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ORIGINAL ARTICLE / ÖZGÜN MAKALE

EVALUATION OF EDUCATIONAL NEEDS OF DIABETIC PATIENTS

DİYABETİK HASTALARIN EĞİTİM İHTİYAÇLARININ DEĞERLENDİRİLMESİ

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ABSTRACT

Objective: *Our study aimed to assess the role of pre-graduate pharmacy students' participation in a diabetic education program on improving diabetic self-care.*

Material and Method: This *study included both a cross-sectional and a longitudinal follow-up. Altinbas University fifth-year pharmacy students gathered relevant information from diabetic patients that visited community pharmacies, under the supervision of their instructor pharmacist. The participants filled out the diabetic self-care scale on their first visit before they were given the education. Patients refilled the same self-care questionnaire after three months. Statistical package for the social science (SPSS) 26 was used for all statistical analysis.*

Result and Discussion: *The study comprised 86 diabetic patients. The second questionnaire results showed significant improvement in all patients. The total diabetic self-care scale scores were improved remarkably after the training session. HbA1c and BMI values decreased significantly. An educational program can improve diabetic self-care and diabetic outcomes. Active participation of final year pharmacy students in patient care can also improve pharmacists' participation and contribution to patient care delivery.*

Keywords: *Diabetes, self-care, patient education, clinical pharmacist, quality of life*

ÖZ

Amaç: *Çalışmamız, son sınıf eczacılık öğrencilerinin diyabetik bir eğitim programına katılımlarının diyabetik öz bakımın iyileştirilmesindeki rolünü değerlendirmeyi amaçlamıştır.*

Gereç ve Yöntem: *Bu çalışma hem kesitsel hem de boylamsal bir takip içermektedir. Altınbaş Üniversitesi eczacılık beşinci sınıf öğrencileri, serbest eczaneleri ziyaret eden diyabet hastalarının gerekli bilgilerini sorumlu eczacılarının gözetiminde topladı. Katılımcılar diyabetik öz bakım ölçeğini doldurduktan sonra kendilerine eğitim verildi. Hastalar aynı öz bakım anketini üç ay sonra tekrar doldurdu. Tüm istatistiksel analizler için sosyal bilimler için istatistiksel paket (SPSS) 26 kullanıldı.*

Sonuç ve Tartışma: *Çalışmaya 86 diyabetik hasta dahil edildi. İkinci anket sonuçları tüm hastalarda anlamlı iyileşme gösterdi. Toplam diyabetik öz bakım ölçeği puanları, eğitim seansından sonra önemli ölçüde*

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iyileşti. HbA1c ve BMI değerlerinde anlamlı azalma oldu. Bir eğitim programı diyabetik öz bakımı ve diyabetik sonuçları iyileştirebilir. Eczacılık son sınıf öğrencilerinin hasta bakımına aktif katılımı, eczacıların hasta bakımı sunumuna katılımını ve katkısını da artırabilir.

Anahtar Kelimeler: *Diyabet, öz bakım, hasta eğitimi, klinik eczacı, yaşam kalitesi*

INTRODUCTION

Diabetes mellitus (DM) is a prevalent term for a bunch of metabolic disorders, most of which include incessant hyperglycemia. Diabetes results from impaired insulin secretion and/or insulin efficacy [1]. Type 1 Diabetes Mellitus (T1DM) develops from the inability of the pancreas to produce and secrete endogenous insulin. Although T1DM can be seen at all ages, it is more prevalent in people under 30 years of age. It accounts for the highest incidence of childhood chronic diseases (14.8/100,000) [2]. External factors have recently been associated with the pathogenesis of T1DM as causes and potentiators of beta cells degradation. These factors are, but not limited to, intestinal microbiota, viral infections, vaccination, cow's milk consumption, vitamin D deficiency, polyunsaturated fatty acids, glycemic index, toxins and chemicals [3-7]. Type 2 Diabetes mellitus (T2DM) was formerly referred to as either non-insulin-dependent diabetes or adult-induced diabetes. People with T2DM comprise approximately 90-95% of all diabetic patients. Individuals with T2DM have a relative insulin deficit in addition to insulin receptor resistance [8]. Gestational diabetes mellitus (GDM) presents during pregnancy. Around %1–2 of all pregnant women develop elevated glucose intolerance during pregnancy that, in most cases, returns to normal postpartum [9]. Advanced maternal age, weight, ethnic origin, T2DM family history and a preceding GDM history are known risk factors. GDM may lead to macroscopic babies, poor pregnancy outcomes, glycosuria, and polyhydramnios during pregnancy [10].

Learning to cope with the multifaceted nature of diabetes in a social environment has been defined as an evolutionary process of information or consciousness growth in diabetes self-care [11-12]. Healthy lifestyle including healthy diet, physical activity, blood sugar monitoring, medication compliance, good problem-solving skills, healthy coping skills, and risk-reduction behaviors are the seven dimensions of diabetic self-care [13-14]. The patient's strong and persistent compliance is required for effective diabetes control and failure to follow self-care directives is often the main contributor to diabetic complications. Non-compliance is caused by lack of self-discipline, absence of support from family members and/or physicians, poverty, and shortage of health facilities. According to the American Public Health Association, more than 75% of individuals with chronic diseases should take an active or critical role in self-care. Several studies have showed low compliance to self-care activities, which include medication usage, insulin injection, and urine and blood sugar tests, among diabetic patients. Diabetic patients need an effective and continuous program to help prevent complications, ensure metabolic control, maintain and monitor their quality of life. Education in diabetes is vital. Education should cover all the information, attitude, and skill necessary for the patient and family to facilitate maintenance

and monitoring [15]. Self-management education has been shown to effectively increase patient outcomes in terms of attaining and maintaining lower glycosylated hemoglobin levels [16].

Increasing diabetes awareness provides benefits for the patients and physicians. Firstly, it reduces the workload of healthcare professionals as patients readily understand their problems and take action accordingly. Diabetes education increases patients' quality of life. It can improve self-monitoring, treatment, and metabolic control. It also enables the prevention and early diagnosis of acute and chronic complications and decreases the cost of diabetes care[17]. The diabetes educator is an essential member of the multidisciplinary diabetes treatment team[18].This study aims to assess the role of pre-graduate pharmacy students' participation in a diabetic education program and improving diabetic self-care.

MATERIAL AND METHOD

Study Design

This cross-sectional and longitudinal follow-up study was carried out during the clinical pharmacy internship. Twenty-five pharmacy students in their fifth year, from Altinbaş University's School of Pharmacy, started their internships in 25 different community pharmacies in Bakirkoy, Istanbul for 10 weeks from September to December 2020. During these ten weeks, the students collected data and participated in educational activities. Data including demographic and socioeconomic profiles, clinical characteristics, diabetes treatment, and associated comorbidities, laboratory results, weight, height were collected from volunteers using a pre-prepared form. Students were able to maintain the previous demographic variables under the supervision of the pharmacists that run these pharmacies and collaborate in this project. The validated Turkish version of the diabetic self-care scale was used to assess diabetic self-care in volunteers. The diabetic self-care scale, a Likert-type scale with 35 items, developed by Lee and Fisher in 2005 was validated by Karakurt and Kasikci in 2015 [19-20]. The validated Turkish scale is a 4point Likert scale while the original is a 6 point Likert scale. The response options were changed to “Never (1)” “Sometimes (2)” “Frequently (3)”, and “Always (4)”. Participants filled out the questionnaire before they were educated by the students under the supervision of a pharmacist. The educational materials included previously prepared and verified brochures and rubrics. These brochures and rubrics were created by Altinbas University's clinical pharmacy department. It was double-checked for its content and tested for readability using the Flesch Reading Ease test. This all-inclusive education emphasized healthy lifestyle changes, self-care, personal hygiene, foot hygiene, and active participation in disease prevention and treatment. Three months after the education, the patients were asked to complete the diabetic self-care scale again, and their laboratory tests and weight were re-analyzed. The differences in response to diabetic self-scale before and after education as well as the changes in Body Mass Index (BMI) and HbA1C values were analyzed.

Patient Consent and Ethics Approval Forms

The patient permission form was taken before participation in the study, which was approved by the Altinbas University Ethics Committee (date 27.11.2019 / No 1008).

Statistical Analysis

SPSS version 26 was used to analyze the data. Unless otherwise noted, all data are provided as mean + SEM. The results with $p < 0.05$ in the 95% confidence interval were considered significant.

RESULT AND DISCUSSION

Demographic and Clinical Characteristics

The study included 86 diabetic patients who agreed to participate in the study. The demographic data of the patients are shown in Table 1.

Table 1. Demographic and clinical characteristics

Demographic values N= (86)	**N**	**%**
Age (Mean±SD/Median)	57.45 ± 12.5/58	
25%	49.75	
75%	65	
Gender		
Female	46	53.49
Male	40	46.5
Educational Status		
No formal education	5	5.8
Primary school	33	38.4
Middle school	23	26.7
High school	16	18.6
University graduate	9	10.5
Marital Status		
Married	71	82.6
Single	15	17.4
Economic Status		
Low income	7	8.1
Middle income	66	76,7
High income	10	11.6
Smoking status		
Non-smoker	66	76.7
Smoker	20	23.3
Alcohol use status		
Non-consumer	82	95.3
Consumer	4	4,7

Table 1 (*continued*). Demographic and clinical characteristics

Diabetes Mellitus type		
T1 DM	33	38,4
T2 DM	53	61,6
Presence and number of comorbidities		
No comorbidity	32	37,2
1-2 comorbidities	43	50
3+ comorbidities	11	13

Most participants (53.49 %) were female, with a mean age of 58 years. Most patients (61.6 %) had type 2 diabetes mellitus. Most participants had at least elementary school education with only 10.5% of participants having a university degree.

The Diabetes Self-Care Scale Scores, BMI and HbA1c

The total mean and SD of the pre and post-test scores were found to be 85.77 ± 21.88, 108.44 ± 7.451 respectively (*p<0.001)* (Table 2). The mean post-test scores following the training sessions in the study were found to be significantly higher than the pre-test scores for all the questions with a *p<0.001* in a majority of them.

Table 2. Analysis of the diabetes self-care scale scores before and after the training session

Diabetes self-care scale (N=86)	**Pre mean ± SD**	**Post mean ± SD**	***p*-value**
- **Diet-related questions** **1. I eat my meals at the same time every day.** **2. I always eat my snacks.** **3. I stay on my diet when I eat at restaurants.** **4. I stay on my diet when I go to parties.** **5. I stay on my diet when people around me do not know that I have diabetes.** **6. I do not overeat.**	14.98 ± 4.47	17.88 ± 2.7	*p*<0.0001*
- **Exercise-related questions** **7. I exercise regularly.** **8. I exercise even when I do not feel like exercising.** **9. I get enough exercise.**	5.01 ± 2.39	6.14 ± 2.08	*p* = 0.003*
- **Blood glucose testing-related questions** **10. I test my blood sugar.** **11. I keep a log of my blood sugar results.**	5.34 ± 1.84	5.97 ± 1.53	*p* =0.015*
- **Medication adherence-related questions** **12. I take my diabetes pills as ordered.** **13. I take my insulin shots as ordered.** **14. I adjust my insulin dosage according to my blood sugar results.**	9.05 ± 2.27	10.63 ± 1.12	*p*<0.0001*

Table 2 (*continued*). Analysis of the diabetes self-care scale scores before and after the training session

- **Hypoglycemic control-related questions** **15. I carry candy or sugar tablets when I am away from home.** **16. I take candy or sugar tablets when my blood sugar is low.**	5.08 ± 2.12	6.58 ± 1.40	p<0.0001*
- **Physician visits-related questions** **17. I see my doctor on a regular basis.** **18. I consult my doctor when my blood sugar is too high.** **19. I consult my doctor when my blood sugar is too low.**	8.43 ± 2.59	8.53 ± 1.09	p=0.743
- **Foot care and personal hygiene-related questions** **20. I regularly examine my feet.** **21. I always wear shoes outside.** **22. I always wear shoes inside during the day.** **23. I regularly wear socks.** **24. I keep my toenails trimmed.** **25. I bathe regularly.** **26. I brush my teeth every day.**	21.38 ± 5.79	27.16 ± 1.12	p<0.0001*
- **Diabetes and its complications awareness-related questions** **27. I wear diabetes identification.** **28. I talk with other people that have diabetes about how they care for themselves.** **29. I ask healthcare provider(s) about how to prevent complications.** **30. I read information on diabetes when it is given to me.** **31. I go to the library to find information on diabetes.** **32. I attend a diabetes support group.** **33. I subscribe to a diabetes magazine.** **34. I search the Internet to find information on diabetes.** **35. I use what I have learned to prevent complications.**	16.50 ± 7.21	25.45 ± 3.53	p<0.0001*
Total score	85,77 ±21,88	108,44 ±7,451	p<0.0001*

The BMI and HbA1c values at baseline and after three months were obtained from only 30 patients. At three months, there was a significant decrease in the mean BMI and HbA1c values (p<0.05) (Table 3).

Self-care is a developmental process of knowledge or awareness established by patients. They learn to cope with the complex nature of their disease in a social setting. The diabetic self-care scale has been validated in Turkey and it is appropriate for measuring all these dimensions. By actively participating in their treatment, diabetic patients can have a significant effect on the progression and development of their illness. However, especially with long-term improvements, adherence or

compliance to these activities is usually low [21]. Lack of adequate knowledge, economic challenges and inadequate access to health facilities are factors that have been shown to lead to poor self-care [22]. During this study, participants were educated on all these aspects of diabetic self-care. We found this method to be effective in improving patients' outcomes as all patients showed significant improvements in their eating habits and adhered more to their diets. Diet is one of the most challenging areas for diabetic self-care, according to Nagelkerk and his colleagues [23]. According to the findings of a study conducted in Saudi Arabia [24], more than half of diabetic patients denied altering their eating habits, which is indicative of the difficulty in adhering to dietary restrictions. Although a cluster-randomized trial concluded that patient education did not affect diabetic patients' motivation or awareness [25]. Many other studies supported our finding that patient education can improve diet behaviors in diabetic patients.

Table 3. Changes in the BMI and HbA1c values at baseline and three months

N=30	**Pre-training session**		**Post-training session**		***p*-value**
	Mean ± SD	**Median**	**Mean ± SD**	**Median**	
BMI	32 ±4.48	31.75 (28-35.87)	30.88 ± 5.55	31.25 (26.12-34)	$p<0.05$
HbA1c	10.89± 1.82	11 (9.12-12.5)	10.27±11.14	9 (7-9)	$p<0.05$

Similar improvements were detected in exercise habits, with significant changes perceived post-education patient reports. Generally, physical activity in diabetics is exceptionally low and is influenced by a variety of psychological and social factors [16]. Furthermore, Asa et al. and Cugusi et al. explored the impact of an aquatic exercise intervention on individuals with type 2 diabetes and discovered that exercise improved their quality of life significantly [25-26]. Also, Myers et al. found that exercise programs, independent of training style, improved physical health quality of life in patients with type 2 diabetes (aerobic, resistance, or combined). In the Saudi Arabia study, 50% of the patients denied modifying their exercise habits. Our students were able to provide a comprehensive education focused on prioritizing and making time for exercise, and reducing exercise-induced injury, allowing them to address any concerns or worries that may have prevented the patient from exercising altogether.

Continuous monitoring of blood glucose levels is essential to establish a better diabetic outcome. Blood glucose monitoring improved significantly in our study patients. Whitley et al. found that more frequent blood glucose tests were reported by %59 of the participants in their research after the participants were educated, with a significant difference given $p<0.05$ [27].

Our data disclose a significant increase in the patient's compliance with their medications following the education sessions. These findings are also in line with another study conducted by Erku et al., which found pharmacist interventions significantly improved medication compliance [28]. According to another comprehensive analysis of randomized clinical research, five out of six studies that examined tailored pharmacist interventions showed that patient education considerably increased medication compliance by 7% to 27%.

Our education improved our patients' knowledge of their disease and its complications and their abilities to cope with some problems, such as dealing with hypoglycemic crisis and improved their communication with their physicians. They are more aware of how to differentiate self-manageable complications and serious ones. This improvement means that they were starting to develop good problem-solving skills, healthy coping mechanisms, and risk-reduction behaviors.

During the educational sessions, foot care and personal hygiene were also emphasized. Daily foot inspection, professional treatment, hygiene, and suitable shoe gear are all helpful in reducing the incidence of foot issues. According to McCook-Martinez et al., proper foot care education helps to prevent disease-related morbidity, hospitalization, and amputation [28]. In a research that included lower limb screening and treatment regimens for at-risk patients, Lavery et al. discovered a reduction in hospitalizations and amputations [29]. In our study, we did not measure the effect of foot management objectively; however, the subjective data that we obtained through the self-care questionnaire suggests positive outcomes.

Unfortunately, objective data was confined to BMI and HbA1C results obtained from only 30 patients. Nevertheless, the changes in BMI and HbA1C were significant at three months. These changes could be because of the improvement in self-care dimensions, especially diet and exercise. After a 3-month trial with diabetic patients, KaracaSivrikaya discovered a substantial drop in the patients' HbA1c value, while Ersoy et al.also identified a significant decrease in the patients' HbA1c value after a 6-month follow-up [30-31]. After one year of education, the HbA1c value of patients with type 2 diabetes dropped, according to a research done in Germany [32]. Najafipour at el. concluded that long-term exercise programs had a significant effect on HbA1C [33]. In contrast to prior research that indicated beneficial decreases in HbA1C levels, Duke and his colleagues discovered that diabetes self-management education had no meaningful effect on HbA1c in African Americans [34]. According to another research, individual patient education did not significantly improve HbA1c in six studies comparing it to standard therapy [35].

The small sample size for the patients who provided their laboratory results was one of our main limitations; the follow-up data collection began during the first months of the pandemic, which made it more difficult to reach many of our patients; and laboratory tests were provided only by patients who

had such results on their first pharmacy visit. Another limitation of our study is that we did not obtain enough information about how long the patients had been diagnosed with diabetes, so we were unable to demonstrate the relationship between diagnosis time and self-care skill scores. Regardless, our study is still valuable not only because it demonstrates a significant improvement in diabetic self-care through education, but also because it was delivered by pre-graduate pharmacy students, who were able to prove themselves as valuable human resources for future education programs.

A comprehensive program that covers all aspects of self-care and addresses all the worries and concerns of diabetic patients can improve diabetic self-care and diabetic outcomes. Although a variety of demographic, socioeconomic, and social support characteristics have been identified as positive enhancers of diabetic patient self-care activities, the role of doctors in encouraging self-care is critical and cannot be overstated. Pre-graduate students under the supervision of a registered pharmacist are an excellent human resource, who when appropriately trained, can contribute to clinical pharmacy practices in community pharmacies and hospitals.

AUTHOR CONTRIBUTIONS

Concept: *N.A., N.O, S.Ö, S.U, R.O* .; Design: *N.A., N.O, S.Ö, S.U, R.O;* Control: *N.A., N.O, S.U, R.O;* Sources: *N.A., N.O, S.Ö, S.U, R.O.;* Materials: *N.A., N.O, S.U.;* Data Collection and/or processing: *N.A., N.O, S.Ö.;* Analysis and/or interpretation: *N.A., N.O, S.U.;* Literature review: *N.A., N.O, S.Ö, R.O.;* Manuscript writing: *N.A., N.O, S.U.;* Critical review: *N.A., N.O, S.Ö, S.U, R.O.;* Other: -

CONFLICT OF INTEREST

The authors declare that there is no real, potential, or perceived conflict of interest for this article.

ETHICS COMMITTEE APPROVAL

The patient permission form was taken before participation in the study, which was approved by the Altinbas University Ethics Committee (date 27.11.2019 / No 1008).

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