European Association for the Study of Diabetes (EASD). *Diabetes Care*, 2012; 35(6): 1364-1379.
 39. Stancu E, Täerel AE, Soroceanu V, Rais C, Ghica M, Ethical aspects of food supplements in EU and Romania. *Farmacia*, 2019; 67(4): 736-742.
 40. Strand MA, Mager NAD, Hall L, Martin SL, Sarpong DF, Pharmacy Contributions to Improved Population Health: Expanding the Public Health Roundtable. *Prev Chronic Dis.*, 2020; 17: E113.
 41. Sun H, Saeedi P, Karuranga S, Pinkepank M, Ogurtsova K, Duncan BB, Stein C, Basit A, Chan JCN, Mbanya JC, Pavkov ME, Ramachandaran A, Wild SH, James S, Herman WH, Zhang P, Bommer C, Kuo S, Boyko EJ, Magliano DJ, IDF Diabetes Atlas: Global, regional and country-level diabetes prevalence estimates for 2021 and projections for 2045. *Diabetes Res Clin Pract.*, 2022; 183: 109119.
 42. Täerel AE, Soroceanu V, Rais C, Trends in the evolution of the annual classified list of medicines between 1989-2012. *Farmacia*, 2013; 61(5): 948-956.
 43. Täerel AE, Rosenberg L, Nicolescu T, Ethics and equity in providing pharmaceutical assistance to the population. *Rev Rom Bioet.*, 2010; 8(1): 150-154.
 44. Terry D, Phan H, Peck B, Hills D, Kirschbaum M, Bishop J, Obamiro K, Hoang H, Nguyen H, Baker E, Schmitz D, Factors contributing to the recruitment and retention of rural pharmacist workforce: a systematic review. *BMC Health Serv Res.*, 2021; 21(1): 1052.
 45. Timar R, Velea I, Timar B, Lungeanu D, Oancea C, Roman D, Mazilu O, Factors influencing the quality of life perception in patients with type 2 diabetes

- mellitus. *Patient Prefer Adherence*, 2016; 10: 2471-2477.
46. Witry M, Ernzen M, Pape A, Viyyuri BR. Pilot and Feasibility of Combining a Medication Adherence Intervention and Group Diabetes Education for Patients with Type-2 Diabetes. *Pharmacy*, 2019; 7(3): 76.
47. World Health Organization, Global Report on Diabetes, <https://apps.who.int/>.
48. World Health Organization; Regional Office for Europe, The Legal and Regulatory Framework for Community Pharmacies in the WHO European Region. Copenhagen: World Health Organization; Regional Office for Europe, 2019.
49. World Health Organization, Quality of care: a process for making strategic choices in health systems. World Health Organization, 2006.