

## ARTICLE

# Pharmacists' Management of Diabetes during Ramadan Fasting

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## Abstract

**Background:** Proper management of diabetes requires a set of preventive and therapeutics measures that include proper diet, regular exercise, monitoring of blood glucose and insulin administration however, significant counseling and education of patients are required to be provided by pharmacists if patients are fasting. **Objectives:** This study investigated pharmacists' knowledge and practices towards diabetes management during the month of Ramadan. **Methods:** A cross sectional pre-validated questionnaire-based study was carried out among pharmacists practicing in hospital settings and pharmaceutical industry pharmacists. Data were collected from June 2015 to November 2015. The questionnaire covered: a) demographics, b) knowledge of diabetic risk factors and c) knowledge of blood glucose levels such as normal, diagnostic, target levels require during fasting and during complications. **Results:** 288 pharmacists participated in the study; 69.1% were practicing pharmacists and 30.9% were industrial

pharmacists. The majority qualified as Pharm D (70.5%) and most respondents (85.5%) have experience ranging between 1 to 5 years. A significant difference has been found between practicing pharmacists and industrial pharmacists regarding knowledge of diabetes risk factors, complications, normal and target blood glucose levels. The mean knowledge score for industrial pharmacist was higher than hospital and clinical pharmacists [9.5 (3.4) versus 6.8 (2.7);  $p < 0.05$ ]. **Conclusion:** The barriers that hinder the role of pharmacists in Pakistan should be addressed especially for practicing pharmacists. Initiation of education and training programs related to diabetic care for practicing pharmacists is required on urgent basis. Pre-Ramadan training is essential to enable pharmacists to counsel fasting diabetic patients effectively.

**Keywords:** Diabetes management, hospital and clinical pharmacists, Ramadan, fasting patients, Diabetic patients.

## Introduction

Diabetes mellitus (DM) is the most common metabolic disorders nearly in all countries of the world (1). It is characterized by raised blood glucose it may lead to serious consequences over time (1). The International Diabetic Federation in 2014 estimated a global prevalence of around 387 million people (i.e. 8.3 % of the world population). About one quarter of global population live in South Asia. The burden of non-communicable diseases is increasing in South Asia because of high life expectancy, higher poverty rate and limited access to health care services (2). The onset of diabetes among Asians occurs earlier than white populations and therefore higher rates of complications, morbidity and mortality have been seen among young Asian population (3). Pakistan has a high disease burden of DM, ranking the 6<sup>th</sup> globally. More than 10 % of the adults suffer from diabetes and an equal number suffer from impaired glucose tolerance. Thus more than 15.4 million of the adult population of Pakistan have diabetes (4).

Managing diabetes can sometimes be a lifelong challenge to the patient since proper management of diabetes requires a set of preventive and therapeutics measures that include proper diet, regular exercise, monitoring of blood glucose and insulin administration (5). Patients with diabetes feel that diabetes powerfully affects their lives because of various physical, social and mental distresses of hypoglycemia, hyperglycemia and chronic complications (6). Aggressive control of blood glucose level is one of the ways that can improve the outcome of patient towards diabetes care (7). Quality of life is of utmost importance among people who are living with diabetes. The diabetics who are experiencing poor quality of life are at increased risk for developing complications because of worse glycemic control and diminished care (6). Diabetes-related quality of life does not depend on a single factor, such as insulin or oral medications, but it also depends on social support, diet, physical activity, self-efficiency, income status, education and also on health and psychiatric conditions of the individual (8).

During the holy month of Ramadan, adult Muslims observe a total day time fast. The fasting time period start before dawn (*Suhoor*) and end just after sunset (*Iftar*). Diabetic patients require special counseling during the month of Ramadan due to fasting. However, many studies have shown that health care providers would not offer specific instruction and discourage fasting to diabetic patients in the month of Ramadan (9-11). The purpose of this study was

to investigate the pharmacists' knowledge and practices pertaining to management of diabetes during the month of Ramadan in Karachi, Pakistan. This is one of the few studies of its nature done in South Asian region (12). It is make it extremely relevant that the study was done in a country with majority Muslim population (96.4% are Muslims) (13) and with a high disease burden of DM (>15.4 million of adult are diabetic) (2). It was conducted in the biggest city of Pakistan. Population of Karachi is estimated as 20.88 million.

## Subjects and Methods

### *Design and settings*

A cross sectional study was carried out on pharmacists practicing in community and hospital settings (collectively called practicing pharmacists) and pharmacists associated with pharmaceutical industry (called industrial pharmacists) from June 2015 to early November 2015. The proposal of this project was approved by Institutional Review Board of Sir Syed College of Medical Sciences. A written informed consent was obtained from every participant before filling the questionnaire. The participation of pharmacists' was completely voluntary and their knowledge scores were kept strictly confidential.

### *Participants*

Pharmacists' graduated from any pharmacy school of Pakistan with at least one year experience in a hospital, retail, community pharmacy, day care clinics (for practicing pharmacists) or in product sales and marketing (for industrial pharmacists). Moreover, industrial pharmacists included in this study were dealing with diabetic products. Pharmacy students, interns, trainees and pharmacists working in pharmaceutical production and quality assurance were excluded. A total number of 288 pharmacists responded to the questionnaire and they were approached by non-probability convenience sampling methodology. Every year around 2587 pharmacists graduate from all universities, colleges and pharmacy schools in Pakistan (14). Assuming that same numbers of pharmacists have graduated in last twenty years and there would be equal distribution of pharmacist in each province. 51740 pharmacists qualified over the last 20 years in Pakistan but only 25 percent of pharmacists pursue a career in hospital and community pharmacy services (14).

### *Study questionnaire*

A pre-validated semi structured questionnaire was adopted from previous studies (15,16). The questionnaire has both

**Table 1.** Demographic profile of the study participants.

Description	Category	Frequency (n)	Percentages
Age (years)	21-30	240	83.3%
	31-40	41	14.2%
	>40	7	2.4%
Gender	Male	103	35.8%
	Female	185	64.2%
Religion	Muslim	262	91%
	Non-Muslim	26	9%
Qualification	B-Pharmacy	15	5.2%
	Pharm D	203	70.5%
	M-Pharmacy	5	1.7%
	MPhil / MS	23	8%
	MBA	40	13.9%
	Other	2	0.7%
Experience (years)	1-5	247	85.7%
	6-10	31	10.7%
	>10	10	3.4%
Pharmacy practice <sup>a</sup>	Practicing pharmacists	199	69.1%
	Industrial pharmacists	89	30.9%
Job designation	Pharmacist	118	41%
	Staff pharmacist	42	14.5%
	Senior pharmacist	19	6.6%
	Diabetes educator pharmacist	10	3.5%
	Manager of pharmacy	20	6.9%
	Sales promotion officers	49	17%
	Brand manager	30	10.4%

*Practicing pharmacists denote public and private hospital pharmacists, community pharmacists and clinic pharmacists, on the other hand industrial pharmacists denote product sales, marketing and education.*

open and closed ended questions covering three domains: A) demographics, B) knowledge related to risk factors, C) normal and diagnostic glucose levels, target blood glucose

levels during fasting, complications and management of diabetes. The questionnaire was piloted before the large scale usage.

**Data analysis**

Sample size was calculated using the WHO formula for sample size calculation, keeping margin of error of 5% and confidence interval of 95%. Data were analyzed using statistical software SPSS (version 19.0). For measuring the difference between the knowledge of subgroups about diabetes, independent t-test was applied and a p-value of

0.05 or less was considered statistically significant.

**Results****Participants' profiles**

A total of 288 pharmacists participated in the study, 69.1% were practicing pharmacists and 30.9% were industrial pharmacists (Table1). There were more females than males

<b>Table 2.</b> Pharmacists' knowledge about risk level categorization for diabetic patients who are fasting during Ramadan		
Clinical and medication status	Correct category <sup>a</sup>	Respondents' correct responses as number (%)
Type 1 diabetes patient	Very high risk	32 (11.1%)
Patients with history of recurrent hypoglycemia	Very high risk	46(16%)
Pregnant patient	Very high risk	32 (11.1%)
Patients with hypoglycemia unawareness	Very high risk	86(29.9%)
HONK within 3 months prior to Ramadan	Very high risk	20 (6.9%)
Patients with sustained poor glyceemic control	Very high risk	19 (6.6%)
DKA within 3 months prior to Ramadan	Very high risk	89 (30.9%)
Severe hypoglycemia within the last 3 months prior to Ramadan	Very high risk	55(19.1%)
Patients on chronic dialysis	Very high risk	61 (21.2%)
Elderly patients in ill health	High risk	65 (22.6%)
Patients with comorbid conditions that present additional risk factors	High risk	69 (24%)
Patients with renal insufficiency	High risk	95 (33%)
Patients with moderate hyperglycemia <sup>b</sup>	High risk	42 (14.6%)
Patients who perform intense physical labor	High risk	88 (30.6%)
People living alone that are treated with insulin or sulfonylureas	High risk	92 (31.9%)
Patients treated with diet alone, metformin, or a thiazolidinedione	Low risk	112 (38.9%)
Patients treated with short-acting insulin secretagogues <sup>c</sup>	Moderate risk	80 (27.8%)
<p><i>Abbreviations: HONK: hyperosmolr non-ketotic coma (also known as hyperosmotic hyperglycemic state); DKA: diabetic ketoacidosis.</i></p> <p><i>a: based on the ADA workshop report categories (ref 15).</i></p> <p><i>b: defined as average blood glucose between 150 and 300 mg/dl and/or HbA1c 7.5–9.0%</i></p> <p><i>c: such as repaglinide or nateglinide</i></p>		

**Table 3.** Comparison of the knowledge of normal blood glucose levels (BGL), target BGL and BGL during complications by hospital pharmacists and industrial pharmacists separately.

Variables	Correct Responses [% (n)]	
	Practicing pharmacists (n=199)	Industrial pharmacists (n=89)
Normal fasting blood glucose level	21.3% (42)	47.1% (42)
Normal random blood glucose level	24.6% (49)	49.4% (44)
Diagnostic fasting blood glucose level	19.5% (39)	53.9% (48)
Diagnostic random blood glucose level	21.6% (43)	58.4% (52)
HbA <sub>1c</sub>	32.1% (64)	64% (57)
Hypoglycemic blood glucose level	11.5% (23)	46% (41)
Target blood glucose at 2 hour after dawn ( <i>Suho</i> r)	8% (16)	11.2% (10)
Target blood glucose at early afternoon ( <i>Zuhr</i> )	15.5% (31)	26.9% (24)
Target blood glucose before sunset ( <i>Iftar</i> )	13% (26)	13.5% (12)
Target blood glucose after sunset ( <i>Iftar</i> )	5.5% (11)	13.5% (12)
Alarming blood glucose level for diabetes	15.5% (31)	15.7% (14)
Blood glucose level associated with ketonuria	7% (14)	3.3% (3)

(64.2% versus 35.8% respectively). The qualification of majority of the respondents were Pharm D (70.5%) and 91% were Muslims. The majority of pharmacists (85.5%) have been practicing for 1-5 years and most of them (83.3%) were 21-30 years of age

#### **Knowledge of risks and concerns during fasting**

This part of questionnaire was completed by all respondents (Table 2). A quarter of the participants (25%) chose the correct responses. The highest correct answers (38.9%) were scored in the question pertaining to patient treatment with diet alone, metformin or a thiazolidinedione. Overall, pharmacists performed poorly when questioned about patients with sustained poor glycemic control (6.6%) and having hyperglycemic hyperosmolar non-ketotic coma within 3 month prior to Ramadan (6.9% correct).

#### **Knowledge of normal, abnormal and target blood glucose levels**

Overall, 22% of pharmacists gave correct responses to questions pertaining to knowledge of normal blood glucose levels (BGL), diagnostic BGL, target BGL and BGL during complications (Table 3). Majority of correct answers came from industrial pharmacists (34%) as compared to practicing pharmacists (17%).

#### **Comparison of hospital and pharmaceutical pharmacists**

Industrial pharmacists scored more correct answers than practicing pharmacists in all categories as follows as a) normal fasting blood glucose level (47.1% vs. 21.3%), b) random blood glucose level (49.9% versus 24.6%), c) diagnostic fasting blood glucose level (53.9% versus 19.5%), d) diagnostic random blood glucose level (58.4% versus 21.6%), e) HbA<sub>1c</sub> (64% versus 32.1%) and f) hypoglycemic blood glucose level (46% versus 11.5%)

**Table 4.** Difference between knowledge levels<sup>a</sup> of practicing pharmacists and industrial pharmacists about diabetes, its complications and various key blood glucose levels.

Practice setting	N	M	SD	T	Significance level <sup>b</sup>
Practicing pharmacists	199	6.8	2.7	-6.623	<b>0.000</b>
Industry pharmacists	89	9.5	3.4		

*a* Description: scoring of practicing pharmacists (in hospital and community settings) versus industrial pharmacists for questions pertaining to diabetic-related risk factors during Ramadan fasting, normal blood glucose levels (BGL), target BGL and diagnostic BGL and BGL during complications.

*N* = total number of participants in each practice settings; *SD* = standard deviation, *t* = computed test statistics, *df* = degree of freedom; *Sig* = *p* value corresponding to given test statistics and degree of freedom.

*b* indicate statistically significant results, means there is difference among the knowledge of hospital and industrial pharmacist

respectively. Correct responses related to targeted blood glucose levels during fasting i.e. after *Suhoor*, at *Zuhoor*, before and after *Iftar* were scored more consistently by industrial pharmacists than practicing pharmacists (Table 3). However, responses to questions related to diabetic complications i.e. alarming blood glucose level for diabetes and blood glucose level associated with ketouria were only marginally different between the two subgroups. The mean score for industrial pharmacist was higher than practicing pharmacists [9.5(3.4) versus 6.8(2.7),  $p < 0.05$  respectively].

### Discussion

Pharmacists hold an ideal position to provide information on diabetic management during fasting to improve the outcomes. This study showed a positive attitude by pharmacists towards participation in the survey. Majority of pharmacists who participated in this study were below 30 years old (83.3%) and most of them had had experience between one to five years (87.5 %). It is evident that most participants in this study were pharmacy graduates and are in their early career making the findings relevant when planning future educational and training opportunities.

In the current study approximately 32% of respondents were fully aware of the overall risk factors associated with fasting by diabetic patients. Around 22% (n=63) of pharmacists gave correct responses to the questions

pertaining to knowledge of normal, target blood glucose levels and levels during complications. Out of these 63 pharmacists who gave correct response 30 were industrial pharmacists and 33 were practicing pharmacists (i.e. correct response rates were 34% versus 17%). Similar studies from Nepal, Qatar and Libya showed respective rates 26.2%, 60% and 69.6% of respondents with good knowledge (17-19). The better results obtained in the study done in Qatar showed half of participants had over a decade experience whereas in the current study 85.7% of pharmacists have experience below 5 years. Moreover, the study from Nepal enrolled participants who were older and more experienced (62% were over 30 years of age) (17). The major reason for low level of knowledge in the practicing pharmacists in the present study was the lack of hospital-based training for Pharm D graduates. Moreover, the poor acceptance of the role of clinical pharmacists in hospitals by the medical professionals may pose a challenge (20).

Overall, industrial pharmacists (including both sales and marketing sectors) in the present study scored more correct answers than practicing pharmacists. These correct answers were particularly related to their knowledge of normal BGL, target BGL and BGL during various complications. The reasons for this higher level of knowledge among industrial pharmacists might be attributed to the inclusion criteria of our study or in-service training these industrial pharmacists regularly receive. We have included only those



pharmacists from pharmaceutical industries who were dealing with diabetes products. Pharmaceutical industries provide focused structured training and conduct periodic educational programs for the staff in general including pharmacists (21). On the other hand, the clinical roles of practicing pharmacists in hospital and community pharmacy are not clearly recognized and fully functional in Pakistan and perhaps in many other developing countries. Therefore, these pharmacists may actually face significant functional barriers while working in both hospital and community settings (14). Hence, only 10% of graduating pharmacists choose to pursue a career in hospital and community pharmacy practice (14). Even these pharmacists when they find themselves unable to play an active role in patient care, they rather focus more on managerial issues of hospital pharmacies to advance their career due to lack of standard practice guidelines (14).

Results revealed in the present study are a matter of concern as it bear a direct impact on patients' care and results in ineffective and incomplete instructions to diabetic patients in general and during Ramadan in particular. A prior study from Pakistan demonstrated that a) large diabetic population have never received any diabetes information and b) diabetic patients living in rural areas have little access to diabetes education compared to urban areas (22). Others studies indicated that patients' knowledge and awareness of diabetes is essentially low in Pakistan (23-25). The pre-Ramadan education for diabetic patients was shown in a study from Pakistan to reduce risks of hypoglycemia and hospitalizations (26). Other studies have clearly illustrated that diabetic outcomes do improve with pharmacists' interventions (27,28).

The clinical-based training for pharmacy graduates plays a vital role in strengthening their knowledge and enhancing their skills. For instance, Aga Khan University Hospital (AKUH) has set a leading example in Pakistan by intake new graduates to its biannual pharmacy residency program since 1990 (29). Similar initiatives are badly needed to be adopted by other institutions in Pakistan and elsewhere. Recognizing the high prevalence of diabetes, diabetic care-focused continuous education programs (CEP) ought to be mandatory for practicing pharmacists to help refresh their knowledge. CEP have shown improvements in participants' knowledge of diabetes (30). Pre-Ramadan educational events and training programs would predictably enhance the skills of pharmacy professionals and help improve their counseling of diabetic patients who fast during Ramadan.

In conclusion, the present study is one of the few studies done in this region and its alarming results require immediate attention. The educational and training programs for pharmacists practicing in hospital settings in relationship to diabetic care are required on urgent basis. These should be particularly organized before and during the month of Ramadan.

#### Authors' contributions

MA, MF and AK conceived and organized the project. AK, MF and AH collected the data. Data interpretation and analysis has been done by AK and reviewed by MA and SK. MA and AK drafted the manuscript. All authors approved the final version.

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