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Research Article

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Impact of Community Pharmacy Diabetes Care Program on Knowledge and Glycemic Control: An Unexplored Opportunity for Community Pharmacists in Pakistan

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Summary

Background: *Effective management of diabetes mellitus depends on efficacy of therapy as well as patient adherence to medication therapy and non-pharmacological approaches. One of the most important tools to improve patient adherence is counseling. Community pharmacists can effectively contribute to patient care as they have the expertise and accessibility to do the task appropriately.*

Objective: *The objective of the study was to evaluate the impact of pharmacist counseling on glucose control and medication adherence of diabetic patients attending community pharmacies in Pakistan.*

Method: *A randomized, controlled, single blinded, pre-post intervention study design was used. The respondents included patients diagnosed with both diabetes mellitus (Type I or II) visiting community pharmacies for purchasing their regular medicine. Simple random sampling technique by lottery method was used to select community pharmacies to be included in-group A (intervention n=4) and group B (control n=4). The total number of patients were 40 in each group while estimating a drop-out rate of 25%. Convenience sampling technique was used to select patients visiting community pharmacies. Patients in the intervention group received special counseling. Blood glucose was checked after every 15 days for a period of six months. Pre-validated tools such as diabetes knowledge questionnaire 24 and brief medication questionnaire were used. Data was cleaned, coded and analyzed in SPSS 21. Wilcoxon test ($p \geq 0.05$) was used to compare pre-post intervention knowledge regarding diabetes and. Mann-Whitney test ($p \geq 0.05$) was used to find differences among medication adherence among control and intervention groups as well as pre and post intervention.*

Results: *The results of the present study showed that respondents having diabetes since the past 1-3 years had comparatively better knowledge scores (18.8, 3±2.04) after intervention. Mean knowledge scores regarding diabetes mellitus among intervention group at baseline was (16.02, ±2.93) which was improved after six months (19.97, ±2.66). Significant difference was observed ($p \leq 0.05$) in pre-post intervention knowledge regarding diabetes management. Knowledge of patients was improved regarding different aspects of diabetes management after counseling by community pharmacists. The fasting blood glucose improved at three months (9.32, ±1.92) and after six months (8.95, ±1.45) in intervention group.*

Conclusion: *The results of the current study concluded that counseling by community pharmacist has a positive impact on blood glucose management among diabetic and patients. Educational programs should be initiated by community pharmacists as this can lead to improvement in glycemic control and enhance the image of pharmacist as a key health care member in management of chronic diseases.*

Keywords: Diabetes, Intervention, Community Pharmacist, Glycemic, Chronic Diseases, Pakistan

Introduction

The term Diabetes Mellitus (DM) is considered as a metabolic disease characterized by high glucose levels along with metabolic disturbances of carbohydrates, fat and protein dye to insulin deficiency or resistance. The etiology of diabetes include factors such as genetic, environment and lifestyle. The chances of death in diabetic patient due to cardiovascular disorders is increased by 2-4 times than an individual without diabetes. The most common complications of diabetes include peripheral vascular disease, end-stage renal disease, blindness and amputations [1]. Approximately 425 million individuals globally are suffering

from diabetes mellitus, with Pakistan being ranked as 7th in diabetes disease burden with a prevalence of 6.9%. Approximately 7 million adults have been diagnosed with diabetes whereas 3 million are still undiagnosed. It is estimated that the prevalence will be 15% by the year 2030, and Pakistan can escalate to 4th position in terms of prevalence of diabetes mellitus [2]. According to National Diabetes Survey of Pakistan, the prevalence has increased to 26.3% in the year 2017 [3]. The risk of cardiovascular disorders, retinopathy and nephropathy increases due to the existence of diabetes mellitus [4]. Adequate control of glycemic parameters, blood pressure and lipid profile remains poor regardless of the use of new medicines and explicit care for patients with diabetes mellitus. Treatment approaches for both the diseases are complex, requiring extensive care, counseling, and self-care training in order to prevent and decrease the risk of acute as well as chronic complications [5].

Patient related barriers as well as healthcare professionals and system related barriers could lead to ineffective management of diabetes mellitus [6]. One of the major barrier hindering effective management of diabetes is patient non-adherence to lifestyle modifications and medications. The major barriers to medication adherence include complex therapeutic plans, difficulty in understanding medical prescriptions, socioeconomic aspects, lack of knowledge regarding the disease and medications, lack of motivation to change and limited health literacy [7]. Missed doses and physician appointments also contribute towards poor control of these diseases [8]. Cultural and linguistic barriers affect the health beliefs, health literacy and patient attitude, which has a major impact on self-management of diabetes [9]. Inadequate social support also serves as an important barrier for performing self-care activities and for adherence to the treatment and disease control [10].

The increasing incidence of diabetes mellitus has emphasized to develop and implement effective management programs for the disease at the primary care level. One such intervention involves the recruitment of pharmacists in chronic disease management programs, which has reported positive results in various healthcare settings across the world [11]. As community pharmacies are accessible to public, are opened all day and are located in every area, they are considered to be key site for provision of counseling and information regarding medicines [12]. Patients having diabetes frequently visits a community pharmacy than other patients. Community pharmacists consequently have the potential to play a key role in management of diabetes and its complications by starting programs for monitoring therapeutic interventions, improving medication adherence, and by providing lifestyle and nutritional counseling [13].

Literature review has revealed positive impact of pharmaceutical care provided by community pharmacists to diabetic patients, through the use of combination of complex interventions such as disease education, nutrition/exercise consultation and reinforcement, proper foot/eye care, monitoring and promoting medication adherence, identifying drug-related problems, and optimization of pharmacotherapy [7]. Simplifying dosing regimens, motivational strategies, unit dose packaging, and educational counselling over the telephone, refill reminders, self-monitoring, and dose-tailoring by community pharmacist as few of the strategies have been identified successfully for provision of optimal care to patients [14]. Community pharmacists are considered to be medicine experts so they are easily able to identify and resolve medicine adherence issues in diabetic patients. The educational component includes intensive and frequent counselling by a pharmacist, while the structural component involves packaging of medications in blister packs that contains each patient's daily medications [15]. Therefore, the present study was designed to evaluate the impact of pharmacist counseling on glucose control and medication adherence of diabetic patients attending community pharmacies in Pakistan.

Methodology

Study Design and Study Respondents

A randomized, controlled, single blinded, pre-post intervention study design was used to evaluate the impact of pharmacist counseling on glucose control and medication adherence of diabetic patients attending community pharmacies in Pakistan. The community pharmacies were randomly selected which reduced likelihood of selection and confounding biasness in the determination of outcomes. The participants and community pharmacists both were kept blinded regarding allocation of participants to control and intervention groups as to reduce information biasness. The study sites were community pharmacies situated in twin cities (Islamabad and Rawalpindi) of Pakistan. The respondents included patients diagnosed with diabetes mellitus (Type I or II) visiting community pharmacies for purchasing their regular medicine.

Sampling and Sample Size

Community pharmacies of twin cities which were selected in pre intervention phase were eight. Simple random sampling technique by lottery method was used to select community pharmacies to be included in-group A (intervention n=4) and group B (control n=4). Pharmacists working at community pharmacies included in-group A (intervention) were targeted for training while no training was given to the pharmacists working at community pharmacies included in group B (control). According to WHO, at least thirty encounters must be included in each group to assess the impact of intervention. The total number of patients were 40 in each group while estimating a drop-out rate of 25%. Convenience sampling technique was used to select patients visiting community pharmacies. Ten patients were selected at each community pharmacy after taking their consent to participate in the study.

Designing and Implementation of Intervention

The focus, targets, contents and format of intervention were designed after a series of discussions with different stakeholders. The content of the training material was developed from International Diabetes Federation Diabetes Education Module [16]. The name of the training module was recommended to be "Clinical Skills for Management of Diabetes Mellitus". The pharmacists were also provided with brochures and one pagers

related to diabetes management and counseling, glucose log sheets, glucometer and questionnaires for assessment of diabetes knowledge and medication adherence. The pharmacists were also provided patient kits, which comprised of brochures of diseases, diet charts and glucose monitoring cards.

Patients in the intervention group received special counseling sessions by the community pharmacist whereas those in the control group received the usual pharmacy services i.e. dispensing of medications and provision of information regarding to administration of medications. The patients enrolled in the control and intervention group were required to visit the community pharmacy after every fifteen days for six months during the course of study. At the enrollment, patients in intervention group received counseling about disease, its complications, medication, lifestyle modifications and self-monitoring of the disease. Each patient also received consultations based on individual needs. Patient kits were provided along with counseling. The duration of counseling was minimum 20 minutes. Blood pressure and blood glucose was checked for each patient in both control and intervention groups at each visit. Pharmacist reinforced the intervention about the lifestyle modifications, medication adherence, and self-monitoring on each visit. The principal investigator also counseled the patients in intervention group through tele monitoring during the course of the study.

Data Collection Tools

A pre-validated tool Diabetes Knowledge Questionnaire 24 was used to assess diabetes knowledge. The urdu version was utilized for this study [17]. The questionnaire comprised of twenty-four questions related to diabetes etiology, symptoms, lifestyle modifications and complications. The scoring of the DKQ-24 included the sum of all the correct items of each respondent. One point was given to each correct answer and no point for the incorrect option. The score range of the tool is 0-24, the higher score indicates better patient knowledge regarding diabetes.

Medication adherence to diabetes medicines was assessed using Brief Medication Questionnaire [18]. The tool BMQ is comprised of eleven questions divided into three screens according to the barriers faced by patient: Regimen screen that asks patients about administration of medication in the past week, a Belief screen that deals with questions related to effects of drug and side effects and a Recall screen comprised of questions related to remembrance of potential difficulties during administration of medicines. A score of 1 is given in each question if the patient reports non-adherence to the current regimen. A score of 0 is given if the patient reports adherence to medications. A score ≥1 indicates a positive screen for the particular barrier. Glucose log sheets had been designed to monitor BP and glucose after every 15 days. The mean readings were calculated after three months and six months.

Reliability of Data Collection Tools

Pilot testing was conducted on 10% of the sample for checking the reliability of all the tools. The cronbach alpha value was found to be 0.80 for Diabetes Knowledge Questionnaire 24 and 0.761 for Brief Medication Questionnaire respectively.

Data Collection Procedure

Data was collected by the community pharmacists trained by the principal investigator. The questionnaires were administered by the pharmacists to the respondents at baseline and after 6 months. Blood glucose was monitored by selected community pharmacists after every 15 days for 6 months. After data collection, data was cleaned, coded and entered in SPSS version-21. To check the distribution of data, skewness test was performed. Descriptive statistics comprising of frequency and percentages were calculated. Wilcoxon test ($p \geq 0.05$) was used to compare pre-post intervention knowledge regarding diabetes. Mann-Whitney test ($p \geq 0.05$) was used to find differences among medication adherence among control and intervention groups as well as pre and post intervention.

Results

Demographic Characteristics

Out of 40 respondents of control group, 52.5% (n=21) were males whereas 47.5% (n=19) were females. Of the total respondents in control group, 2.5% (n=1) had completed matric, 20% (n=8) had completed intermediate, 30% (n=12) were graduated, 40% (n=16) had completed post-graduation and 7.5% (n=3) were illiterate. Out of total respondents, 17.5% (n=7) had diabetes since past 1-3 years whereas 47.5% (n=19) had a history of diabetes for more than 6 years. Majority of the respondents had a history of hypertension for more than 6 years (42.5%, n=17) whereas 40% (n=16) had diabetes since past 4-6 years. Out of 40 respondents of intervention group, 67.5% (n=27) were males whereas 32.5% (n=13) were females. Of the total respondents in intervention group, 25% (n=10) had completed matric, 25% (n=10) had completed intermediate, 32.5% (n=13) were graduated, 2.5% (n=1) had completed post-graduation and 15% (n=6) were illiterate. Out of total respondents, 15% (n=6) had diabetes since past 1-3 years whereas 47.5% (n=19) had a history of diabetes for more than 6 years. Majority of the respondents had a history of hypertension for more than 6 years (62.5%, n=25) whereas 17.5% (n=7) had diabetes since past 4-6 years. A detailed description is given (Table 1).

Table 1: Demographic Characteristics

Demographic Characteristics	Control Group n (%)	Intervention Group n (%)
Age		
20-30 years	0	0
31-40 years	8 (20)	6 (15)
41-50 years	18 (45)	11 (27.5)
51-60 years	9 (22.5)	21 (52.5)
>60 years	5 (12.5)	2 (5)
Gender		
Male	21 (52.5)	27 (67.5)
Female	19 (47.5)	13 (32.5)
Level of Education		
Matric	1 (2.5)	10 (25)
Intermediate	8 (20)	10 (25)
Graduate	12 (30)	13 (32.5)
Postgraduate	16 (40)	1 (2.5)
Illiterate	3 (7.5)	6 (15)

Duration of Diabetes Mellitus		
<1 year	0	6 (15)
1-3 years	7 (17.5)	6 (15)
4-6 years	14 (35)	9 (22.5)
>6 years	19 (47.5)	19 (47.5)
Income Level		
<Rs.10,000	0	2 (5)
Rs.10,000-20,000	0	1 (2.5)
Rs.21,000-30,000	4 (10)	3 (7.5)
Rs.31,000-40,000	14 (35)	0
Rs.41,000-50,000	12 (30)	2 (5)
>Rs.50,000	10 (25)	32 (80)

Assessment of Knowledge regarding Diabetes Mellitus between Control and Intervention Group

The results of the current study showed that the correct knowledge regarding different aspects of diabetes management among control group at baseline was: cause of disease (77.5%, n=31), types of diabetes (65%, n=26), risk factors (47.5%, n=19), diagnosis of disease (67.5%, n=27), exercise (40%, n=16), medications (70%, n=28), complications such as kidney damage (77.5%, n=31), hyperglycemia (10%, n=4) and self-care such as wound management (55%, n=22). The results highlighted that the correct knowledge regarding different aspects of diabetes management among control group after six months was: cause of disease (77.5%, n=31), types of diabetes (50%, n=20), risk factors (42.5%, n=17), diagnosis of disease (52.5%, n=21), exercise (32.5%, n=13), medications (62.5%, n=25), complications such as kidney damage (77.5%, n=31), hyperglycemia (10%, n=4) and self-care such as wound management (55%, n=22).

The results of the current study showed that the correct knowledge regarding different aspects of diabetes management among intervention group at baseline was: cause of disease (45%, n=18), types of diabetes (82.5%, n=33), risk factors (67.5%, n=27), diagnosis of disease (80%, n=32), exercise (35%, n=14), medications (77.5, n=31), complications such as kidney damage (95%, n=38), hyperglycemia (12.5%, n=5) and self-care such as wound management (77.5%, n=31). The results highlighted that the correct knowledge regarding different aspects of diabetes management among intervention group after six months was: cause of disease (65%, n=26), types of diabetes (97.5%, n=39), risk factors (82.5%, n=33), diagnosis of disease (87.5%, n=35), exercise (67.5%, n=27), medications (90%, n=36), complications such as kidney damage (97.5%, n=39), hyperglycemia (72.5%, n=29) and self-care such as wound management (92.5%, n=37). A detailed description is given (Table 2).

Table 2: Assessment of Knowledge regarding Diabetes Mellitus between Control and Intervention Group

Indicator	Control Group				Intervention Group			
	Baseline		After Six Months		Baseline		After Six Months	
	Correct n (%)	Incorrect n (%)	Correct n (%)	Incorrect n (%)	Correct n (%)	Incorrect n (%)	Correct n (%)	Incorrect n (%)
Causes and Types of Diabetes Mellitus								
Eating too much sugar and sweet foods is a cause of diabetes	31 (77.5)	9 (22.5)	31 (77.5)	9 (22.5)	18 (45)	22 (55)	26 (65)	14 (35)
A common cause of diabetes is lack of insulin resistance in the body	25 (62.5)	15 (37.5)	25 (62.5)	15 (37.5)	35 (87.5)	5 (12.5)	36 (90)	4 (10)
Diabetes is caused by the kidneys difficulty in keeping the urine without sugar	17 (42.5)	23 (57.5)	17 (42.5)	23 (57.5)	8 (20)	32 (80)	24 (60)	16 (40)
The kidneys produce insulin	29 (72.5)	11 (27.5)	26 (65)	14 (35)	14 (35)	26 (65)	24 (60)	16 (40)
There are two main types of diabetes: Type l ("insulin-dependent" / "insulin treated) and Type2 (" not insulin-dependent ")	26 (65)	14 (35)	20 (50)	20 (50)	33 (82.5)	7 (17.5)	39 (97.5)	1 (2.5)
Hypoglycaemia (low blood sugar) is caused by too much food	24 (60)	16 (40)	16 (40)	24 (60)	25 (62.5)	15 (37.5)	35 (87.5)	5 (12.5)
In untreated diabetes the amount of blood sugar usually rises	25 (62.5)	15 (37.5)	18 (45)	22 (55)	40 (100)	0	40 (100)	0
Risk Factors								
If you are diabetic your children are at greater risk to be diabetic	19 (47.5)	21 (52.5)	17 (42.5)	23 (57.5)	27 (67.5)	13 (32.5)	33 (82.5)	7 (17.5)
Diagnosis								
The blood sugar level of 210, in a fasting glucose test, is very high	27 (67.5)	13 (32.5)	21 (52.5)	19 (47.5)	32 (80)	8 (20)	35 (87.5)	5 (12.5)
The best way to assess your diabetes is making urine tests.	17 (42.5)	23 (57.5)	12 (30)	28 (70)	20 (50)	20 (50)	31 (77.5)	9 (22.5)
Lifestyle Modification								
Regular exercise increases the need for insulin or other medicine for diabetes	16 (40)	24 (60)	13 (32.5)	27 (67.5)	14 (35)	26 (65)	27 (67.5)	13 (32.5)
The way you prepare your food is as important as the food you eat	21 (52.5)	19 (47.5)	21 (52.5)	19 (47.5)	30 (75)	10 (25)	36 (90)	4 (10)
A diabetic diet consists essentially of special foods	29 (72.5)	11 (27.5)	29 (72.5)	11 (27.5)	34 (85)	6 (15)	36 (90)	4 (10)

Medications								
The medication is more important than diet and exercise to control diabetes	28 (70)	12 (30)	25 (62.5)	15 (37.5)	31 (77.5)	9 (22.5)	36 (90)	4 (10)
Consequences of Diabetes								
Diabetes often causes poor circulation	28 (70)	12 (30)	25 (62.5)	15 (37.5)	31 (77.5)	9 (22.5)	39 (97.5)	1 (2.5)
Cuts and wounds heal more slowly in diabetics	27 (67.5)	13 (32.5)	26 (65)	14 (35)	36 (90)	4 (10)	38 (95)	2 (5)
Diabetes can damage the kidneys	31 (77.5)	9 (22.5)	31 (77.5)	9 (22.5)	38 (95)	2 (5)	39 (97.5)	1 (2.5)
Diabetes can lead to decreased sensitivity of the hands, fingers and feet	29 (72.5)	11 (27.5)	29 (72.5)	11 (27.5)	33 (82.5)	7 (17.5)	36 (90)	4 (10)
Tremors and sweating are signs of high sugar in the blood	4 (10)	36 (90)	4 (10)	36 (90)	5 (12.5)	35 (87.5)	29 (72.5)	11 (27.5)
Frequent urination and thirst are signs of low blood sugar	10 (25)	30 (75)	10 (25)	30 (75)	10 (25)	30 (75)	25 (62.5)	15 (37.5)
Diabetes can be healed	24 (60)	16 (40)	22 (55)	18 (45)	31 (77.5)	9 (22.5)	33 (82.5)	7 (17.5)
Self-Care								
Diabetics should take special care when cutting the nails of the toes	31 (77.5)	9 (22.5)	31 (77.5)	9 (22.5)	40 (100)	0	40 (100)	0
A person with diabetes should clean a wound with an iodine solution and alcohol	22 (55)	18 (45)	22 (55)	18 (45)	31 (77.5)	9 (22.5)	37 (92.5)	3 (7.5)
Elastic pantyhose or tight stockings are not harmful for diabetics	18 (45)	22 (55)	18 (45)	22 (55)	25 (62.5)	15 (37.5)	33 (82.5)	7 (17.5)

Comparison of Pre and Post Intervention Knowledge regarding Diabetes Mellitus after Community Pharmacist Counseling

The results of the present study showed that respondents among intervention group having age 41-50 years had comparatively higher knowledge scores regarding diabetes mellitus after six months of community pharmacist counseling (23.90, ±0.36). Males had comparatively better knowledge (23.85, ±0.36) than females (23.75, ±0.29) after six months of counseling. Respondents having intermediate education (23.90, ±0.31) had comparatively higher knowledge score after six months of counseling. Respondents having diabetes since past one year had comparatively better scores (23.88, ±0.33) after counseling by pharmacist. Respondents having hypertension since the past one year had comparatively better knowledge (23.83, ±0.40) after six months of counseling. Respondents having income less than Rs.10000 had better knowledge scores (23.83, ±0.40) after six months. No improvement was observed in knowledge scores among control group over the period of six months. A detailed description is given (Table 3).

Table 3: Comparison of Pre and Post Intervention Knowledge regarding Diabetes Mellitus after Community Pharmacist Counseling

Demographic Variables	Knowledge regarding Diabetes Mellitus (Score Range:0-24)			
	Control Group		Intervention Group	
	Baseline	After 6 Months	Baseline	After 6 Months
Age				
31-40 years	13.62 (±1.99)	12.87 (±2.53)	17.83 (±0.98)	23.50 (±2.41)
41-50 years	14.50 (±3.45)	12.66 (±3.83)	15.81 (±3.89)	23.90 (±0.36)
51-60 years	13.22 (±4.02)	12.33 (±4.47)	15.76 (±2.66)	23.85 (±0.35)
>60 years	13.80 (±1.30)	13.40 (±1.81)	14.50 (±3.53)	22.10 (±1.30)
Gender				
Male	13.90 (±2.80)	12.95 (±3.15)	15.55 (±2.88)	23.85 (±0.36)
Female	14.00 (±3.49)	12.47 (±3.87)	17.60 (±2.91)	23.76 (±0.29)
Level of Education				
Matric	18.15 (±2.56)	17.96 (±2.32)	16.10 (±2.02)	23.80 (±0.42)
Intermediate	14.50 (±3.81)	13.50 (±3.38)	16.80 (±3.26)	23.90 (±0.31)
Graduate	13.75 (±3.16)	13.33 (±3.14)	16.61 (±2.87)	20.66 (±2.05)
Postgraduate	13.50 (±2.96)	11.62 (±3.57)	15.87 (±2.70)	19.93 (±3.02)
Illiterate	14.33 (±2.30)	12.33 (±4.16)	16.00 (±2.68)	23.83 (±0.40)
Duration of Diabetes Mellitus				
<1 year	0	0	17.33 (±0.57)	23.88 (±0.33)
1-3 years	12.71 (±1.25)	11.14 (±2.19)	15.60 (±4.39)	23.80 (±0.44)
4-6 years	14.37 (±4.14)	12.93 (±4.12)	15.57 (±2.43)	21.71 (±1.43)
>6 years	14.05 (±2.46)	13.17 (±3.22)	16.08 (±2.99)	19.68 (±2.53)
Duration of Hypertension				
<1 year	0	0	17.33 (±0.57)	23.83 (±0.40)
1-3 years	12.71 (±1.25)	11.14 (±2.19)	14.42 (±1.98)	18.14 (±2.26)
4-6 years	14.37 (±4.14)	12.93 (±4.12)	15.62 (±3.75)	20.75 (±3.10)
>6 years	14.05 (±2.46)	13.17 (±3.22)	17.05 (±1.98)	20.00 (±2.06)

Income Level				
<Rs.10,000	0	0	11.50 (±0.70)	23.50 (±0.30)
Rs.21,000-30,000	14.25 (±4.19)	13.25 (±2.87)	17.50 (±3.31)	20.25 (±1.50)
Rs.31,000-40,000	14.21 (±3.40)	13.21 (±3.57)	16.35 (±3.56)	20.92 (±2.61)
Rs.41,000-50,000	13.58 (±2.53)	12.25 (±2.63)	14.91 (±2.84)	19.50 (±3.47)
>Rs.50,000	13.90 (±3.34)	12.40 (±4.67)	16.30 (±1.63)	19.10 (±1.66)

Score range: 0-24 (Higher mean score indicates better knowledge whereas lower mean score indicates poor knowledge)

Comparison of Pre and Post Intervention Knowledge regarding Diabetes Mellitus after Community Pharmacist Counseling

The results of the present study showed that the mean knowledge scores regarding diabetes mellitus among control group at baseline was (13.95,±3.11) whereas after six months was reduced to (12.72,±3.47). Mean knowledge scores regarding diabetes mellitus among intervention group at baseline was (16.02, ±2.93) which was improved after six months (19.97, ±2.66). A detailed description is given (Table 4).

Impact of Pharmacist Counselling on Knowledge of Patients Regarding Diabetes Mellitus

Significant difference was observed ($p \leq 0.05$) in pre-post intervention knowledge regarding diabetes management. Knowledge of patients was improved regarding different aspects of diabetes management after counseling by community pharmacists. A detailed description is given (Table 5).

Table 5: Impact of Pharmacist Counselling on Knowledge of Patients Regarding Diabetes Mellitus and Hypertension

Knowledge		N	Mean Rank	Sum of Ranks	Diabetes Knowledge		Hypertension Knowledge	
					z-value	p-value	z-value	p-value
Diabetes Knowledge	Negative ranks	0	0.00	0.00	-5.102	**0.001**	-5.245	**0.001**
	Positive ranks	34	17.50	595.00				
	Ties	6						
	Total	40						

Wilcoxon Test ($p \geq 0.05$)

Comparison of Impact of Community Pharmacist Counseling on Blood Glucose at Baseline, Three Months and Six Months among Control and Intervention Group

The results of the study showed that the mean fasting blood glucose at baseline among control (9.60, ±1.41) and intervention (9.92, ±2.05) groups was almost similar. The mean fasting blood glucose increased among control group after three months (9.88, ±1.51) and six months (10.14, ±1.29). The fasting blood glucose improved at three months (9.32, ±1.92) and after six months (8.95, ±1.45) in intervention group. A detailed description is given (Table 6).

Table 6: Comparison of Impact of Community Pharmacist Counseling on Blood Glucose at Baseline, Three Months and Six Months among Control and Intervention Group

Indicators	Control Group			Intervention Group		
	Baseline	3 Months	6 Months	Baseline	3 Months	6 Months
Fasting Blood Glucose (mmol/L) Mean ±SD	9.60 (±1.41)	9.88 (±1.51)	10.14 (±1.29)	9.92 (±2.05)	9.32 (±1.92)	8.95 (±1.45)

Comparison of Medication Adherence among Pre and Post Intervention Group of Diabetic Patients

Significant difference ($p \leq 0.05$) was observed in regimen screen, belief screen and recall screen of diabetes medication adherence among pre and post intervention groups of diabetic patients. No difference ($p \geq 0.05$) was observed in access screen of diabetes medication adherence among pre and post intervention groups of diabetic patients. A detailed description is given (Table 7).

Table 7: Comparison of Pre and Post Intervention Medication Adherence among Diabetic Patients

Adherence Indicators	N	Mean Ranks	Sum of Ranks	Test Statistics	p-value
Diabetes Medication Adherence					
Regimen Screen	Baseline: 40 Six months: 40	Baseline: 48.03 Six months: 32.98	Baseline: 1921.00 Six months: 1319.00	**499.000**	**0.001**
Belief Screen	Baseline: 40 Six months: 40	Baseline: 21.45 Six months: 59.55	Baseline: 858.00 Six months: 2382.00	38.000	**0.001**
Recall Screen	Baseline: 40 Six months: 40	Baseline: 20.50 Six months: 60.50	Baseline: 820.00 Six months: 2420.00	0.000	**0.001**
Access Screen	Baseline: 40 Six months: 40	Baseline: 40.50 Six months: 40.50	Baseline: 1620.00 Six months: 1620.00	800.000	0.568

Mann-Whitney Test ($p \geq 0.05$)

Comparison of Medication Adherence among Control and Intervention Groups of Diabetic Patients after Six Months

Significant difference ($p \leq 0.05$) was observed in regimen screen, belief screen and recall screen of diabetes medication adherence among control and intervention groups of diabetic patients after six months. No difference ($p \geq 0.05$) was observed in access screen of diabetes medication adherence among control and intervention groups of diabetic after six months. A detailed description is given (Table 8).

Table 8: Comparison of Medication Adherence among Control and Intervention Groups of Diabetic and Hypertensive Patients after Six Months

Adherence Indicators	N	Mean Ranks	Sum of Ranks	Test Statistics	p-value
Diabetes Medication Adherence					
Regimen Screen	Control: 40 Intervention: 40	Control: 42.53 Intervention: 30.25	Control: 1276.00 Intervention: 1209.00	**389.000**	**0.003**
Belief Screen	Control: 40 Intervention: 40	Control: 16.77 Intervention: 49.55	Control: 503.00 Intervention: 1982.00	38.000	**0.001**
Recall Screen	Control: 40 Intervention: 40	Control: 15.50 Intervention: 50.50	Control: 465.00 Intervention: 2020.00	0.000	**0.001**
Access Screen	Control: 40 Intervention: 40	Control: 34.40 Intervention: 36.33	Control: 1032.00 Intervention: 1453.00	580.000	0.627

Mann-Whitney Test ($p \geq 0.05$)

Impact of Community Pharmacist Counseling on Knowledge regarding Diabetes Mellitus and Blood Glucose

The results of the current study showed that knowledge regarding diabetes and blood glucose improved in intervention group being counseled by community pharmacists over a period of six months. No significant improvement was observed in control group over a period of six months. A detailed description is given (Table 9).

Diabetes Knowledge		Blood Glucose (mmol/L)	
Control after Six Months Mean (±SD)	Intervention after Six Months Mean (±SD)	Control after Six Months Mean (±SD)	Intervention after Six Months Mean (±SD)
12.72 (±3.47)	19.97 (±2.66)	10.14 (±1.29)	8.95 (±1.45)

Discussion

Community pharmacies are easily accessible to the public and are located in every area, so they serve as an excellent site for patient counseling and provision of pharmaceutical care [12]. Community pharmacists can play an important role in management of diabetes by assisting patients in achieving therapeutic and lifestyle goals [19]. As experts of drug therapy, community pharmacists can be excellent additions to the multidisciplinary primary health care team in terms of better drug selection and patient education [20]. He/She can play an important role in educating the patient in order to enhance the knowledge regarding disease, necessary lifestyle modifications and medicine usage [21]. The results of the present study showed that the knowledge regarding diabetes mellitus improved over a six months period in intervention group who received counseling from community pharmacist. Similar findings were reported in a study conducted in Belgium and UK where the knowledge regarding diabetes improved after counseling by community pharmacist [22, 23]. On the other hand, the findings of the present study reported no improvement in knowledge regarding diabetes among control group over time. Similar results were observed in a study conducted in UK where no improvement in knowledge among control group was observed [24].

For successful management of diabetes, it is necessary that a community pharmacist periodically monitors level of knowledge and drug related problems among patients [25]. The results of the current study showed that knowledge of young patients regarding diabetes improved significantly as compared to elderly. This might be due to the fact that elderly patients had difficulty in understanding and memorizing the information regarding disease and its management. A study conducted in Portugal reported similar results where younger adults had better knowledge scores for diabetes management after intervention as compared to older adults [26]. The results of the present study reported that males had better post-intervention diabetes knowledge scores than females. Similar findings were reported in studies conducted in Ghana and Egypt where improvement in knowledge was reported post-intervention by community pharmacist [8, 27]. On the other hand, the present study showed that better qualification helped in improvement in knowledge of disease management after counseling by community pharmacist. Similar results were reported in a study conducted in India where patients having better qualification reported improved knowledge after counseling by community pharmacist [28]. The results of the current study showed that patients having diabetes since past 4-6 years and income level between Rs.31, 000-40,000 had better post-intervention diabetes knowledge scores. Similar findings were reported in a study conducted in Cyprus where patients having better socio-economic status had better knowledge [5].

Pharmaceutical care programs initiated by community pharmacist can lead to improvement of glycemic goals [28]. Significant reduction was observed in fasting blood glucose in intervention group as compared to control group after period of three and six months. Reduction in blood glucose was observed among all demographic variables. Similar findings were reported in studies conducted in Malaysia, Turkey and Brazil where improvement in blood glucose was observed [7, 11, 29].

Community pharmacists have a major role in optimizing medication therapy and improving adherence in patients with diabetes [30]. The results of the current study showed that medication adherence improved in patients with diabetes. Majority of the patients started to take their medications on time after period of six months in intervention group. Similar results were obtained in a study conducted in Japan where medication adherence was improved after counseling by community pharmacist [31]. Moreover, the present study findings showed that patients were of the view that that the drug worked for them. Majority of the patients agreed that they remembered doses of their medications for diabetes and did not worry about the side effects of the drugs. Similar findings were reported in a study conducted in Australia where patient adherence was improved after community pharmacist intervention [15].

Conclusion

The current study provided a valuable insight regarding the benefits of inclusion of community pharmacist in diabetes health care team. The results of the current study concluded that counseling by community pharmacist has a positive impact on blood glucose management as well as medication adherence among diabetic patients. The knowledge of disease management improved after a six months intervention by community pharmacists. Better qualification and income also helped in perceiving the counseling positively and improved diabetes management. Thus, community pharmacist counseling had a positive impact on diabetes management and helped patients in achieving their desired blood glucose goals as well as medication adherence was also improved.

Recommendations

Educational programs should be initiated by community pharmacists as this can lead to improvement in glycemic control and enhance the image of pharmacist as a key health care member in management of chronic diseases. For this purpose, the extended responsibilities of community pharmacists in chronic diseases should be clearly indicated in health policy of the country. The community pharmacists should be made an integral part of the primary health care team for chronic disease management. Pharmacist led diabetes clinics should be started in the country where pharmacists can provide education regarding disease, its management and self-care activities.

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