RESEARCH ARTICLE

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Diabetes care in Qatar: a survey of pharmacists' activities, attitudes and knowledge

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Abstract

Background Diabetes mellitus is recognized as a major public health issue and is one of the top ten causes of death in Qatar. *Objective* To describe the activities, and attitudes of Qatar pharmacists toward diabetes, to measure their diabetes knowledge and to assess their perceived barriers for diabetes care. *Setting* Community and ambulatory pharmacies in Qatar. *Method* Study objectives were addressed in a cross sectional survey of community and ambulatory pharmacists in Qatar. A phone call explaining the study was made to all community and ambulatory pharmacists in Qatar. Consenting pharmacists anonymously completed the survey either online or as paper. *Main outcome measure* Diabetes related activities, knowledge, attitudes and perceived barriers. *Results* Over 7 months, 126 surveys were collected (28% response rate). The majority of pharmacists always or often counselled patients on the appropriate time to take each medication and on medication side effects (90%, n = 100/111 and 73%, n = 81/111 respectively). Yet around 50% always or often provided education on the importance of screening for nephropathy (n = 59/112) and retinopathy (n = 58/109). In addition, 41% always or often provided education about the importance of immunization (n = 45/111) and 45% always or often provided therapy recommendations to physicians (n = 49/111). Using Diabetes Attitude Scale-3, most respondents had positive attitudes toward the need for special training, psychosocial impact of diabetes, and patient autonomy. Around 25% (n = 32/126) scored less than 6 out of 10 on the diabetes related knowledge test. The top three barriers for providing diabetes services were lack of time (53%, n = 67/126) shortage of personnel (42%, n = 53/126) and lack of private counseling area (42%, n = 53/126). *Conclusion* Qatar pharmacists mainly provide basic services for diabetic patients. They have an average diabetes related knowledge. Yet overall, they have positive attitudes toward diabetes, which is a vital component of any successful diabetes care service.

Keywords Attitude · Diabetes · Knowledge · Pharmacist · Pharmaceutical care · Qatar

Impacts on practice

- Qatar pharmacists are offering basic counseling services to diabetic patients. Efforts should be exerted to help them overcome their perceived barriers and to encourage them to offer more advanced services.
- Qatar community pharmacists have overall positive attitudes toward diabetes with the exception of the importance of glycemic control.
- Continuing education courses or programs offering diabetes workshops should be provided to Qatar pharmacists to improve their diabetes knowledge and their attitudes toward the benefits of good glycemic control in diabetic patients.

Introduction

Diabetes mellitus is recognized as a global major public health issue [1]. It is estimated that the number of adults living with diabetes in 2014 was 422 million compared to 108 million in 1980 [2]. It is expected that the number of diabetic patients will rise to 642 million by 2040. Diabetes associated complications can result in increased disability, reduced life expectancy and massive health utilization for every society [3]. With good management and education,

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these complications can be prevented or at least delayed. Despite the availability of diabetes care clinical practice guidelines, diabetes is poorly managed resulting in reduced health and in unnecessary cost [4–6]. The need for improved diabetes care offers an excellent opportunity for pharmacists to be involved in the management of people with diabetes [7, 8]. Considering their extended working hours, their frequent public contact, and their drug therapy expertise, pharmacists can be important assets to the diabetes multidisciplinary healthcare teams [9, 10]. Roles that pharmacists can play include but are not limited to diabetic patient identification, assessment, education, referral, and monitoring. Pharmacists can also assist in identifying asymptomatic diabetic patients [11]. In addition, they can help in preventing type 2 diabetes mellitus by raising community awareness about diabetes and about the importance of healthy lifestyle [12]. Another major area for pharmacy involvement is patient education. Diabetes self-management education (DSME), the process of helping the diabetic patient acquire the necessary knowledge, and skills for self-care, is one of the components of diabetes management. The American Diabetes Association Standards for DSME and the International Diabetes Federation (IDF) recognize pharmacists as one of the key instructors responsible for teaching critical self-management practices [13, 14]. Pharmacist provided DSME entails giving information about the patient's medical condition, reviewing the treatment plan, teaching how to use blood glucose monitors, and promoting adherence to medications [9, 11]. Referring diabetic patients to other healthcare providers when needed, monitoring and optimizing medication therapy are other important roles for pharmacists [11]. Many examples of pharmacist provided diabetes services have appeared in the literature. These services are successful in improving medication adherence, health outcomes and quality of life among diabetic patients and in decreasing healthcare resource utilization [10, 15–18].

In Qatar, as per the IDF the prevalence of diabetes mellitus in adults in 2015 is 20% [19]. Diabetes mellitus is ranked as one of the top ten causes of death in Qatar accounting for 9% of all deaths in 2016 [20]. In addition, it is one of the leading causes of burden of disease accounting for around 4% of the disability adjusted life years (DALYs) in Qatar [21]. Around 600 pharmacists (less than 1 pharmacist per 1000 population) practice in public and private ambulatory care clinics and in community pharmacies in Qatar. The main duty of pharmacists is dispensing prescription medications at the order of a physician in ambulatory clinics and over the counter medications in community pharmacies. Pharmacists working in both settings encounter patients with chronic medical conditions including diabetes, hypertension, and other conditions or patients with acute illnesses. The practice of pharmacy in Qatar has evolved over the years to include the provision of advanced cognitive services without additional financial charges. The emerging diabetes epidemic represents a significant opportunity for pharmacists to demonstrate their impact on patient care. There is paucity of information in relation to the diabetes care activities currently provided by ambulatory and community pharmacists, and in relation to their diabetes knowledge and to their attitudes towards diabetes.

Aim of the study

The study aims are to describe Qatar ambulatory and community pharmacists' attitudes towards diabetes and the diabetes care activities they routinely provide to diabetic patients, to measure their diabetes knowledge and to assess their perceived barriers for the provision of diabetes care in the pharmacy setting in Qatar.

Ethics approval

Qatar University (QU) Institutional Review Board (IRB) reviewed the study proposal and issued exemption from full ethics review (QU-IRB 108/12).

Method

Study design and study participants

A cross-sectional survey of ambulatory and community pharmacists was conducted in Qatar. Pharmacists who were licensed and practicing in public and private ambulatory care clinics and in community pharmacies in Qatar were eligible to participate in the study.

Assessment tool

Anonymous responses from the study participants were solicited using a self-administered survey tool. The survey instrument was created using the general principles of good survey design [22]. It comprised of a total of 32 close and open-ended questions that could be completed within an average of 20 minutes. The first section of the survey collected information in relation to the pharmacists' sociodemographic and practice characteristics including age, years of practice, gender, number of hours worked per week, and other information. The second part of the survey targeted the pharmacists' diabetes care services. The pharmacists were requested to indicate the frequency of providing specific services to diabetic patients using a 4-item scale (never, rarely, often, and always). These services were generated after a thorough literature review of clinical practice guidelines

and similar pharmacy practice related studies [8, 23, 24]. The pharmacists' diabetes knowledge was evaluated using in part with permission the University of Michigan Diabetes Research and Training Center (MDRTC) Diabetes Knowledge Test (DKT) [25]. This test has already been previously used to measure pharmacist diabetes knowledge [26].

The third version of the Diabetes Attitude Scale (DAS-3) was used with permission to assess the pharmacists' attitudes towards 33 related statements on a 5-point Likert scale (strongly disagree = 1; disagree = 2; neutral = 3; agree = 4, and strongly agree = 5). This scale measures clinician's attitudes in 5 subscales: need for special training to provide diabetes care, seriousness of type 2 diabetes, value of tight glucose control, psychosocial impact of diabetes, and attitude toward patient autonomy [27]. The scores for each subscale were calculated based on formulas and equations set by the scale designers [28].

In the final section of the survey, 11 potential barriers were listed and the pharmacists were requested to choose all the barriers that they perceive could hinder their provision of diabetes care services. The pharmacists also had the chance to mention any other additional perceived barriers. The survey was tested for clarity, relevance, acceptability and time to completion by a group of ten volunteer ambulatory and community pharmacists and by four clinical faculty members at QU who are considered experts in the area of diabetes care. Refinements were made as required before the survey implementation. The final survey was translated into Arabic using forward–backward method. The translated survey was reviewed for face and content validity by an expert panel of four Arabic speaking experienced academic clinical pharmacy faculty at QU College of Pharmacy.

Survey implementation

QU College of Pharmacy (CPH) created a contact database of all practicing pharmacists in Qatar using many resources including Qatar Ministry of Public Health pharmacist database. This database listed 540 pharmacists at the time of conducting the study. The study team contacted all the pharmacists in the database by phone and invited them to participate. The consenting pharmacists were sent the survey either online using a survey software or as paper in either Arabic or English: Electronic mails (E-mails) containing the survey website address were sent to the participants who wanted to complete the survey online and the paper-based survey was faxed or given in person to the other participants. After anonymously completing the survey, the participants were asked to fax the survey back to the main office at QU CPH or the study team collected the surveys by hand. Three survey reminders at 2-week intervals were sent to all participants through email, fax and phone.

Data analysis

Data were entered into the Statistical Package for Social Sciences (SPSS, version 22, SPSS, Chicago, IL, USA) for analysis. Partially completed surveys were included in the analysis. Consequently, the denominator (i.e. number of respondents) for each question was variable. Categorical data was analyzed using frequencies and percentages. Attitudes were measured using means and standard deviations. Student's t tests were used to assess if pharmacists' attitudes were different from neutral. Reliability analysis with Cronbach alpha was conducted on the Diabetes Attitudes Scale using the actual survey responses.

Predictors of attitudes and knowledge were determined using stepwise regression analysis. In order to pre-identify potential predictors of pharmacists' attitudes and knowledge, correlation coefficients were calculated. The variables with the statistically significant associations were identified and put into an explanatory regression model in order to discover the model that accounted for the most variance. Statistical significance was accepted at $p < 0.05$.

Results

We contacted 540 community and ambulatory pharmacists of which 450 pharmacists consented to participate. Over a 7-month period from May to December 2013, 126 surveys were collected (approximately 28% response rate). One hundred surveys were submitted online, 20 surveys were delivered by hand and the remaining six were sent by fax. Table 1 summarizes the participants' sociodemographic and practice characteristics. Seventy-eight respondents (62%) were male. The mean age was 35 years with a range between 21 years to 55 years. The mean number of prescriptions processed on a workday was 141 prescriptions with a range from 5 to 1200 prescriptions. The average number of diabetic patients seen per workday was 34 with a range from 0 to 400 patients. Seventy-six respondents (63%) reported that the percentage of their patients who are diabetic is between 25 and 50%.

Eighty six respondents (70%) indicated that they did not receive any diabetes training and/or continuing professional education activities. Yet 124 respondents (98%) expressed interest in receiving diabetes related training in the future. Sixty-three respondents (50%) indicated that they or their immediate family members have diabetes.

Diabetes mellitus care services

Pharmacists' provision of services to diabetic patients is described in Table 2. The majority of surveyed pharmacists always or often described to patients the appropriate time to administer each oral anti-diabetic medication and always or

Table 1 Sociodemographic and practice characteristics

Characteristic	Frequency (%)
Gender (N = 126)	
Male	78 (62%)
Female	48 (38%)
Country of origin (N = 126)	
Egypt	46 (36%)
India	20 (16%)
Jordan	18 (14%)
Sudan	17 (13%)
Palestine	11 (9%)
Philippines	7 (6%)
Other countries	7 (6%)
Number of years since pharmacy graduation (N = 121)	
< 5	22 (18%)
6–10	34 (28%)
11–15	40 (33%)
16–20	14 (12%)
> 20	11 (9%)
Number of practice years in Qatar (N = 123)	
< 5	52 (42%)
6–10	48 (39%)
11–15	12 (10%)
16–20	7 (6%)
> 20	4 (3%)
Country awarding highest pharmacy degree (N = 126)	
Egypt	49 (39%)
India	27(21%)
Jordan	21 (17%)
Sudan	11 (9%)
Palestine	1 (1%)
Philippines	5 (4%)
Qatar	2 (1%)
Other countries	10 (8%)
Average number of pharmacists in the pharmacy at any one shift (N = 125)	
1	46 (37%)
> 1	79 (63%)
Average number of pharmacy technicians in the pharmacy at any one shift (N = 126)	
None	14 (11%)
1	62 (49%)
> 1	50 (40%)
Pharmacy practice setting (N = 126)	
Chain community pharmacy	39 (31%)
Independent community pharmacy	14 (11%)
Public healthcare ambulatory clinic pharmacy	25 (20%)
Private healthcare ambulatory clinic pharmacy	14 (11%)
Outpatient hospital pharmacy	32 (25%)
Others	2 (2%)
Diabetes training and/or continuing professional education activities? (N = 123)	
Yes	37 (30%)
No	86 (70%)

Table 1 (continued)

Characteristic	Frequency (%)
Interest in receiving diabetes specific training and or continuing professional education activities in the future (N = 126)	
Yes	124 (98%)
No	2 (2%)
Approximate percentage of diabetic patients (N = 121)	
0%	1 (1%)
10%	38 (31%)
25%	59 (49%)
50%	17 (14%)
75%	5 (4%)
100%	1 (1%)
Availability of anti-diabetic medications in the pharmacy (N = 126)	
Yes	124 (98%)
No	2 (2%)
Availability of diabetic supplies and/or supplements in the pharmacy (N = 124)	
Yes	86 (69%)
No	38 (31%)

often counseled them about the side effects of these medications (90%, n = 100/111 and 73%, n = 81/111 respectively). In addition, 7 out of 10 pharmacists always or often counseled patients on the appropriate insulin administration and more than 80% always or often counseled patients on the appropriate handling and storage of insulin and on the proper use of insulin pens, syringes, lancets and needles (85%, n = 95/111 and 81%, n = 89/110 respectively). More than 70% of participants always or often counseled patients on the use of blood glucose meters (74%, n = 83/112), about signs, symptoms, causes and treatment of hypoglycemia (78%, n = 86/110) and about the importance of self-testing of blood glucose levels (80%, n = 91/113).

However, around half of respondents always or often provided education to patients on the importance of regular screening for retinopathy (53%, n = 58/109). or nephropathy (53%, n = 59/112) and on the current treatment targets for cholesterol in diabetes (50%, n = 56/111). Moreover, 54% always or often reviewed the patient's drug refill history to identify poor adherence (n = 61/112). In addition, 41% always or often provided education about the importance of immunization for influenza and pneumococcal pneumonia (n = 45/111) and 45% always or often provided drug therapy recommendations to the physician to help the patient reach blood glucose targets (n = 49/111).

Diabetes mellitus knowledge

Diabetes Mellitus knowledge was evaluated using ten diabetes mellitus related questions. Table 3 lists the different questions that were asked as well as the percentage of respondents who correctly answered each question. Thirty

two respondents (25%) scored less than 6 out of 10 on the test while 38 respondents (30%) scored 8 points or more out of 10. Mean knowledge score was 6.64 (SD = 1.54).

The number of patients with diabetes seen in a day (Standardized coefficient = 0.194, $p = 0.049$) and availability of anti-diabetic medicines (Standardized coefficient = 0.224, $p = 0.023$) were the only two significant contributors towards the mean knowledge score. They accounted for 9.3% of the variance ($R^2 = 0.093$, F = 4.92, $p = 0.009$).

Attitudes towards diabetes mellitus

Table 4 shows the pharmacists' attitudes toward Diabetes. The Diabetes Attitude Scale-3 had good internal consistency, with a Cronbach alpha coefficient of 0.95. Overall, pharmacists have positive attitudes towards diabetes. They were supportive of the need for diabetes special training, of the seriousness of type 2 diabetes, of the psychosocial impact of diabetes and of the importance of patient autonomy in controlling their disease ($p < 0.001$). Attitudes supporting tight glucose control were neutral and not statistically significant ($p = 0.841$). The percentage of patients with diabetes emerged as the only significant predictor of the pharmacist mean attitude score and accounted for 9.7% of the variance ($R^2 = 0.097$, F = 8.36, $p = 0.005$) (Standardized coefficient = 0.311, $p = 0.05$).

Perceived barriers for providing diabetes mellitus care services

Table 5 shows community and ambulatory pharmacists' perceived barriers for providing diabetes services. The top

Table 2 Diabetes Care Services

Statements	Frequency (%)			
	Never[a]	Rarely[a]	Often[a]	Always[a]
Counsel on the use of blood glucose meters including how to obtain a blood sample and how to interpret results (N = 112)	7 (6%)	22 (20%)	41 (37%)	42 (37%)
Evaluate blood glucose log for values outside target range (N = 112)	13 (12%)	20 (18%)	48 (43%)	30 (27%)
Provide drug therapy recommendations to the physician to help the patient reach blood glucose targets (N = 111)	27 (24%)	34 (31%)	30 (27%)	20 (18%)
Counsel about the importance of wearing a medical alert bracelet (N = 111)	56 (50%)	24 (22%)	26 (23%)	5 (5%)
Counsel about signs, symptoms, causes and treatment of hypoglycemia (N = 110)	3 (3%)	21 (19%)	58 (53%)	28 (25%)
Counsel on when to contact the healthcare provider (N = 110)	2 (2%)	32 (29%)	54 (49%)	22 (20%)
Counsel on what to do in case of illness or severe stress (N = 112)	8 (7%)	31 (28%)	47 (42%)	26 (23%)
Counsel about the cautions of over-the-counter drugs or herbal products as they relate to diabetes management (N = 111)	7 (6%)	34 (31%)	47 (42%)	23 (21%)
Review the patient's drug refill history to identify poor adherence (N = 112)	19 (17%)	32 (29%)	35 (31%)	26 (23%)
Provide patient-specific interventions to help improve adherence (N = 112)	9 (8%)	31 (28%)	47 (42%)	25 (22%)
Counsel on the appropriate handling and storage of insulin (N = 111)	2 (2%)	14 (13%)	47 (42%)	48 (43%)
Counsel on the appropriate use of insulin pens, syringes, lancets and needles (e.g., sharp disposal) (N = 110)	1 (1%)	20 (18%)	46 (42%)	43 (39%)
Counsel on how insulin works and the key differences amongst insulin formulations (N = 112)	5 (4%)	30 (27%)	50 (45%)	27 (24%)
Counsel on appropriate insulin administration (mixing insulin, injection technique, injection time…) (N = 111)	4 (4%)	29 (26%)	45 (40%)	33 (30%)
Describe the appropriate time to administer each oral anti-diabetic drug (N = 111)	1 (1%)	10 (9%)	53 (48%)	47 (42%)
Counsel about the side effects of oral anti-diabetic drugs (N = 111)	5 (4%)	25 (23%)	47 (42%)	34 (31%)
Counsel on current recommendations for antiplatelet therapy (e.g., low dose Aspirin). (N = 111)	16 (14%)	31 (28%)	45 (41%)	19 (17%)
Recommend anti-platelet therapy to the patient's physician when indicated (N = 111)	31 (28%)	41 (37%)	27 (24%)	12 (11%)
Provide education on the importance of controlling blood pressure in diabetes (N = 112)	4 (3%)	41 (37%)	45 (40%)	22 (20%)
Provide drug therapy recommendations to physician to help the patient reach blood pressure targets (N = 111)	27 (24%)	35 (32%)	34 (31%)	15 (13%)
Discuss the importance of self-testing of blood glucose levels (n = 113)	2 (2%)	20 (18%)	44 (39%)	47 (41%)
Counsel on the current treatment targets for cholesterol in diabetes (N = 111)	11 (10%)	44 (40%)	42 (38%)	14 (12%)
Provide education on the importance of regular screening for nephropathy (N = 112)	12 (10%)	41 (37%)	41 (37%)	18 (16%)
Provide education on the importance of regular screening for retinopathy (N = 109)	11 (10%)	40 (37%)	41 (38%)	17 (15%)
Provide education on the importance of regular screening for neuropathic pain (N = 112)	7 (6%)	36 (32%)	50 (45%)	19 (17%)
Counsel on good foot care techniques (N = 111)	7 (6%)	29 (26%)	51 (46%)	24 (22%)
Provide education about the importance of immunization for influenza and pneumococcal pneumonia (N = 111)	22 (20%)	44 (39%)	34 (31%)	11 (10%)
Stress the importance of weight control in diabetes management where applicable (N = 111)	5 (4%)	21 (19%)	55 (50%)	30 (27%)
Refer my diabetic patients to a structured diabetes education program (N = 112)	28 (25%)	40 (36%)	29 (26%)	15 (13%)
Refer my diabetic patients to a dietitian (N = 111)	21 (19%)	42 (38%)	35 (31%)	13 (12%)
Stress the importance of diet and regular exercise in diabetes management (N = 111)	0 (0%)	23 (21%)	53 (48%)	35 (31%)
Promote smoking cessation where applicable (N = 111)	5 (5%)	27 (24%)	50 (45%)	29 (26%)

[a]Never: this service is not provided to patients with diabetes. Rarely: this service is provided to about 25% of patients with diabetes. Often: this service is provided to about 75% of patients with diabetes. Always: this service is provided to about 100% of patients with diabetes

three perceived barriers for providing diabetes services were lack of time (53% of respondents, n = 67/126), lack of private counseling area (42%, n = 53/126) and shortage of personnel (42%, n = 53/126).

Discussion

This study is one of the first studies in Qatar to describe the pharmacists' diabetes care related activities, to assess their diabetes knowledge and to gauge their attitudes toward diabetes. The majority of pharmacists reported

Table 3 Diabetes related Knowledge

	Frequency and percent of pharmacists who answered correctly
Which should not be used to treat low blood glucose? 3 hard candies, 1/2 cup orange juice, 1 cup diet soft drink and 1 cup skim milk (N = 124)	45 (36%)
The best way to take care of diabetic feet is to: look at and wash them each day, massage them with alcohol every day, soak them for 1 h each and buy shoes a size larger than usual (N = 124)	88 (71%)
Which of the following is not associated with diabetes? Vision problems, lung problems, kidney problems and nerve problems (N = 124)	99 (98%)
Signs of ketoacidosis include: sweating, vomiting, frequent urination and low blood glucose (N = 124)	18 (15%)
If the diabetic patient is sick with the flu, which of the following changes should you recommend? Take less insulin, drink less liquids, eat more proteins and test for glucose and ketones more often (N = 124)	76 (61%)
If the patient has taken intermediate-acting insulin (NPH or Lente), he or she is most likely to have an insulin maximum reaction (peak) in 1–3, 6–12, 12–15 and more than 15 h (N = 124)	75 (60%)
The patient realized just before lunch time that he or she forgot to take his or her insulin before breakfast. What should you recommend now? Skip lunch to lower your blood glucose, take the insulin that you usually take at breakfast, take twice as much insulin as you usually take at breakfast, and check your blood glucose level to decide how much insulin to take (N = 124)	84 (68%)
Which of the following oral anti hyperglycemic agents can cause hypoglycemia? Metformin, sulfonylureas, pioglitazone and acarbose (N = 124)	85 (69%)
Which of the following oral anti hyperglycemic agents does not cause weight gain? Metformin, nateglinide, pioglitazone and glyburide (N = 115)	89 (72%)
Which of the following is true regarding Sitagliptin? Administer orally once daily, administer orally twice daily, administer orally three times per day, administer orally as needed (N = 124)	78 (63%)

Table 4 Pharmacists' attitudes toward diabetes

Subscale	No. of items	Mean ± (SD)	Neutral score	p value (sig different from neutral)
Total	33	3.72 (0.26)	3	< 0.001
Need for special training	5	4.48 (0.53)	3	< 0.001
Seriousness of NIDDM	7	3.53 (0.43)	3	< 0.001
Value of tight control	7	3.01 (0.58)	3	0.841
Psychosocial Impact of DM	6	3.80 (0.48)	3	< 0.001
Patient autonomy	8	3.91 (0.67)	3	< 0.001

Table 5 Perceived barriers for providing diabetes mellitus care services

Barrier	Frequency (%)
I do not have enough time	67 (53%)
Shortage of personnel	53 (42%)
I do not have a private counselling area	53 (42%)
Low patient expectations regarding pharmacists role in diabetes care	49 (39%)
Lack of diabetes related educational materials in the pharmacy	46 (37%)
Lack of access to patients medical profiles	43 (34%)
Lack of diabetes therapeutic knowledge and skills	24 (19%)
Limited funding	24 (19%)
Cultural or religious barriers	22 (17%)
Lack of diabetic patients visiting the pharmacy	8 (6%)
I am not interested in providing diabetes care	1 (> 1%)
Language barrier	1 (> 1%)
Lack of diabetes training programs for pharmacists	1 (> 1%)
Low patient knowledge about diabetes management	1 (> 1%)

offering basic counseling services to diabetic patients including educating patients on the use of medications and on handling and storing of insulin, and advising patients about the importance of self-testing of blood glucose and on how to properly use blood glucose meters. These results are comparable to similar studies conducted in Canada, Indonesia, Kuwait, Norway and United States [23, 24, 29–32].

Interestingly, most pharmacists indicated that they always or often stressed to patients the importance of weight control, diet and exercise. These findings are consistent with those of studies in Nepal and in Scotland [33, 34]. In addition, these findings are very promising as nutrition therapy and physical activity can improve glycemic control in diabetic patients and are considered fundamental components in the overall treatment of this disease [8, 35, 36].

Yet only few pharmacists provided the more advanced diabetes services. For instance, 46% of pharmacists never or rarely reviewed the patient's drug refill history and identified poor adherence. This result is of paramount significance given the high level of non-adherence reported in diabetic patients in Qatar [37]. Pharmacists should identify the barriers for medication taking in diabetic patients and should have an important role in addressing medication non-adherence [8]. In addition, around 40% of pharmacists rarely or never provided education to diabetic patients regarding the importance of regular screening for diabetes microvascular complications. According to Bener et al. [38], the prevalence of diabetic nephropathy, retinopathy and neuropathy among outpatient diabetic patients in Qatar is 12.4, 12.5 and 9.5% respectively. Guidelines support the importance of routine screening for diabetic microvascular complications [8]. Pharmacists have ample opportunities to promote diabetic patients' awareness and screening of these complications.

Furthermore, over half of the respondents rarely or never provided drug therapy recommendations to the physician and rarely or never refereed diabetic patients to a dietician or a structured diabetes education program. This finding can be explained by the low level of pharmacists' participation in the multidisciplinary teams responsible for treating diabetic patients in Qatar [39], and to the inadequate collaboration between pharmacists and other healthcare professionals [40]. The current health care delivery model in community and ambulatory settings in Qatar is not integrated and the burden of care typically lies in the hands of physicians [39]. In a survey conducted by Wilbur et al. [41] among general practitioners in Qatar, almost one third of surveyed physicians were uncomfortable with pharmacists assisting in drug regimen design or recommending changes in therapy to them.

A multi-disciplinary team approach is critical for providing optimal and patient centered diabetes care and for preventing diabetic complications [7]. Efforts should be exerted to support the involvement of Qatar pharmacists as members of the health care team in the management of diabetes.

Moreover, education related to immunization for influenza and pneumococcal pneumonia was rarely or never offered to diabetic patients by almost 60% of participants. Clinical practice guidelines recommend vaccination against influenza and pneumonia for diabetic patients [8]. According to a study conducted in a primary health care center in Qatar, only 20% of adult diabetics receive vaccination [42]. Qatar pharmacists can play a vital role in disease prevention by advocating immunization to high risk patients including diabetic patients [43].

The majority of pharmacists had a low to average knowledge on diabetes. These results are relatively comparable with those of studies conducted in Nepal and Libya [33, 44]. One possible explanation for the pharmacists' inadequate diabetes knowledge reported in our study is that Qatar pharmacists have diverse educational qualifications and the majority have obtained their degrees from pharmacy schools that have traditional pharmaceutical sciences based curricula. To advance pharmacy practice in the area of diabetes, it is very essential that continuing education courses or programs offering diabetes workshops are provided to Qatar pharmacists to improve their diabetes knowledge and to encourage them to offer more advanced patient care services.

Interestingly, the pharmacists demonstrated general positive attitudes toward diabetes and toward the following subscales of the scale: special training, patient autonomy, seriousness of the disease and psychosocial impact of diabetes. These results are in line with those of studies from Kuwait, Canada and United States [23, 24, 30]. However, Qatar pharmacists were not supportive of the importance of glycemic control in diabetic patients. These findings may indicate that the respondents may not appreciate the value of controlling blood glucose in diabetic patients. Studies have demonstrated that better glycemic control is associated with a significantly reduced risk of developing diabetic complications [45–48]. Any diabetes continuing education courses that would be provided to Qatar pharmacists should stress the benefits of good glycemic control in diabetic patients.

Furthermore, Qatar pharmacists perceived several potential barriers for the integration of diabetes care into pharmacy practice. The top perceived barriers were lack of time, lack of private counseling area and shortage of personnel followed by low patient expectation regarding pharmacist role in diabetes care and lack of access of patients' profiles. These barriers are consistent with those reported in previous studies assessing the pharmaceutical care practices of pharmacists in Qatar [49], and with those of similar surveys in Kuwait and United States [30, 32]. Increasing the number

of pharmacists and pharmacy technicians, establishing electronic health records and private counseling areas in pharmacies in Qatar, and promoting the role of pharmacist in diabetes care can help in overcoming these barriers.

The study had several limitations. It is possible that only the pharmacists who were active in diabetes care were the ones who answered the study survey, which may have led to an exaggeration in the results, related to the pharmacists' attitudes and provided diabetes services. Furthermore, only 24% of Qatar pharmacists answered the study survey. It is plausible that the study results may not reflect the practices and attitudes of all pharmacists in Qatar. However, given the comparability of the sociodemographic and practice characteristics of the study respondents to those of Qatar pharmacists as documented in Qatar Ministry of Public Health databases and previous pharmacist related publications in Qatar [50], we would consider that the study results are representative of Qatar pharmacist population. Moreover, using a survey instrument has the potential of causing a recall and social desirability bias. It would have been better if the study survey was accompanied by semi-structured interviews or focus groups with pharmacists from the different healthcare sectors in Qatar to further validate the study results.

Conclusion

This study proved that Qatar pharmacists mainly provide basic services for diabetic patients and their involvement in offering advanced diabetes services is limited. They have an average diabetes related knowledge level and are in need for diabetes related training and/or continuous educational activities. Their top perceived barriers for provision of diabetes care include lack of time, lack of private counseling area and shortage of personnel. Yet, Qatar pharmacists have overall positive attitudes toward diabetes, which is an important element for provision of optimal care for diabetic patients.

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