*Hacettepe University Journal of the Faculty of Pharmacy*
*Volume 36 / Number 1 / July 2016 / pp.1-26*

# Effect of Pharmacist Counseling on Patient's Knowledge Regarding Type 2 Diabetes in Pakistan

**Madeeha Malik[*,**,°], Zarmina Qazi[*], Azhar Hussain[*], Muhammad Azeem[*], Martha Susanna Lubbe [**]**

Received : 08.12.2015
Revised : 17.03.2016
Accepted : 21.03.2016

## Abstract

Pharmacists are easily accessible to patients and health care providers and can be involved more in the management of diabetes. The main objective of the present study was to explore the perceptions and knowledge of patients with diabetes and pharmacists working as diabetes educators towards management of type 2 diabetes in twin cities of Pakistan. A descriptive cross-sectional study design was used. A questionnaire was developed through extensive literature review and focus group discussions by using the International Diabetes Federation and American Diabetes Association guidelines as a reference and was distributed to a sample of 20 pharmacists working as diabetes educators and 1200 patients with diabetes i.e. (600 counselled by the diabetes educators vs. 600 diabetes patients without any counselling). After data collection, data were analyzed through descriptive analysis and non-parametric tests using SPSS program version 16. The mean composite knowledge score regarding management of type 2 diabetes

***** Hamdard Institute of Pharmaceutical Sciences, Hamdard University, Islamabad, Pakistan
**Medicine Usage in South Africa (MUSA), School of Pharmacy, Faculty of Health Sciences, North-West University, Potchefstroom Campus, Potchefstroom
° Corresponding Author E-mail**:** madeehamalik15@gmail.com

were: diabetes educators (29.1 ± 2.62), patients counselled by diabetes educators (36.0 ± 3.70) and patients not counselled by diabetes educators (35.54 ± 3.75). No significant differences ($p \leq 0.05$) among the knowledge of diabetes patients counselled and not counselled by diabetes educators were reported. The results of the present study showed that the knowledge of diabetes educators as well as patients regarding management of type 2 diabetes was inadequate. Training of diabetes educators is neglected. There is lack of official planning, evaluation and supervision on diabetes education process in Pakistan. Close surveillance as well as regular and continuous training programs for diabetes educators can provide an opportunity to overcome many shortcomings in patient education.

**Keywords:** Counseling, Diabetes, Knowledge, Pharmacist, Pakistan.

## Özet

# Pakistanda Tip 2 Diyabet ile İlgili Hasta Bilgisi üzerinde Eczacı Danışma Etkisi

Eczacılar hasta ve sağlık çalışanları için kolayca ulaşılabilir ve daha diyabet yönetiminde yer alabilir. Bu çalışmanın temel amacı, Pakistan ikiz şehirlerinde diyabetli hastaların ve diyabet eğitimcileri olarak tip 2 diyabet yönetimine yönelik çalışan eczacıların algı ve bilgisini keşfetmektir. Bir tanımlayıcı kesitsel çalışma dizaynı kullanılmıştır. Geniş bir literatür inceleme ve odak grup tartışmaları aracılığıyla Uluslararası Diyabet Federasyonu ve Amerikan Diyabet Birliği yönergeleri referans alınarak bir anket geliştirilmiş ve diyabet eğitimcileri olarak çalışan 20 eczacı ve diyabet 1200 hastadan oluşan bir örneklemde dağıtılmıştır (diyabet eğitimcileri

tarafından danışmanlık yapılan 600 hasta, danışmanlık almayan 600 hastaya karşı). Veriler toplandıktan sonra, tanımlayıcı analiz ve SPSS-16 parametrik olmayan testler ile veriler değerlendirilmiştir. Tip 2 diyabet yönetimine ilişkin ortalama bileşik bilgi puanları: diyabet eğitimcileri (29.1 ± 2.62), diyabet eğitimcilerinden danışmanlık alan (36.0 ± 3.70) ve diyabet eğitimcilerinden danışmanlık almayan (35.54 ± 3.75). Diyabet eğitimcileri tarafından danışmanlık alan veya almayan diyabet hastalarının bilgileri arasında bir fark ($p \leq 0.05$) bildirilmemiştir. Bu çalışmanın sonuçları, tip 2 diyabet yönetimine ilişkin diyabet eğitimcilerinin yanı sıra hastaların bilgi yetersiz olduğunu gösterdi. Diyabet eğitimcilerinin eğitimi ihmal edilmiştir. Pakistan diyabet eğitim süreci ile ilgili resmi planlama, değerlendirme ve denetim eksikliği var. Yakın gözetim yanı sıra diyabet eğitimcilerine yönelik düzenli ve sürekli eğitim programları hasta eğitimindeki birçok eksikliklerin üstesinden gelmek için bir fırsat sağlayabilir.

**Anahtar Kelimeler:** Danışmanlık, Diyabet, Bilgi, Eczacı, Pakistan

## 1. Introduction

Diabetes education program is one of the most helpful programs to provide awareness to the patients with diabetes according to their needs. It provides the patient with self-training to achieve his/her glycemic goals. This results in adequate knowledge which is associated with good metabolic control and prevention of complications associated with diabetes mellitus and its therapy [1]. Diabetic education not only improves patient's understanding, knowledge and attitude toward diabetes but also improve their HBA1C [2]. Physicians are more effective in treating acute conditions than chronic conditions due to the fact that chronic conditions need

more time to manage [3]. Whereas pharmacists are easily accessible to patients and health care providers and can be involved more in the management of diabetes [3].

Pharmacists' provided patient counseling might be considered as an important element in implementing the disease management program. They can play a vital role in patient's disease identification, assessment, education, referral, and monitoring [3,4]. It was considered before that diabetes education only involves adjusting meal plans for the patients with diabetes. But studies have reported that pharmacist using different approaches including patient education, consultation, or Collaborative drug therapy management (CDTM) helped to improve glycemic control, positively modified other risk factors and increased adherence to American Diabetes Association (ADA) standards of care [1,5,6]. Another study conducted in India suggested that pharmacist provided patient counseling has a positive impact in improving the perceptions of patients regarding disease, diet, life style modification and in turn on glycemic control and overall health related quality of life in diabetes [6].

Pharmacists are capable for individual patient education which increases patient interest and also helps pharmacist in managing each and every problem of patient by involving the patient [7, 8]. A study from South Carolina was concluded that clinical pharmacist's involvement significantly lowered HBA1C value by setting specific goals for each patient and by considering his/her meal plans, exercise and drug regimens when required [9]. Failure in management of diabetes includes many factors including low literacy, patient knowledge, attitude, cultural belief and behavior toward diabetes. Most important factor affecting diabetes is underestimating the importance of diabetes education. On the other hand, pharmacist is an important member of health care team. The idea of involving pharmacist in diabetes education for improving patient compliance was initiated in September 2005 while proper training commenced in January 2006 in Pakistan. There

is no data available present date on evaluating the role of pharmacist in management of type 2 diabetes in Pakistan. This study will be unique in this aspect as it will be the first ever study evaluating the different aspects of performance of pharmacist as diabetes educator in Pakistan. Furthermore there is a lack of published data in Pakistan which has evaluated the current knowledge of patients regarding management of type 2 diabetes in Pakistan. Thus, the main objective of the present study was to explore the perceptions and knowledge of the patients with diabetes and pharmacists working as diabetes educators towards management of type 2 diabetes in twin cities of Pakistan.

## 2. Material and Methods

### Study-design

A descriptive cross-sectional study design was used to evaluate the knowledge and perceptions of patients and pharmacists regarding management of type 2 diabetes and role of diabetes educator. Approval was obtained for this study from the Ethical Committee of Hamdard University. Moreover in Pakistan, questionnaire-based studies do not need any endorsement from Ministry of Health. Despite that, prior information was sent to the Ministry of Health, Government of Pakistan for the execution of this research among diabetes educators and the respective patients counseled by them in the twin cities. Besides, approval for the data collection was also taken from Medical Superintendent (MS) of the hospitals and chief executives of pharmaceutical companies in which diabetes educators were employed.

**Study population, sample size and sampling of respondents**

This study was conducted from March to May 2015. The study population included all the twenty diabetic educators working at public and private tertiary healthcare facilities located in Islamabad and Rawalpindi. Two groups of patients attached with diabetic educators vs. without educators were developed. As per World Health Organization (WHO) criteria, 30 patients per diabetic educator were selected which makes a total of 600 patients for the group of patients attached to diabetic educator and similarly a total of 600 patients without an educator [10]. Convenient sampling technique was adopted to select the patients from these healthcare facilities.

**Study tool**

A questionnaire was developed through extensive literature review and focus group discussions by using the International Diabetes Federation and American Diabetes Association guidelines as a reference. Two focus group discussions were carried out at different time intervals with 4 different groups of experts including diabetes consultants, specialists, physicians and doctors from academia and pharmacists working as diabetes educators. Each group comprised of 3–4 participants for the development, finalization, face and content validity of the data collection tool. Pilot testing was carried out on 4 diabetes educators and 120 patients (10%) of the total sample size before commencement of the final study. A Cronbach alpha value of 0.72 confirmed the reliability and internal consistency of the questionnaire. The questionnaire was comprised of five sections. Section I included demographic data. Section II included questions regarding the knowledge of patient and diabetes educator regarding correct ranges of blood glucose levels for normal individuals, pre-diabetic patients, patients with diabetes and individuals with gestational

diabetes. Section III included questions regarding knowledge of diabetes educators and regarding important indicators including waist circumference, blood pressure, HBA1C, triglycerides, blood pressure, HDL, LDL, body mass index and ketones etc. in management of diabetes. Section IV included questions for patients and diabetes educators regarding defined goals for patient with diabetes, food group's percentages, effect of smoking and alcohol on blood glucose levels. Responses were assigned as 1 = yes/correct and 2 = no/incorrect for section II, III and IV. Knowledge scores for questions asked from the patients in section II and IV were computed. Section II consisted eight questions regarding correct ranges of blood glucose levels (score 8-16) while section IV included twelve questions regarding desired goals for patients with diabetes, diet and life style modification (score 12-24). The composite score range was 20-40 and a lower score indicated better knowledge. Section V included questions exploring perceptions of patient and diabetic educator regarding role of diabetes education and educators in Pakistan. A 5-point Likert scale where 1 = strongly disagree, 2 = disagree; 3 = neutral, 4 = agree and 5 = strongly agree was used.

**Data collection**

Two teams, one in each city, with 10 data collectors in each team, were trained by the group of experts including the principal investigator. The questionnaire was self-administered to the respondents by the data collectors. Informed and verbal consent for participation was taken from the respondents. Respondents were assured about the confidentiality of information verbally and were shown an undertaking signed by the principal investigator. The questionnaire was collected from them on the same day.

**Data analysis**

The data were computed and analyzed using SPSS program version 16 and descriptive analysis was conducted. The results of each item in the questionnaire were reported as percentages and frequencies. Mann-Whitney ($p \leq 0.05$) and Kruskal–Wallis ($p \leq 0.05$) tests were used to compare the knowledge scores of patients with diabetes by gender, qualification, duration of having diabetes, counseling received by diabetes educator vs. not received and duration of diabetes counseling received.

## 3. Results and Discussion

**Demographics**

Out of 20 diabetes educators, 60% were male while 40% were female. All of them had Pharm-D degree. Fifteen percent of the total respondents were working in public sector, 30% in private sector while 55% were working in both the sectors simultaneously. Regarding the experience of the pharmacists in the field of diabetes education, 60% had working experience of < 1 year and 40% had 1-5 years. On the other hand, out of 1200 patients with diabetes, 51.83% were male and 48.17% were female. Out of the total patients, 21.83% had diabetes since less than 1 year, 28.5% had since 1-5 years, 22.33% had since 6-10 years while 27.33% had for more than 10 years. Fifty percent of the respondents were counseled by the diabetes educators. Out of the these fifty percent of the patients, 42.83% had been counseled for the last 1 year while 7.17% had been receiving counseling for 1-5 years (Table 1).

**Table 1.** Demographics

| Indicators | | n (%) |
|---|---|---|
| **Diabetes Educators** | | |
| Gender | Male | 12 (60) |
| | Female | 8 (40) |
| Qualification | Matric | 0 |
| | Intermediate | 0 |
| | Bachelors | 0 |
| | Pharm-D | 20 (100) |
| Experience as diabetes educator | < 1 year | 12 (60) |
| | 1-5 years | 8 (40) |
| | 6-10 years | 0 |
| | > 10 years | 0 |
| Location | Public | 3 (15) |
| | Private | 6 (30) |
| | Both | 11 (55) |
| **Patients with Diabetes** | | |
| Gender | Male | 622 (51.83) |
| | Female | 578 (48.17) |
| Qualification | Primary | 178 (14.83) |
| | Middle | 136 (11.33) |
| | Metric | 146 (12.17) |
| | Intermediate | 92 (7.67) |
| | Graduation | 92 (7.67) |
| | Professional degree | 106 (8.83) |
| | Illiterate | 446 (37.1) |
| Duration of diabetes | < 1 year | 262 (21.83) |
| | 1-5 years | 342 (28.5) |
| | 6-10 years | 268 (22.33) |
| | > 10 years | 328 (27.33) |
| Counseling by diabetes educator | Yes | 600 (50) |
| | No | 600 (50) |
| Duration of counseling received | < 1 year | 514 42.83() |
| | 1-5 years | 86 (7.17) |
| | 6-10 years | 0 |
| | > 10 years | 0 |
| | No counseling received | 600 (50) |

**Knowledge of diabetes educators and patients with diabetes regarding diagnostic criteria for diabetes**

The results showed that diabetes educators did not know the correct range of fasting and random blood glucose level for normal individuals in 90% and 70% of the cases while correct range of fasting and random blood glucose level for individuals with diabetes were not known by the diabetic educators in 20% and 70% of the cases. On the other hand, the correct range of fasting and random blood glucose level for normal and individuals with diabetes were not known by the patients counseled by the diabetes educators in 91%, 82%, 84% and 76.3% of the cases while in 90%, 73.3%, 83.6% and 71% of the cases it was not known by the patients who were not counseled by the diabetes educators, respectively (Table 2).

**Table 2.** Knowledge of diabetes educators and patients with diabetes regarding diagnostic criteria for diabetes

| Indicators | Diabetes Educator | | Pt. Counseled by D.E | | Pt. not Counseled by D.E | |
|---|---|---|---|---|---|---|
| | Correct | Incorrect | Correct | Incorrect | Correct | Incorrect |
| | n (%) | n (%) | n (%) | n (%) | n (%) | n (%) |
| **Normal** | | | | | | |
| Fasting blood glucose level is 70-100 mg/dl | 2 (10) | 18 (90) | 54 (9) | 546 (91) | 60 (10) | 540 (90) |
| Random blood glucose level is < 160 mg/dl | 6 (30) | 14 (70) | 108 (18) | 492 (82) | 160 (26.67) | 440 (73.33) |
| **Pre-diabetes** | | | | | | |
| Fasting blood glucose level is 110-125 mg/dl | 19 (95) | 1 (5) | 58 (9.67) | 542 (90.33) | 66 (11) | 534 (89) |
| Random blood glucose level is 120-160 mg/dl | 9 (45) | 11 (55) | 34 (5.67) | 566 (04.33) | 30 (5) | 570 (95) |
| **Diabetes** | | | | | | |
| Fasting blood glucose level is > 126 mg/dl | 16 (80) | 4 (20) | 96 (16) | 504 (84) | 98 (16.33) | 502 (83.67) |
| Random blood glucose level is > 250 mg/dl | 6 (30) | 14 (70) | 142 (23.67) | 458 (76.33) | 174 (29) | 426 (71) |
| **Gestational Diabetes** | | | | | | |
| Fasting blood glucose level is ≥ 92 mg/dl | 12 (60) | 8 (40) | 10 (1.67) | 590 (98.33) | 2 (0.33) | 598 (99.67) |
| Random blood glucose level is ≥ 150 mg/dl | 14 (70) | 6 (30) | 10 (1.67) | 590 (98.33) | 2 (0.33) | 598 (99.67) |

* Pt. = patient, D.E = diabetic educator

**Knowledge of diabetes educators regarding management of diabetes**

The results showed that diabetes educators did not know the correct ranges of waist circumference, blood pressure, fasting BG, HDLC, TGs levels, triglycerides, LDL, HDL, micro albuminuria, body mass index and ketones for appropriate management of diabetes in 30%, 65%, 80%, 60%, 80%, 65%, 40%, 25%, 75%, 75% and 35% of the cases, respectively. A detail description is given (Table 3).

**Table 3.** Knowledge of diabetes educators regarding management of Diabetes

| **Indicators** | **Diabetes Educator** | |
|---|---|---|
| | **Correct n (%)** | **Incorrect n (%)** |
| TGs levels are ≥ 160 mg/dl Or treatment of this lipid disorder | 4 (20) | 16 (80) |
| Fasting BG is ≥ 110 mg/dl or previously diagnosed type II diabetes | 4 (20) | 16 (80) |
| Micro albuminuria should be < 10mg /24 hr. | 5 (25) | 15 (75) |
| Body mass index should be < 20 | 5 (25) | 15 (75) |
| Triglycerides should be < 120 mg/dl | 7 (35) | 13 (65) |
| Blood pressure is ≥140/100 mm Hg or previously diagnosed HTN | 7 (35) | 13 (65) |
| HDLC in men is < 40 mg/dl and in women is < 50 mg /dl or treatment of lipid disorder | 8 (40) | 12 (60) |
| LDL cholesterol should be < 100 mg/dl | 12 (60) | 8 (40) |
| Ketones should be positive | 13 (65) | 7 (35) |
| Waist circumference in men is ≥ 40 inches and in women is ≥ 35 inches | 14 (70) | 6 (30) |
| HDL cholesterol should be > 40 mg/dl | 15 (75) | 5 (25) |

**Knowledge of diabetes educators and patients regarding diet, life style modification and blood glucose monitoring**

The results showed that diabetes educators did not know the correct ranges for blood glucose level before meal, blood glucose level 2hr. after meals, blood glucose level at bedtime, carbohydrates, proteins and fats percentage in diet in 85%, 40%, 75%, 15%, 55% and 25% of the cases, respectively. The correct range of blood glucose level before meal, blood glucose level after 2hr of meals, blood glucose level at bedtime, carbohydrates, proteins and fats percentage in diet were known by patients counseled by the diabetes educators in 72.3%, 65%, 88%, 57.6%, 52 % and 35.3% of the cases while in 66.6%, 58.3%, 89.3%, 49.6%, 47% and 30% of the cases in which patients were not counseled by the diabetes educators, respectively (Table 4).

**Table 4.** Knowledge of diabetes educators and patients regarding diet, life style modification and blood glucose monitoring

| Indicators | Diabetes Educator | | Pat.* Counseled by D.E | | Pat. not Counseled by D.E | |
|---|---|---|---|---|---|---|
| | Correct | Incorrect | Correct | Incorrect | Correct | Incorrect |
| | n (%) | n (%) | n (%) | n (%) | n (%) | n (%) |
| Blood glucose before meal should be 90-100 mg/dl | 3 (15) | 17 (85) | 166 (27.67) | 434 (72.33) | 200 (33.33) | 400 (66.67) |
| Blood glucose 2 hr. after meal should be equal to 200 mg/dl | 12 (60) | 8 (40) | 210 (35) | 390 (65) | 250 (41.67) | 350 (58.33) |
| Blood glucose at bed time should be < 90 mg/dl | 13 (65) | 7 (35) | 72 (12) | 528 (88) | 64 (10.67) | 536 (89.33) |
| Blood glucose at 3-4 am should be equal to 140 mg/dl | 5 (25) | 15 (75) | 16 (2.67) | 584 (97.33) | 26 (4.33) | 574 (95.67) |
| Blood glucose before exercise should be 140 mg/dl | 4 (20) | 16 (80) | 18 (3) | 582 (97) | 16 (2.67) | 584 (97.33) |
| HbA1c should be 6.5-7% | 14 (70) | 6 (30) | 104 (17.33) | 496 (82.67) | 110 (18.33) | 490 (81.67) |
| Blood pressure should be 130/80 mmHg | 18 (90) | 2 (10) | 200 (33.33) | 400 (66.67) | 234 (39) | 366 (61) |
| Carbohydrates percentage > 50-60% increases BG level | 17 (85) | 3 (15) | 254 (42.33) | 346 (57.67) | 302 (50.33) | 298 (49.67) |
| Protein percentage > 15-20% increases BG level | 9 (45) | 11 (55) | 288 (48) | 312 (52) | 318 (53) | 282 (47) |
| Fats (lipids) percentage > 20-30% increases BG level | 15 (75) | 5 (25) | 388 (64.67) | 212 (35.33) | 420 (70) | 180 (30) |
| Smoking increases blood glucose level | 17 (85) | 3 (15) | 106 (17.67) | 494 (82.33) | 98 (16.33) | 502 (83.67) |
| Alcohol affects blood glucose level | 17 (85) | 3 (15) | 56 (9.33) | 544 (90.67) | 42 (7) | 558 (93) |

* Pt. = patient, D.E. = diabetic educator

**Mean scores of knowledge of patients and educators regarding management of type 2 diabetes**

The mean composite knowledge score regarding management of type 2 diabetes were: diabetes educators (29.1 ± 2.62), patients counseled by diabetes educators (36.0 ± 3.70) and patients not counseled by diabetes educators (35.54 ± 3.75). A detail description is given below (Table 5).

**Table 5.** Mean scores of knowledge of patients and educators regarding management of type 2 diabetes

| Knowledge Scores | Diabetes educator Mean (± S.D) | Patient counseled by diabetes educator Mean (± S.D) | Patient not counseled by diabetes educator Mean (± S.D) |
|---|---|---|---|
| Correct ranges of blood glucose levels (8-16) | 11.88 (± 1.31) | 15.15 (± 1.31) | 15.01 (± 1.32) |
| Diabetes management (12-24) | 17.29 (± 1.99) | 20.87 (± 2.74) | 20.53 (± 2.78) |
| Composite (20-40) | 29.1 (± 2.62) | 36.0 (± 3.70) | 35.54 (± 3.75) |

**Perceptions of diabetes educators and patients regarding role of diabetes education and educator in management of diabetes in Pakistan**

Almost all the diabetic educators agreed that diabetes educator plays an important role in diabetes management and pharmacist is capable for playing this role. Seventy percent of them agreed that diabetes education promote rational use of drugs while 95% of them were of view that pharmacist can help in better follow up in patients with diabetes. On the other hand, 95.6% of the patients counseled by the diabetes educators agreed that diabetes educator plays an important role in diabetes management and 94.6% were of view that pharmacist is capable for playing this role. Ninety five percent of them agreed that diabetes education promote

rational drug use patients and pharmacist can help in better follow up in patients with diabetes. While 96.3% of the patients not counseled by the diabetes educators agreed that diabetes educator plays important role in diabetes management and 92.3% were of view that pharmacist is capable for playing this role (Table 6).

**Table 6.** Perceptions of diabetes educators and patients regarding role of diabetes education and educator in management of diabetes in Pakistan

| Indicators | Diabetic Educator | | Pt. Counseled by D.E | | | Pt. not Counseled by D.E | | |
|---|---|---|---|---|---|---|---|---|
| | Strongly disagree + disagree | Neutral | Strongly agree + agree | Strongly disagree + disagree | Neutral | Strongly agree + agree | Strongly disagree + disagree | Neutral | Strongly agree + agree |
| Do you think diabetes educator plays important role in diabetes management? | 0 | 0 | 20(100) | 4 (0.67) | 22 (3.67) | 574 (95.66) | 6 (1) | 16 (2.66) | 578 (96.34) |
| Do you think pharmacist is capable for diabetes education? | 0 | 0 | 20(100) | 2 (0.33) | 30(5) | 568(94.67) | 8(1.33) | 38 (6.33) | 554 (92.34) |
| Do you think number of diabetes educator should be increased in Pakistan? | 0 | 1(5) | 19(95) | 4(0.67) | 24(4) | 572(95.33) | 4 (0.67) | 16 (2.66) | 580 (96.67) |
| Do you think diabetes education can help in improving patient care? | 0 | 0 | 20(100) | 4(0.67) | 24(4) | 572(95.33) | 4 (0.67) | 18 (3) | 578 (96.34) |
| Do you think pharmacist help in improving patient compliance in diabetic patients? | 0 | 0 | 20(100) | 4(0.67) | 22(3.67) | 574(95.66) | 4 (0.67) | 20 (3.33) | 576 (96) |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Do you think diabetes education promote rational drug use? | 3 (15) | 2 (10) | 15 (70) | 4(0.67) | 22(3.67) | 574(95.66) | 4 (0.67) | 16 (2.66) | 580 (96.67) |
| Do you think pharmacist help in better follow up in diabetic patients? | 0 | 1(5) | 19 (95) | 4(0.67) | 22(3.67) | 574(95.66) | 4 (0.67) | 16 (2.66) | 580 (96.67) |
| Do you think patient understanding increases after counseling by diabetes educator? | 0 | 0 | 20(100) | 4(0.67) | 22(3.67) | 574(95.66) | 4 (0.67) | 16 (2.66) | 580 (96.67) |

**Comparison of patients' knowledge scores regarding diabetes management by demographic characteristics**

Significant differences ($p \leq 0.05$) were found among the knowledge scores of different genders of the patients. The knowledge of male patients regarding their diabetes management was comparatively better than the females. Significant differences ($p \leq 0.05$) were also found in the knowledge scores of patients having different levels of qualification and duration of receiving diabetes counselling. Patients with professional degrees and receiving diabetes counselling for the last five years had better knowledge regarding their diabetes management. On the other hand no significant differences ($p \leq 0.05$) were found between the patients counselled by diabetes educators vs. not counselled by diabetes educators and patients having different duration for diabetes (Table 7).

**Table 7.** Comparison of patients' knowledge scores regarding diabetes management by demographic characteristics

| Variable | Diagnostic | | | | Management | | | | Composite | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **n** | **Median Score** | **Test statistics** | **P-value** | **n** | **Median Score** | **Test statistics** | **P-value** | **n** | **Median Score** | **Test statistics** | **P-value** |
| **Gender** | | | | | | | | | | | | |
| Male | 622 | 280.01 | 38567.50[a] | **0.001** | 622 | 275.71 | 37231.00[a] | **0.001** | 622 | 274.41 | 36826.00[a] | **0.001** |
| Female | 578 | 322.55 | | | 578 | 327.17 | | | 578 | 328.57 | | |
| **Qualification** | | | | | | | | | | | | |
| Illiterate | 178 | 339.51 | | | 178 | 330.79 | | | 178 | 334.20 | | |
| Primary | 136 | 247.84 | | | 136 | 265.61 | | | 136 | 252.78 | | |
| Middle | 146 | 268.32 | | | 146 | 249.21 | | | 146 | 246.25 | | |
| Matric | 92 | 244.77 | 176.97[b] | **0.001** | 92 | 172.99 | 268.49[b] | **0.001** | 92 | 181.07 | 276.62[b] | **0.001** |
| Intermediate | 96 | 167.92 | | | 96 | 126.75 | | | 96 | 124.14 | | |
| Graduate | 106 | 151.41 | | | 106 | 110.38 | | | 106 | 108.02 | | |
| Professional degree | 446 | 386.99 | | | 446 | 424.73 | | | 446 | 427.71 | | |
| **Duration of diabetes** | | | | | | | | | | | | |
| Less than 1 year | 262 | 313.56 | | | 262 | 313.23 | | | 262 | 315.45 | | |
| 1-5 years | 342 | 295.69 | 1.26[b] | 0.739 | 342 | 305.87 | 2.12[b] | 0.547 | 342 | 303.14 | 1.93[b] | 0.587 |
| 6-10 years | 268 | 295.30 | | | 268 | 284.23 | | | 268 | 286.99 | | |
| More than 10 years | 328 | 299.34 | | | 328 | 298.02 | | | 328 | 296.84 | | |
| **Counseling by D.E** | | | | | | | | | | | | |
| Counseled | 600 | 311.47 | 41710.00[a] | 0.082 | 600 | 311.16 | 41802.50[a] | 0.128 | 600 | 312.68 | 41345.50[a] | 0.083 |
| Not counseled | 600 | 289.53 | | | 600 | 289.84 | | | 600 | 288.32 | | |
| **Duration of counseling** | | | | | | | | | | | | |
| Less than 1 year | 514 | 152.52 | 5007.50[a] | 0.258 | 514 | 155.05 | 4356.50[a] | **0.02** | 514 | 154.44 | 4513.50[a] | **.05** |
| 1-5 years | 86 | 138.45 | | | 86 | 123.31 | | | 86 | 126.97 | | |

a Mann–Whitney test; b Kruskal–Wallis test

**Discussion**

Diabetes education is currently one of the most accurate ways to manage glycemic challenges as pharmacological treatment alone might not be able to produce exceptional results in management of diabetes [11]. Every individual must be counseled regarding life style modifications, diet and exercise plans to adequately manage fluctuating blood glucose levels in individuals with diabetes [11, 12]. The results of the present study showed that the knowledge of diabetes educators as well as patients were inadequate regarding correct ranges of fasting and random blood glucose levels. Diabetes educators did not know the correct ranges of various important indicators including waist circumference, blood pressure, fasting BG, HDLC, TGs levels, triglycerides, LDL, HDL, micro albuminuria, body mass index and ketones which need to be managed for a better glycemic control in individuals with diabetes. The results of the current study further revealed that the knowledge of diabetic educators regarding importance of life style modification and diet were not up to the mark. This might be due to the fact that the diabetes educators in the present study were not much experienced and might not be adequately trained. Similar results highlighting unequipped trainers (insufficient knowledge and experience) and lack of appropriate educational facilities from a study conducted in Iran were reported [13].

The results of the current study highlighted inadequate knowledge of patients regarding importance of life style modification and diet. This might be due to the lack of interest of patients/diabetes educators, unstructured education to the patients, inappropriate counseling techniques used by the diabetes educators. However, despite the effectiveness of education on diabetes management, several studies have suggested poor or improper patients' knowledge and performance in treatment regimen, complications prevention and control, diet, and gestational diabetes management [14-17]. Results from another study emphasized the need for

diabetes education at all levels, both for the patients as well as the health care providers to counter the pandemic of diabetes-related complications [8,18].

Diabetes education provides patient self-training to achieve his/her glycemic goal. Self-care training has been reported to improve patient understanding, patient knowledge and attitude towards diabetes and also improve HbA1c [2]. The results of the present study showed that almost all the diabetes educators and patients agreed that diabetes educator plays an important role in diabetes management and pharmacist is capable for playing this role. These results are in line with the results of studies highlighting that participation of pharmacist in health related issue increases pharmacist's professional responsibilities and also improves acceptance of pharmacy profession among patients [19,20]. Many studies suggested that pharmacist provided patient counseling has a positive impact in improving the perception about disease, diet and life style changes and in turn on glycemic control and overall quality of life in diabetic patients [6,21-23]. The results of the current study further highlighted that most of diabetes educators and patients agreed that diabetes education promote rational drug use and pharmacist can help in better follow up in patients with diabetes. Similarly, studies demonstrated that education and services provided by pharmacist were very effective in managing patients with type 2 diabetes [24-26]. The results of the present study reported significant differences among the knowledge scores of different genders of the patients. The knowledge of male patients regarding their diabetes management was comparatively better than the females. Similar results from a study conducted in Pakistan reported that men had significantly better knowledge score than women. The results of the current study also reported significant differences in the knowledge scores of patients having different levels of qualification and duration of receiving diabetes counselling. Patients with professional degrees and receiving diabetes counselling for 1-5 years had comparatively better knowledge regarding their diabetes management. Similar results from a study conducted in Pakistan

concluded that literacy and education had better impact on diabetes knowledge. Diabetes related educational programs should be conducted for less educated individuals [27].

Majority of the patients in Pakistan did not receive any diabetes education [19]. Remaining patients report that they received only minimum time for education from their health care practitioners due to heavy patient load in OPD [28]. The results of the present study showed no significant difference among the knowledge of patients counselled by diabetes educators vs. not counselled by diabetes educators and patients having different duration for diabetes. This might be due to the fact that there might be lack of patient's interest, inadequate training of diabetic educators, lack of official planning for patient education, evaluation and supervision of the education process. Similar results highlighting unequipped trainers (insufficient knowledge and experience) and lack of appropriate educational facilities from a study conducted in Iran were reported [13].

## 4. Conclusion

The results of the present study concluded that effective diabetes education program is a great challenge for the multi-professional health team in Pakistan. Training of diabetes educators is neglected. There is a lack of official planning, evaluation and supervision on diabetes education process in Pakistan. However, if we consider that this program has been recently introduced in Pakistan, it can be concluded that some existing problems in the patient education process are expectable. Thus, close surveillance as well as regular and continuous training programs for diabetes educators can provide an opportunity to overcome many shortcomings in patient education.

**References**

1. Afridi M. and MN Khan: Role of health education in the management of diabetes mellitus. Journal of the College of Physicians and Surgeons--Pakistan 2003, 13(10): 558-561.
2. Zareban I, Karimy M, Niknami S, Haidarnia A,Rakhshani F: The effect of self-care education program on reducing HbA1c levels in patients with type 2 diabetes. Journal of education and health promotion 2014, 3:123-128.
3. Campbell RK: Role of the pharmacist in diabetes management. American Journal of Health-System Pharmacy 2002, 59(9):18-21.
4. Fodor JG, Adamo KB: Prevention of type 2 diabetes mellitus by changes in lifestyle. The New England Journal of Medicine 2001, 345(9):696-701.
5. Armor BL, Britton ML, Dennis VC, Letassy NA: A review of pharmacist contributions to diabetes care in the United States. Journal of Pharmacy Practice 2009, 23(3):250-64.
6. Atak NT, Gurkan T, Kose K: The effect of education on knowledge, self management behaviours and self efficacy of patients with type 2 diabetes. Australian Journal of Advance Nursing 2008, 26(2):66-74.
7. Ozkan M, Ozcelikay G: The role of community pharmacists on the life style of diabetic patients. Turkish Journal of Pharmaceutical Sciences 2012, 9(2):26-31.
8. Blenkinsopp A, Hassey, A: Effectiveness and acceptability of community pharmacy-based interventions in type 2 diabetes: a critical review of intervention design, pharmacist and patient perspectives. International Journal of Pharmacy Practice 2005, 13(4):231-240.
9. Ragucci KR, Fermo JD, Wessell AM, Chumney EC. Effectiveness of pharmacist-administered diabetes mellitus education and management services: Pharmacotherapy. The Journal of Human Pharmacology and Drug Therapy 2005, 25(12):1809-1816.
10. Organization, W.H., Promoting rational use of medicines: core components. 2002.
11. Funnell MM., et al., National standards for diabetes self-management education. Diabetes Care 2009, 32(Supplement 1): 87-94.
12. Delahanty LM, Halford BN: The role of diet behaviors in achieving improved glycemic control in intensively treated patients in the Diabetes Control and Complications Trial. Diabetes Care 1993, 16(11):1453-1458.

13. Abazari, P., et al., Inadequate investment on management of diabetes education. Journal of Research in Medical Sciences: The Official Journal of Isfahan University of Medical Sciences 2012, 17(8):792-798.
14. Fallahty J, Rezaei R, Astane S, Mousavi FM: The awareness of diabetic patients with different levels of retinopathy of eye complications associated with diabetes. Arak Medical University Journal 2010, 13(3):116-122.
15. Golchin M, Ghorbani A: Knowledge and practice on insulin self injection procedure in diabetic patients at Qazvin Diabetes Unit. The Journal of Qazvin University of Medical Sciences 2008, 12 (1) :89-90.
16. Mohsen S, Reza SG, Ali K, Akbar HZ, Somaye D: Knowledge, attitude and practice about walking among woman by type 2 diabetics. Payesh Journal 201, 10:477-84.
17. Uddin I, Iftikhar R, Ahmed T: Knowledge, Attitude and practice of diabetic patients before and after education intervention. Diabetes International 2001, 11: 80-2.
18. Reeves S, Perrier L, Goldman J, Freeth D, Zwarenstein M: Interprofessional education: effects on professional practice and health care outcomes. Cochrane Database of systematic reviews 2013, 28;3:CD002213.doi: 10.1002/14651858.CD002213.pub3.
19. Wilbur K: Pharmacy student perceptions of public health service roles and responsibilities. International Journal of Pharmacy Practice 2011, 19(3):179-184.
20. Fornos JA, Andrés NF, Andrés JC, Guerra MM, Egea B: A pharmacotherapy follow-up program in patients with type-2 diabetes in community pharmacies in Spain. Pharmacy World and Science 2006, 28(2):65-72.
21. Krass I, Armour CL, Mitchell B, Brillant M, Dienaar R, Hughes J, Lau P, Peterson G, Stewart K, Taylor S, Wilkinson J: The Pharmacy Diabetes Care Program: assessment of a community pharmacy diabetes service model in Australia. Diabetic Medicine 2007, 24(6):677-683.
22. Adepu R., Rasheed A, Nagavi B: Effect of patient counseling on quality of life in type-2 diabetes mellitus patients in two selected South Indian community pharmacies: A study. Indian Journal of Pharmaceutical Sciences 2007, 69(4):519-524.
23. Wubben DP,Vivian EM: Effects of pharmacist outpatient interventions on adults with diabetes mellitus: a systematic review. Pharmacotherapy: The Journal of Human Pharmacology and Drug Therapy 2008, 28(4):421-436.
24. Sriram S,Chack LE,Ramasamy R,Ghasemi A, Ravi TK, Sabzghabaee AM:Impact of pharmaceutical care on quality of life in patients with type 2 diabetes mellitus. Journal

of research in medical sciences: The Official Journal of Isfahan University of Medical Sciences 2011, 16 (Suppl1):S412- S418.

25. Mazroui NR, Kamal MM, Ghabash NM, Yacout TA, Kole PL, McElnay JC: Influence of pharmaceutical care on health outcomes in patients with Type 2 diabetes mellitus. British Journal of Clinical Pharmacology 2009, 67(5): 547-557.
26. Lindenmeyer A, Hearnshaw H, Vermeire E, Van Royen P, Wens J, Biot Y: Interventions to improve adherence to medication in people with type 2 diabetes mellitus: a review of the literature on the role of pharmacists. Journal of Clinical Pharmacy and Therapeutics 2006, 31(5):409-419.
27. Jabbar A, Hameed A, Chawla R, Akhter J: How well do Pakistani patients and physicians adhere to standards of diabetes care. International Journal of Diabetes in Developing Countries 2007, 27(3):93-96.
28. Gul N: Knowledge, attitudes and practices of type 2 diabetic patients. Journal of Ayub Medical College 2010, 22(3):128-31.