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DIABETIC KNOWLEDGE, SELF CARE ACTIVITIES AND MEDICATION ADHERENCE OF TYPE 2 DIABETIC PATIENTS IN TURKEY

MASTER THESIS

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APPROVAL

This thesis has been deemed by the jury in accordance with the relevant articles of Yeditepe University Graduate Education and Examinations Regulation and has been approved by Administrative Board of Institute with decision dated 12.04.2019..... and numbered 2019/06-01

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DECLARATION

I hereby declare that this thesis is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person nor material which has been accepted for the award of any other degree except where due acknowledgment has been made in the text.

08/04/2019

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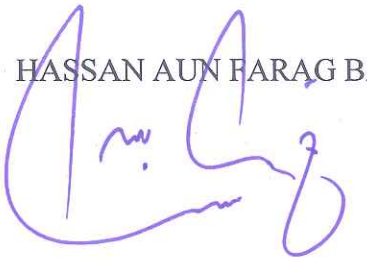

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LIST OF SYMBOLS AND ABBREVIATIONS

AACE	American Association of Clinical Endocrinologist
ACSM	American College of Sports Medicine
ADA	American Diabetes Association
AIDS	Auto Immune Deficiency Syndrome
CAD	Coronary artery diseases
CVS	Cardio vascular system
DM	Diabetes Mellitus
EASD	European Association for The Study of Diabetes
FPG	Fasting plasma glucose
GDM	Gestational diabetes mellitus
GIT	Gastro intestinal tract
HgbA1C	Hemoglobin A1C
HIV	Human Immunodeficiency Viruses
IDF	International Diabetes Federation
IFG	Impaired fasting glucose
IGT	Impaired glucose tolerance
MCD	Meds Check Diabetes
MI	Myocardial infarction
MMAS	Morisky`s Medication Adherence Scale
NIH	National Institute of Health

OGTT	Oral glucose tolerance test
OHAs	Oral hypoglycemic agents
PPG	Post prandial glucose
SBGM	Self-blood glucose monitoring
SDSAM	The Summary of Diabetes Self-Care Activities Measure
TURDEP-2	Turkish Diabetes Epidemiology Study
T2D	Type 2 Diabetes
WHO	World Health Organization

ABSTRACT

Bader, H (2019). Diabetic Knowledge, Self-Care Activities and Medication Adherence of Type 2 Diabetic Patients in Turkey. Yeditepe University, Institute of Health Science, Department of Clinical Pharmacy, MSc thesis, Istanbul.

The aim of this study is to determine the level of medication adherence and self-care activities of type 2 diabetic patients from (Istanbul) Turkey, and assess the effect of some demographic factors like educational level and age on them. 407 questionnaires had been administered as self-completion questionnaires in paper and pencil form, and had been distributed over 36 community pharmacies throughout Istanbul to interview type 2 diabetic patients who come to dispense their prescriptions in these pharmacies in the period between 01\Feb\2018 and 31\Aug\2018. After dividing the participant according to their age into three age groups (<40, 40-65 and >65 years), and according to their educational level into two educational groups (lower education and higher education) The Diabetes Self-Care Activities Measure scores has been calculated and the medication adherence level also have been calculated, and a retrospective analysis was performed to determine the relation between the self-care activities and medication adherence with patient`s age and educational level. The number of days of Self-care activities for diabetic patient was found to be increased significantly as the age decreased. And it also has been found that patients with higher educational level tend to be more adherent to self-care activities than those of lower educational level. The degree of non-adherence decreased significantly as educational level increased (P value <0.01), and increased significantly as age increased. Out of 407 participants only 33 patients were fully adherent to their medication, while the rest were classified as non-adherent to some degree.

Key Words: Self-Care Activities, Medication Adherence, Educational level, Istanbul-Turkey.

ÖZET

Bader, H (2019). Diyabetik Bilgi, Öz Bakım Etkinlikleri ve Türkiye'de Tip 2 Diyabetik Hastalarda İlaç Uyumu.Yeditepe Üniversitesi, Sağlık Bilimleri Enstitüsü, Klinik Eczacılık AD, Yüksek lisans tezi, İstanbul.

Bu çalışmanın amacı, (İstanbul) Türkiye'deki tip 2 diyabetik hastaların ilaç bağlılık ve öz bakım aktivitelerinin seviyesini ve eğitim düzeyi ve yaş gibi bazı demografik faktörlerin bunlara etkisini değerlendirmektir. 407 anket kağıt ve kalem formunda kendi kendine doldurma anketleri olarak uygulanmış ve 01 / Şubat / 2018 arasındaki dönemde bu eczanelerde reçetelerini dağıtan Tip 2 diyabetik hastalarla görüşmek üzere İstanbul genelinde 36 topluluk eczanesine dağıtılmıştır ve 31 / Ağustos / 2018. Katılımcı yaşlarına göre üç yaş grubuna (<40, 40-65 ve> 65 yaş) ve eğitim seviyelerine göre iki eğitim grubuna (düşük eğitim ve yüksek öğrenim) göre Diyabet Öz Bakım Aktiviteleri Ölçüm puanları hesaplanmış ve ilaç uyumu düzeyi de hesaplanmış ve öz bakım faaliyetleri ile ilaç uyumu ile hastanın yaşı ve eğitim düzeyi arasındaki ilişkiyi belirlemek için geriye dönük bir analiz yapılmıştır. Diyabetik hasta için öz bakım aktivitesi gün sayısının yaş azaldıkça anlamlı derecede arttığı bulundu. Ayrıca, eğitim seviyesi yüksek olan hastaların öz bakım faaliyetlerine, eğitim düzeyi düşük olanlardan daha fazla bağlı oldukları bulunmuştur. Uyumsuzluk derecesi, eğitim seviyesi arttıkça önemli ölçüde azaldı (P değeri < 0.01) ve yaş arttıkça önemli ölçüde arttı. 407 katılımcının yalnızca 33'ü hasta ilaçlarına tamamen bağlıydı, geri kalanı ise bir dereceye kadar bağlı değil olarak sınıflandırıldı.

Anahtar Kelimeler: Öz Bakım Etkinlikleri, tedaviye bağlılık, Eğitim Düzeyi, istanbul-Türkiye.

1. INTRODUCTION

Diabetes mellitus (DM) is a global health problem, and the number of people suffering from this diseases is increasing very fast every year. Between 5 to 10 % of patients with diabetes mellitus are classified as type I, and between 90 to 95 % are classified as type 2 diabetics (1).This chronic disease has a huge effect on the quality of life of the patients and also on their health status and it is considered as a crucial health issue because of its pandemic potentiality (2).Diabetes has been ravaging millions of people from all over the world. Just in 2013, this disease has killed 4.6 million patient all over the world (3), and in 2014 the disease was responsible for the death of 4.9 million (4). More than 80 % of mortality because of DM happened in low and middle income countries (5). It is expected by 2030 diabetes will be the 7^{th} leading cause of death all over the world (6). According to the International Diabetes Federation (IDF) 424.9 million people were diabetics at the end of 2017, and this number is growing very fast and it is expected that it will reach to 628.6 million by 2045. And also 50% of those diabetic patients are not aware that they are having the disease, and about 75% of them are living in low to moderate income groups (7).

According to the Turkish Diabetes Epidemiology Study – 2 (TURDEP-2), a study that included 26,499 adults aged over 20 years, the prevalence of diabetes was 16.5% which is translated into about 6.5 million adults who have the disease in Turkey. And the same study showed that diabetes increased in Turkey within 12 years (from 1998 to 2010) by 90%, impaired glucose tolerance (IGT) has risen by about 106%, and obesity which is one of the main risk factors for the disease has increased by 40% (8). Turkey has the highest age adjusted comparative prevalence and the third-highest number of people with diabetes in Europe, after Germany and the Russia (9).

Diabetic patients face huge complications because of their disease. For them to be able to prevent or slow down the development of these complications, they have to learn and maintain lifelong self-management behaviors, which includes self-care activities related to health care and daily life (10). They need to show a constant attention to their

food, physical activities, blood glucose level, and the prescribed medication to reach good glycemic control (11).

Diabetes self-management is corner stone for the proper management of diabetic patients, and diabetes education has an important role in enhancing diabetes outcomes. There are many factors contributing to optimum disease management included patient`s age, complexity of the treatment and duration of the disease (11). Although a lot of terms have been used in description of these self-management or self-care activities e.g. (adherence, compliance, and persistence), we can say that compliance is the default medical term that has been used in the literature to describe medication dosing (12). Whoever, the World Health Organization (WHO) has promoted the term (adherence) for the use in chronic disorders as adherence is the extent to which a person's behavior – taking medication, following a diet, and/or executing lifestyle changes – corresponds with agreed recommendations from the health care provider (13).

The risk factors for diabetes including elevated blood pressure, physical inactivity, poor dietary pattern, overweight, tobacco and alcohol consumption, and also poor medication adherence and poor self-care behaviors have been reported to be barriers for the effective management to diabetes complications (14, 15). Most of the risk factors of diabetes and its complications are modifiable. Self-management strategies like blood glucose self-monitoring, dietary restrictions, regular foot care and ophthalmic examination have all been shown to markedly reduce the incidence and the progression of the disease complications (3). Approximately 20 minutes each day of moderate exercise can be able to reduce about 27% risk of diabetes and also helps to lose weight (16, 17). Known modifiable risk factors can be controlled and reduced by the patients themselves through effective education and enhanced knowledge (18). Knowledge not only enhances the self-care behaviors, but it also enable the diabetic patients to effectively adhere to their medications. It has also been noticed that age, shortage of resources and adverse effects are associated to poor medication adherence (3, 14).

Diabetic knowledge is usually insufficient in Diabetic patients, and that is why most of the diabetic patients are suffering from poor self-management skills, and elderly diabetic

patients usually tend to have less education, worse cognitive function, and more barriers to practice appropriate self- care (19, 20).

Medication nonadherence is usually common among type 2 diabetic patients (21), and poor adherence compromises safety and efficacy of therapy, which increases the number of mortalities and morbidities (22, 23). One of the WHO reports said that, due to the magnitude of non-adherence and the scope of its sequelae are so alarming, more health benefits worldwide would result from improving adherence to an already existing therapies than by developing new ones (13).

Turkey, with its huge land area, growing economy, and more than 80 million inhabitants, is a country where diabetes awareness is still considered poor (24). Performing like this study will help us to determine and to assess the factors effecting the self-care activities and medication adherence of the diabetic patients. Moreover, there may be some clinical recommendations that can be given to the health care professionals according to the results of the research that may help increasing adherence and improving patients' quality of life. The aim of this study is to determine the level of medication adherence and self-care activities of type 2 diabetic patients from (Istanbul) Turkey, and assess the effect of some demographic factors like educational level and age on them.

2. GENERAL INFORMATION

2.1. Diabetes Mellitus (DM)

Diabetes mellitus (DM) can be defined as a heterogeneous metabolic disorder which is characterized by the presence of hyperglycemia due to impaired insulin secretion, imperfect insulin action or both. Chronic hyperglycemia of diabetes is associated with relatively specific long term microvascular complications affecting the eyes, kidneys and nerves, as well as an increased risk for cardiovascular disease (CVD). “Prediabetes” is a medical term that refers to an impaired fasting glucose (IFG), an impaired glucose tolerance (IGT), or a glycated hemoglobin (HbA1C) >6.0% and <6.5%, every one of them puts individuals at a really high risk to develop diabetes and its complications (25).

2.1.1. Epidemiology

The epidemic of DM and its complications represents a major global health threat. The International Diabetes Federation (IDF) estimated that 1 in every 11 adults aged between 20 years and 79 years had DM globally in 2015, which means that 415 million adults had Diabetes in 2015 (26). This is a very clear evidence to suggest that we are facing a very big problem with this disease globally. In 2000, IDF estimated that there were 151 million people suffering from diabetes worldwide and expected that by year 2030, there would be 324 million individuals around the world having the disease (27). The World Health Organization (WHO) also expected that the worldwide prevalence of diabetes in 2000 were 171 million and predicted that by 2030 the number will reach 366 million (28). They were completely wrong, because just by 2015 there were already 415 million people with diabetes, way above than what was predicted in 2000 for 30 years later. And the situation may even be worse than that.

2.1.2. Classification

Diabetes mellitus can be classified into 4 classes: Type 1 diabetes mellitus, Type 2 diabetes mellitus, Gestational diabetes mellitus (GDM), and some other specific types of diabetes mellitus.

- Type 1 diabetes: is a result of pancreatic beta cells destruction, due to autoimmune inflammatory mechanism, which leads to an absolute insulin deficiency.
- Type 2 diabetes: is due to of pancreatic beta cell dysfunction which will lead to insulin deficiency and also due to insulin resistance.
- Gestational diabetes: it is that type of diabetes which is diagnosed in pregnancy during the second or third trimester that was not clearly overt before gestation.
- Specific types of diabetes: these types of diabetes occur due to other reasons, for example: Monogenic diabetes syndrome, diseases of the exocrine pancreas and drugs or chemical-induced diabetes (like Glucocorticoids used for the treatment of Human Immune deficiency viruses (HIV)\ Auto immune deficiency syndrome (AIDS), or after organ transplantation). (29)

2.1.3. Type 2 Diabetes Mellitus

More than 90% of the cases of diabetes mellitus are of Type 2 diabetes mellitus (30), and as we mentioned before Type 2 diabetes mellitus is usually characterized by the presence of both insulin resistance and relative insulin deficiency. Insulin resistance is manifested by increased lipolysis and free fatty acid production, elevated hepatic glucose production, and decreased skeletal muscle glucose uptake. Beta cell dysfunction is progressive and by time could lead to worsening blood glucose control. Although the genetic architecture might to some extent determine an individual's response to the environmental changes (31), the main reasons for the global epidemic of Type 2 DM are the rise in obesity, a sedentary lifestyle, high energy diets and ageing (32). Solid evidence shows that many cases of Type 2 DM could be prevented by keeping a healthy body

weight, following a healthy diet, exercising every day for twenty to thirty minutes, avoiding or smoking and alcohol consumption (33, 34).

2.1.4. Diabetes Diagnostic Criteria

Table 2.1. The diagnostic criteria for diabetes (25).

Fasting blood glucose (FBG)	≥ 126 mg\dL	Fasting (no food for at least 8 hours)
Glycated hemoglobin A1c	≥ 6.5%	For adults
2-hours plasma glucose level (2hPG in 75g)	≥ 200 mg\dL	Two hours after the meal
Random blood glucose	≥ 200 mg\dL	Any time of the day regardless when was the last meal

2.1.5. Diabetes Complications

Diabetes complications are divided into two categories: Microvascular complications (long term complications that affects small blood vessels) and Macrovascular complications (due to damage to larger blood vessels). Microvascular complications typically include retinopathy, nephropathy, and neuropathy. Retinopathy is divided into two main categories: Nonproliferative retinopathy and proliferative retinopathy. Nonproliferative retinopathy is the development of microaneurysms, venous loops, retinal hemorrhages, hard exudates, and soft exudates. Proliferative retinopathy is the presence of new blood vessels, with or without vitreous hemorrhage. It is a progression of nonproliferative retinopathy. Nephropathy is defined as persistent proteinuria. It can progress to overt nephropathy, which is characterized by progressive drop in the renal function resulting in end stage renal disease. Neuropathy is a condition associated with nerve pathology. It is classified according to the nerves affected into focal, diffuse, sensory, motor, and autonomic neuropathy. Macrovascular complications are mainly diseases of the coronary arteries, peripheral arteries, and cerebrovasculature. Early macrovascular disease is associated with atherosclerotic plaque in the vasculature supplying blood to the heart, brain, limbs, and other organs. Late stages of macrovascular disease involve complete blockage of these vessels, which can increase the risks of myocardial infarction (MI), stroke, claudication, and gangrene. Cardiovascular disease (CVD) is the main cause of morbidity and mortality in the diabetic patients (35).

In Type 2 diabetic patients, 40% of patients who are taking insulin and 24% of patients using oral hypoglycemic agents (OHAs) will develop retinopathy at 5 years. After 15 to 19 years, the percentages may raise to reach up to 84% and 53%, respectively. Proliferative retinopathy occurs in 2% of patients with type 2 DM for longer than 5 years and in 25% of patients having diabetes for 25 years or more (36). The prevalence of nephropathy in diabetes has not been determined. Approximately 30% of patients with type 1 DM and 5% to 10% of those with type 2 DM become uremic (37). Diabetic nephropathy is considered as a main cause of end stage renal disease. The prevalence of neuropathy is 7% at 1 year, growing to reach 50% at 25 years for both type 1 and type 2 DM (38).

Macrovascular complications diabetic patients cause an estimated increase of coronary artery disease (CAD), peripheral arterial disease, and cerebrovascular disease up to two to four times (39). The prevalence of CAD or stroke in diabetic patients is about 34% in both males and females. The prevalence of peripheral vascular disease in diabetic patients of 30 years of age or over is 26% (40).

2.1.6. Diabetic Goal Plasma Blood Glucose Range

Table 2.2. American Association of Clinical Endocrinologists (AACE) recommended Glycemic Targets for Non-pregnant Adults (41, 42)

Parameter	**Treatment goal**
A1C	Individualize on the basis of age, comorbidities, and duration of disease • ≤6.5 for most • Closer to normal for healthy • Less stringent for "less healthy"
Fasting plasma glucose (FPG)	<110 mg/dL
2-hour postprandial glucose (PPG)	<140 mg/dL

Table 2.3. American Diabetes Association (ADA) recommended Glycemic Targets for Non-pregnant Adults (43).

Parameter	**Treatment goal**

A1C	• <6.5% for patients who meet the following criteria:
	  ○ Short duration of diabetes
	  ○ Long life expectancy
	  ○ No concurrent illness
	  ○ Goal can be attained without significant hypoglycemia or other side effects of treatment
	• <7.0%, a reasonable goal for many patients
	• <8.0% for patients who meet the following criteria:
	  ○ History of severe hypoglycemia
	  ○ Limited life expectancy
	  ○ Advanced microvascular or macrovascular complications
	  ○ Extensive comorbid conditions
	  ○ Long-standing T2D in which A1C goal has been hard to obtain despite intensive efforts

Fasting plasma glucose (FPG)	80-130 mg/dL
2-hour postprandial glucose (PPG)	<180 mg/dL

2.1.7. Non-Pharmacological Treatment Of Type 2 Diabetes

DM is a chronic disease for which self-management is of the highest importance.(44) This point is highlighted in the 1998 Clinical Practice Guidelines for the Management of Diabetes in Canada, where the first step for the management of Type 2 diabetes is non-pharmacological therapy which consists of lifestyle modifications like nutrition or diet therapy, exercise, smoking cessation and diabetic education.(45) If the glycemic goals are not obtained after 2 to 4 months from starting the non-pharmacological therapy, then we can think to start the pharmacological therapy. For Type 2 diabetic patients, including old patients, only attention to diet and weight management, in the same time with some exercise, could help to enhance glycemic control (46).

2.1.7.1. Diet

Dietary has as huge role in both of the prevention and management of type 2 diabetes and it also helps in the reduction of the risk of the disease complications, by contributing to better glycemic control. Studies have shown that reducing hyperglycemia decreases the onset and progression of microvascular complications (47). An individualized dietary system, regular physical activity and weight loss, have been known as main components of diabetes management (48). Recommendations for management and prevention of diabetes from both the European Association for the Study of Diabetes (EASD) and the American Diabetes Association (ADA) emphasized on the importance of individualized care to control the disease, prevent or postponed the complications, and enhance the outcomes (49, 47). An individualized dietary therapy program, prepared by a registered dietitian, is recommended for diabetic patients as an effective part of the whole treatment. Based on ADA's position, there is no "one-size-fits-all "eating pattern for diabetic patients (48). Carbohydrate consumption has a direct effect on postprandial glucose levels in diabetic patients and is the primary macronutrient of concern in glycemic management (50). Consumption of non-nutritive sweeteners has the ability to decrease the total calorie and carbohydrate intake if substituted for caloric sweeteners without

compensation by intake of additional calories from other food sources (48). Moreover, EFSA's Panel on Dietetic Products Nutrition and Allergies concluded in 2011, "Consumption of foods with low calorie sweeteners in place of sugar induces a lower blood glucose level in comparison to the consumption of sugar containing foods" (51).

2.1.7.2. Exercise

Exercise can be considered as one of the cornerstones for diabetes management, although it has a favorable effect on enhancing glycemic control, reduction of CVD risks and reducing mortality (52, 53), more special exercise can lead to a greater benefits (52). Aerobic exercise has been shown to provide similar reduction on HbA1c percentage as either metformin or sulphonylurea (a reduction of 0.73% with exercise and 0.9% with single medication). Diabetic patients should exercise at least 5 days per week, most days of the week if possible and do not stay without physical activity for more than 2 consecutive days (54). For type 2 diabetic patients, supervised exercise programs have shown a great effect in enhancing glycemic control, reducing the need for OHAs and insulin, and producing modest but sustained weight loss (55, 56). Both of aerobic and resistance exercise sessions are useful for diabetic patients, and it is much better to perform both of aerobic and resistance exercises. The duration of exercise should not be less than 2.5 hours per week of moderate intensity aerobic exercises and/or at least 1.5 hours per week of vigorous aerobic and at least two sessions per week of resistance exercise. Overweight and obese patients should increase physical activity gradually up to 1–1.5 hours per day for long term weight loss. Any increase in daily energy expenditure is good e.g. gardening, walking upstairs, washing the car, or cleaning the floor (54).

2.2. Role Of The Pharmacist In Pharmaceutical Care Of Diabetic Patients

Pharmacists represent the third biggest health profession worldwide right after physicians and nurses. (57) Community pharmacists can be considered to be as the most

reachable health care professionals, as appointments are not required to meet them, and to have the highest level of patient contact. So pharmacists are in the right place to play an important role in the care of patients with diabetes.

2.2.1. Patient Education

It is important to explain for patients that pharmacists in the pharmacies have an essential role in providing education regarding their disease. The pharmacist's role is to make sure that patients have enough understanding, knowledge, and skill to follow their prescribed medication regimens and monitoring plans. Pharmacists should also find ways to motivate patients to know more about their medications and to be active associates in their care. Patients also have a role that is represented in adhering to their medications, drug monitoring, and finally report their experiences to pharmacists or other health care providers. (58, 59) Optimally, the patient's role should include seeking information and presenting doubts that may decrease the level of their adherence. According to the policies of the health system and its protocols, pharmacists may also have disease management roles and responsibilities for specified categories of patients. This may help to develop pharmacists' relationships with their patients and the content of education sessions. Steps in the patient education are varied according to the policies and the procedures of the health system, environment, and practice setting. (60)

There are many steps that should be followed by the pharmacists for those patients who are receiving new medications or returning to refill their prescriptions (58, 61):-

1. Build caring relationships with patients as appropriate to the practice setting and stage in the patient's health care management. You should introduce yourself as a pharmacist, explain the purpose and expected duration of the sessions, and get the patient's acceptance to participate. Determine the patient's primary spoken language.

2. Evaluate the knowledge of the patient about his or her disease and therapy, physical and mental ability to use his or her medications properly, and their attitude toward their health problems and medications. Try to ask open ended questions, and ask the patient

to explain for you how he or she will use the medication. Patients coming for refill medications should be asked about how they have been using their medications. They should also be asked to describe any problems, doubts, or uncertainties they are experiencing with their medications.

3. Try to provide information orally and use visual aids to help patients in understanding better. Show the patients the colors, sizes, shapes, and markings on oral tablets. For oral liquids and injectable medications, show patients the dosage marks on measuring devices. In addition to face-to-face oral communication, try to provide written notes to help the patient to remember the information. If a patient is facing issues with his or her medications, collect information and assess the issue. Then adjust the pharmacotherapeutic regimens according to protocols or inform the prescribers.

2.2.2. Drug Counseling

Pharmacists have a huge role in diabetic patients counseling regarding the drugs. Counseling must be for both of oral hypoglycemic agents (OHAs) and insulin. (62)

2.2.2.1. Oral Hypoglycemic Agents (OHAs)

When patient first diagnosed with Type 2 diabetes, it is usually that OHAs are prescribed for them. Few of the most commonly prescribed OHAs and the important counseling points are discussed below.

Diabetic patient must be warned not to skip meals at any time and to follow regular diet patterns to avoid hypoglycemia. OHAs on general are considered as safe drugs. However some patients may develop some complications like loss of appetite, nausea and vomiting, abdominal pain, cramps, malaise, diarrhea or weight loss. The counseling points for OHAs are listed in the **Table 2.4.** (62)

Table 2.4. Counseling points for oral hypoglycemic agents:

Medication	Time of administration	Dose	Possible adverse effects	Notes
Glyburide (sulfonylurea)	With food or 15to30 minutes before meal	Taken in 1 or 2 doses	Hypoglycemia and obesity	Interaction with oral anticoagulants
Glimiperide (sulfonylurea)	Taken with food	Taken in a one dose	Hypoglycemia	Interaction with oral anticoagulants
Gliclazide (sulfonylurea)	Taken with food	Taken in 1 or 2 doses	Hypoglycemia	Interaction with oral anticoagulants
Glipizide (sulfonylurea)	Taken with food	Taken in 1 or 2 doses	Hypoglycemia	Interaction with oral anticoagulants
Metformin (biguanides)	Taken during or straight after a meal to reduce GI side effects	Taken in 1 to 3 doses	GIT disturbance	must stop before surgery and radiological scans which involves contrast media
Acarbose (α-Glucosidase inhibitors)	Swallow water before meal or chew with mouthful of food	Taken 1 to 3 doses	Gastro intestinal (GIT) disturbance	Sucrose should not be used if patient shows hypoglycemia

Repaglinide (biguanides)	Taken with food	Taken 3 times a day	Hypoglycemia	_
Pioglitazone (thiazolidinediones)	Taken with food	Taken in a one dose	Hypoglycemia	_
Dipeptidyl-peptidase-4 (DPP-4) inhibitors (Januvia)	With or without food, at the same time each day	100 mg once daily	Pharyngitis, headache	_
Glucagon-like peptide-1 (GLP-1) agonist (Bydureon)	2 mg subcutaneously once every 7 days (weekly).	The dose can be taken at any time of day, with or without meals	Nausea, diarrhea, headache, itching at the site of injection	_
Sodium glucose cotransporter 2 (SGLT2) inhibitors (Invokana)	once daily in the morning	taken before the first meal of the day	increased urination, thirst, constipation	_

2.2.2.2. Insulin

All type 1 diabetic patients require insulin. Some of the type 2 diabetic patients who initially respond to dietary modification and/ or OHAs eventually they will require insulin therapy. There are many insulin preparations available now days. These preparations may vary in source, onset of action, time to peak effect, and duration of action. Some of the counseling points for diabetic patients using insulin are in **Table 2.5.** (62)

Table 2.5. Counseling points for insulin:

Steps	Counseling points
Drawing of insulin from the vial	Hold the vial upside down and draw more insulin than the prescribed amount. Hold the vial upright to the eye level and then Inject the extra insulin, together with any air bubbles, back into the vial and then pull out the syringe.
Site of self-injection	Thigh (outer and front side), and the abdomen are the best sites for self-injection.
Injection techniques	Sterile the site that you are going to inject. Squeeze the skin at the injection site and inject the needle at an angle of 45 degree into the subcutaneous tissue. Slowly inject the insulin. Then press your finger against the injection site while pulling out the needle.
Disposal of the needles	Disposable syringes must be directly discarded. Glass and metal syringes have to be carefully cleaned before each use.

Time of administration	Generally, insulin preparations should be taken 30 minutes before meal. However, patients should be asked to use insulin as physician prescribed.
Storage of insulin	Insulin should be stored at a temperature of 2-8 degrees containers.
Adverse drug reactions	Advice the patient to check for any allergic reactions (especially with bovine\porcine insulin) and also to be aware of hypoglycemia.
Specialized devices in administrating insulin	Insulin pen has many advantages (easy to carry, less pain and accurate dose administration). Suitable applicants for insulin pen should be isolated and advised by the pharmacist.

2.2.3. Patient Follow-Up

Recent studies has shown that routine follow-up of patients suffering from chronic diseases like diabetes is not happening enough in community pharmacies. An evaluation of the Ontario-based MedsCheck Diabetes (MCD) medication review program established that while about 50% of diabetic patients received an initial diabetes drug therapy review during the first 3.5 years of the program, only 3.3% had received a follow-up in that same time period billed by pharmacists . (63)

Patients with chronic diseases could benefit from regular follow-up by their health care providers, and this includes pharmacists. Monitoring and follow-up helps in regular evaluation of effectiveness, safety and adherence to medication and sustained assurance

that the prescribed medications are helping patients to obtain their therapy outcomes. It also helps in the identification of new drug therapy problems. The regular communication between pharmacists and patients that takes place during routine monitoring and follow-up, helps to improve the relationship between them. (64)

Follow-up evaluation could be beneficial for diabetic patients anytime there is a change in their medication therapy or a change in their condition. For example, if a pharmacist recommends an increase in the metformin dose of one of his patients because his\her A1C level is not at target, then follow-up allows the pharmacist to assess whether therapy targets are met, the development of new adverse effects or whether there are issues related to medication adherence. All of these information can help to determine whether more changes in therapy are needed or not. If the pharmacist fail to follow up with the patient, that could lead to a delay in reaching treatment targets and also may lead to low medication adherence because of the lack of management of adverse effects as well as the lost chance to provide more education about the medication and disease.

Follow-up has to be proactive, intentional, timely and documented. Waiting for the patient to come into the pharmacy for a prescription refill or for him\her to call is not enough. (65)

2.3. Diabetes Self-Care Activities

In diabetes mellitus, self-care is defined as (an evolutionary process of development of knowledge or awareness by learning to survive with the complex nature of the diabetes in a social context) (66, 67). Because most of the day-to-day care in diabetes is being controlled by patients themselves and/ or their families (68), there is a significant need for reliable and valid measures for self-care management of DM (69, 70). There are seven important self-care behaviors in diabetic patients which predict good outcomes. These behaviors are: healthy diet, physical activities, monitoring of blood sugar, medication adherence, good problem-solving skills, healthy coping skills and risk-reduction behaviors (71). These measures can be beneficial for both clinicians and

educators treating diabetic patients and also for researchers who are evaluating new methods to self-care.

So far, self-report is the most practical and economical method to self-care evaluation and yet sometimes it is considered undependable. Diabetes self-care activities are behaviors undertaken by individuals who are already having or those who are at risk of diabetes in order to be able control the disease by themselves (71). These self-care behaviors have been found to be positively related with improved glycemic control, reduce the incidence of both macrovascular and microvascular complications and finally quality of life improvement (72, 73). Furthermore, it has been noticed that self-care includes not just performing these activities but it also includes the interrelationships between these activities (74). Diabetes self-care needs the patient to perform a lot of dietary and lifestyle modifications in addition to the supportive role of healthcare team for conserving a higher level of self-confidence which will lead to a successful behavior change (75).

Diabetes education is essential but it has to be transformed into action or self-care activities to allow the patient to get the full benefit. Self-care activities are referring to behaviors like following a healthy dietary program, avoiding the consumption of fatty food, being more physically active, self-glucose monitoring, and regular foot care (76). Decreasing of the A1C level of the diabetic patient could be the main goal of diabetes self-management but at the same time it cannot be the only thing regarding the care of a diabetic patient. The changes in self-care activities must also be evaluated for progress toward behavioral change (77). Self-monitoring of blood glucose is one of the most important things of diabetes care which can guarantee patient participation in attaining and upholding specific glucose level. The main advantage in glucose monitoring is the evaluation of overall glycemic control and starting proper steps in a timely manner to attain the best control. Self-monitoring allow us to get information about the present glycemic situation, allowing for therapy assessment and guiding adjustments in diet, exercise and medication in order to reach the optimum glycemic control. Regardless of losing weight, participating in a regular physical activity has been found to be correlated to enhanced health results among diabetic patients (78, 79). Both of the National Institutes of Health (NIH) (80) and the American College of Sports Medicine (ACSM) (81)

recommend that all adults, including those who are with diabetes, must participate in regular physical activity.

2.4. Self-Blood Glucose Monitoring (SBGM)

We know that when diabetic patients suffer from constant hyperglycemia this can lead to microvascular and macrovascular complications (82). At the same time, hypoglycemia also could be a life-threatening problem (83, 84). While hyperglycemia is considered as the characteristic feature of diabetes mellitus (82), diabetic patients may also be susceptible to hypoglycemia because of the nature of their disease and therapy (85). Keeping the glucose levels within the target range is considered as the main goal of diabetes mellitus management (86).

Monitoring of the blood glucose levels is considered as an essential element of overall diabetes management (87). It makes both of the clinician and the patient able to assess the efficacy of the medication on glycemic control. According to the American Diabetes Association (ADA) reports, self-management of diabetes, including self-monitoring of blood glucose (SMBG) by patients and health care providers, is an important part of diabetes therapy (88, 89). However, glycemic control is well assessed by applying both of SMBG and glycated hemoglobin (HbA1c) test (87). Where the HbA1c test refers to the average blood glucose level through the last 3 months, while the SMBG displays the instant level of blood glucose, which is very important for creating a therapy adjustment. Both of these two tests are important for attaining the desired blood glucose level. The process of self-monitoring blood glucose using a glucose meter is most effective as a co-therapy along with the pharmacological therapy against diabetes (90). The results of SMBG helps diabetic patients to make suitable regulation to their diet, diabetic therapy and physical activity. Furthermore, it also assists the physicians to provide the diabetic patients with the best treatment advice, especially if there is asymptomatic hyperglycemia or hypoglycemia (91). However, the overall value and effect of SMBG is affected by the knowledge and skills of the diabetic patients about the SMBG. These factors depends mainly on the regional level of education and health care system.

2.5. Medication Adherence In Diabetic Patients

The main reason for the remarkably high rates of morbidity and mortality in diabetic patients is chronic poor metabolic control, especially poor glycemic control.(92) Although a wide range of medications are now available for treating the disease, including some new pharmacological classes of drugs that are included in the current American Diabetes Association (ADA), European Association for the Study of Diabetes (EASD) and the American Association of Clinical Endocrinologists (AACE) recommendations,(93, 94) about 50% of type 2 diabetic patients fail to achieve the target blood glucose level (glycated hemoglobin (HbA1c) < 7%).(95, 96) According to data from the National Health and Nutrition Examination Survey, targets blood glucose levels were achieved only by 55.5% of participants during the period 2009–2010. (97)

There are many reasons which can lead to this poor glycemic control, among these reasons is the lack of integrated care in a lot of health care systems, clinical inertia among the health care providers, and poor medication adherence. Among them, it is evident that poor medication adherence looms large. (98) Although hyperglycemia sometimes it comes with some outward symptoms, tight control of blood glucose level is required to avoid lots of the short term and long term complications of the disease. A blood glucose control goal needs active patient participation in order to master a complex group of self-management skills. These skills include modifying dietary options, applying exercise regimes, blood glucose monitoring, and finally medication adherence. (99, 100) Medication adherence can be defined as the extent to which patients take medications as prescribed.(101) And according to the World Health Organization (WHO), it is defined as (the extent to which a person's behavior—taking medication, following a diet, and/or executing lifestyle changes, corresponds with agreed recommendations from a healthcare provider.) (102) Rates of adherence have been noticed to be higher among patients with acute conditions than those with chronic diseases like diabetes,(103) which needs more complicated and long-term medical regimens. (104, 105) A lot of patients, particularly those who are suffering from chronic diseases, are facing hard time in following their therapy recommendations. Adherence to long-term therapy for patients with chronic diseases averages only 50%

(106). As a result of poor medication adherence, patients do not obtain the maximum benefit from their medication therapy. Suboptimal treatment could lead to an increase in the utilization of health care services (hospitalizations), decrease in the quality of life of the patient, and increased health care costs (medication costs) (106, 107). World health organization (WHO) reports stated that, because the magnitude of non-adherence and the scope of its sequelae are so alarming, more health benefits for the population would result from improving adherence to the already existing treatments than by developing new medications (103).

Measuring methods for medication adherence are classified into direct and indirect methods (108). Because there is no single measure can be considered the gold standard for all types of adherence research,(109) a combination of methods has been recommended when possible.(110) Direct methods can provide us with the proof that the patient toke his medication, and that includes the measurement of the level of the medication or its metabolite in the blood stream or in urine.(108) however, this method is considered very expensive, burdensome to the healthcare provider, and susceptible to be destroyed by the patient.(111) On the other hand, Indirect methods are more commonly used and these include patient questionnaires or patient self-reports, pill counts, rates of prescription refills, assessment of the clinical response of the patient, electronic medication monitors, and patient diaries.(111) And among them the most commonly used indirect methods include patient self-report, pill counts, and pharmacy refills.(111)

2.5.1. Factors Influencing Medication Adherence

Medication regimen which are prescribed for patients suffering from chronic diseases like diabetes requires long term drugs administration as well as regular following up. We know that poor medication adherence can lead to therapy failure which in turn can lead to an increase in patient hospitalization, poor therapeutic outcomes and increased health care costs. (112) According to the World Health Organization (WHO), non-adherence to medical regimens can be a huge clinical issue in the matter of the management

of patients with chronic diseases.(113) Rates of non-adherence with any medication regimen could vary from 15% to 93%, with an estimated average rate of 50%. (114)

According to reports world health organization (WHO), factors influencing medication adherence which are identified from the studies can be classified into five main categories (patient related factors, therapy related factors, health care system factors, social-economic factors and finally disease factors). (115)

2.5.1.1. Patient Related Factors

The patient ultimately is the one who is in charge of whether, how safely and how properly he takes his medicines. One of the common reasons why patients do not take their medication is that they forget to do so (116). Another reason is that the patient is unable to understand the instructions for taking the prescribed medication. In fact, one of the studies stated that more than 60 percent of patients being followed could not be able to correctly tell what their doctor has told them about their medication use just 10 to 80 minutes after getting the information (117).

Patients with chronic diseases which needs long term therapies such as diabetes, sometimes take some conscious decisions like refusing to fill the prescription or not to take their medication as it is prescribed or even discontinue taking the medication. These decisions are due to some factors which include: (118)

- Denial of the disease and the fact that they need to take medication.
- Assuming that as the symptoms gone or the patient “feels better,” he\ she can stop taking their therapy.
- Limited appreciation about the value of medicines when properly used.
- Being afraid of the adverse effects or about becoming addicted.
- Being afraid of the needle.
- They do not feel that they are able to follow their medication regimen.
- Lack of motivations.

Moreover, the educational level and health literacy also has an effect on the adherence level. Low health literacy and reading limitations could significantly affect the

understanding and reading ability of the patient. Reports stated that about 45% of the adult population have literacy skills at or below the 8th grade reading level, which makes it very hard for these patients to read health information, understand basic medical instructions and adhere to medication regimens (119). In another study included patients above 60 years of age, who were treated at two public hospitals, nearly 81% of the patients could not be able to read or to understand the basic things, like prescription labels (119). All of these factors are associated with poor medication adherence.

2.5.1.2. Therapy-Related Factors

Route of administration, complexity of the therapy, duration of therapy and side effects, all of these are therapy-related factors that could affect patient's adherence to medication. (120) studies had found out that patients who are on oral medications are more adherent than those who are on other routs of administration because oral therapies are more convenient and more easy to use. (121, 122) And regarding complexity of therapy, Studies showed that patients who are on once a day medication regimens are more adherent than those patients who take their medication two or three times every day. (123)

Patients with acute diseases are found to be more adherent to their medication than those who are suffering from chronic diseases because of the therapy duration in chronic diseases is much longer. (124, 125) However, other studies regarding chronic diseases showed that because of the long duration of the disease, that could lead to higher adherence (126, 127), and recently diagnosed patients had lower adherence (128). This could be explained as adherence is improved because patient's state of denying to the disease has decreased and the acceptance of long term therapy after years of suffering from the disease. (129), many studies stated that side effects are threats for patient adherence. According to a study has been done in Germany, the second most common reason for non-adherence with antihypertensive therapy was side effects. (130)

2.5.1.3. Health Care System Factors

The main factors affecting patient medication adherence regarding healthcare systems include availability and accessibility. Lack of accessibility to healthcare (131), long time waiting for clinic visits (132, 133, 134, 135, 136), difficulty in getting prescriptions filled (137, 138), and unsatisfied clinic visits (139, 140, 135) all can lead to poor adherence. Also, doctor-patient relationship is one of the most important health care system related factor that positively influence medication adherence. Lack of proper communication regarding the beneficial effect of taking medication, use directions and medication adverse effects could lead to nonadherence, especially in elderly patients who have memory issues. (141)

2.5.1.4. Social-Economic Factors

Better adherence observed among patients who have social support from family and friends who can help them with therapy regimens. (141) Studies indicated that patients who had received support and assistance from their families, friends or doctors were more likely to be adherent to the medications (142, 143). The social support is very important, where it helps the patients to reduce negative attitudes to treatment, having motivation and remembering to take the treatment as well. (120)

On the other hand, Lack of family or social support, limited access to health care centers, inability or difficulty in accessing pharmacy, lack of financial resources, cost of medication, cultural beliefs about diseases or treatment, all have been related to reduced compliance and adherence rates. (141)

2.5.1.5. Disease-Related Factors

Adherence to medication decreases significantly over time especially in patients suffering from chronic diseases (hypertension, hyperlipidemia and diabetes) which requires long term drugs administration. This decrease in medication adherence is mainly because

lack of the symptoms. It is important that the patient understands the disease and must know what will happen if he stopped taking his\her medication. (141)

3. PATIENTS AND METHODS

3.1. Study Population and Data Collection

Both of Summary of Diabetes Self-Care Activities Measure (SDSCA) and 4 items Morisky`s Medication Adherence (MMAS-4) questionnaires had been administered as self-completion questionnaires in paper and pencil form, and had been distributed over 36 community pharmacies throughout Istanbul to interview type 2 diabetic patients who come to dispense their prescriptions in these pharmacies in the period between 01\Feb\2018 and 31\Aug\2018. A total of 421 questionnaire were collected. Then the collected questionnaires were reviewed according to the following Inclusion\Exclusion criteria:

Inclusion Criteria:

(1) Patients who are diagnosed with Type 2 diabetes
(2) Patients age > 18 and < 90 years old
(3) Patients with no physical disability
(4) Patients who fully answer the questionnaires
(5) Patients with no emergency disease

Exclusion Criteria:

(1) Patients who are diagnosed with Type 1 diabetes
(2) Patients age <18 and >90 years old
(3) Patients with physical disability
(4) Patients who did not fully answer the questionnaires
(5) Patients with emergency disease

After reviewing the questionnaires according to the previous Inclusion\Exclusion criteria, out of the 421 questionnaires, 14 questionnaires were not fully answered and 407 questionnaire were included in this study. All of the 36 pharmacies from where the data

was collected were generally community pharmacies, so we can consider the data to be of community dwelling people.

Data from the questionnaire was extracted and classified according to patient's age, gender, educational level and the degree of adherence. And then a retrospective analysis was performed according to the previous covariates, in order to indicate the self-care activities level and the degree of medication adherence of the patients, and assess the factors affecting them.

3.2. Questionnaire 1: Summary of Diabetes Self-Care Activities Measure (SDSCA)

The SDSCA is a questionnaire that has been developed by Toobert and his colleagues in the US to help in determining and assessing the levels of self-care in diabetic adults. This questionnaire consist of 11 items which helps calculate the regularity of doing self-care activities by diabetic patients during the last 7 days, and that includes Diet, physical activity, blood sugar monitoring, foot care and smoking. The diabetic patient is asked to mark a scale from 0 to 7 according to tell the number of days where he performed these activities. And then the score is calculated as discussed in the scoring instructions for the SDSCA (144).

3.3. Scoring Instructions For The Summary Of Self-Care Activities Measure (SDSCA)

Scores are calculated for each of the five regimen areas assessed by the SDSCA: Diet, Exercise, Blood-Glucose Testing, Foot-Care, and Smoking Status.

The first step is for items 1–10, we use the number of days per week on a scale of 0–7.

The second step is Scoring Scales:

- General Diet = Mean number of days for items number 1 and 2.
- Specific Diet = Mean number of days for items number 3, and 4, but with reversing item number 4 (0=7, 1=6, 2=5, 3=4, 4=3, 5=2, 6=1, 7=0).
- Exercise = Mean number of days for items number 5 and 6.

- Blood-Glucose Testing = Mean number of days for items number 7 and 8.
- Foot-Care = Mean number of days for items number 9 and 10.
- Smoking Status = Item number 11 (0 = nonsmoker, 1 = smoker), and number of cigarettes smoked per day.

And scoring for Additional Items for the expanded version of (SDSCA) Recommended regimen, for Items 1A - 4A, and items 12A - 14A, there is no scoring required.
Diet = Use total number of days for item 5A.
Medications = Use item 6A - OR - 7A and 8A, use total number of days for item 6A, use mean number of days if both 7A and 8A are applicable.
Foot-Care = Mean number of days for items 9A - 11A, after reversing 10A and including items 9 and 10 from the brief version. (145)

3.4. Questionnaire 2: The 4-Items Morisky Medication Adherence Scale (4-MMAS)

The 4-MMAS is a general self-reported, medication-taking behavior scale in which the specific health problem like diabetes is inserted for the "health concern". The 4-MMAS consists of four items with a scoring scheme of "Yes" = 1 and "No" = 0. The items are summed to give a range of scores from 0 to 4, where 0 refers to fully adherent patients and as the value increase the degree of Non-Adherence also increase. (Patients with score > or = 1 are classified as non-adherent patients)

3.5. Summary of Diabetes Self-Care Activities Measure Questionnaire and 4-Items Morisky`s Medication Adherence Questionnaire (English version)

Name: ----------
Age: ----------
Gender:

- Male

- Female

How many years having the disease: ----------

Educational level:

- Primary school
- Secondary school
- High school
- University
- Illiterate

Morisky`s Medication adherence Questionnaire:

Do you ever forget to take your medicine?

- No
- Yes

Are you careless about taking your medicine?

- No
- Yes

When you feel better do you sometimes stop taking your medicine?

- No
- Yes

Sometimes if you feel worse when you take the medicine, do you stop taking it?

- No
- Yes

Summary of Diabetes Self-care Activities Questionnaire:

Diet

How many of the last SEVEN DAYS have you followed a healthful eating plan?

0 1 2 3 4 5 6 7

On average, over the past month, how many DAYS PER WEEK have you followed your eating plan?

0 1 2 3 4 5 6 7

On how many of the last SEVEN DAYS did you eat five or more servings of fruits and vegetables?

0 1 2 3 4 5 6 7

On how many of the last SEVEN DAYS did you eat high fat foods such as red meat or full-fat dairy products?

0 1 2 3 4 5 6 7

Exercise

On how many of the last SEVEN DAYS did you participate in at least 30 minutes of physical activity? (Total minutes of continuous activity, including walking).

0 1 2 3 4 5 6 7

On how many of the last SEVEN DAYS did you participate in a specific exercise session (such as swimming, walking, biking) other than what you do around the house or as part of your work?

0 1 2 3 4 5 6 7

Blood Sugar Testing

On how many of the last SEVEN DAYS did you test your blood sugar?

0 1 2 3 4 5 6 7

On how many of the last SEVEN DAYS did you test your blood sugar the number of times recommended by your health care provider?

0 1 2 3 4 5 6 7

Foot Care

On how many of the last SEVEN DAYS did you check your feet?

0 1 2 3 4 5 6 7

On how many of the last SEVEN DAYS did you inspect the inside of your shoes?

0 1 2 3 4 5 6 7

Smoking

Have you smoked a cigarette—even one puff—during the past SEVEN DAYS?

0. No

1. Yes. If yes, how many cigarettes did you smoke on an average day?

Self-Care Recommendations

1A. which of the following has your health care team (doctor, nurse, dietitian, or diabetes educator) advised you to do? Please check all that apply:

- a. Follow a low-fat eating plan
- b. Follow a complex carbohydrate diet
- c. Reduce the number of calories you eat to lose weight
- d. Eat lots of food high in dietary fiber
- e. Eat lots (at least 5 servings per day) of fruits and vegetables
- f. Eat very few sweets (for example: desserts, non-diet sodas, candy bars)
- g. Other (specify):----------
- h. I have not been given any advice about my diet by my health care team.

2A. which of the following has your health care team (doctor, nurse, dietitian or diabetes educator) advised you to do? Please check all that apply:

- a. Get low level exercise (such as walking) on a daily basis.
- b. Exercise continuously for a least 20 minutes at least 3 times a week.
- c. Fit exercise into your daily routine (for example, take stairs instead of elevators, park a block away and walk, etc.)
- d. Engage in a specific amount, type, duration and level of exercise.
- e. Other (specify):----------
- f. I have not been given any advice about exercise by my health care team.

3A. which of the following has your health care team (doctor, nurse, dietitian, or diabetes educator) advised you to do? Please check all that apply:

- o a. Test your blood sugar using a drop of blood from your finger and a color chart.
- o b. Test your blood sugar using a machine to read the results.
- o c. Test your urine for sugar.
- o d. Other (specify):----------
- o e. I have not been given any advice either about testing my blood or urine sugar level by my health care team.

4A. which of the following medications for your diabetes has your doctor prescribed? Please check all that apply.

- o a. An insulin shot 1 or 2 times a day.
- o b. An insulin shot 3 or more times a day.
- o c. Diabetes pills to control my blood sugar level.
- o d. Other (specify):----------
- o e. I have not been prescribed either insulin or pills for my diabetes.

Diet

5A. on how many of the last SEVEN DAYS did you space carbohydrates evenly through the day?

0 1 2 3 4 5 6 7

Medications

6A. on how many of the last SEVEN DAYS, did you take your recommended diabetes medication?

0 1 2 3 4 5 6 7

OR

7A. on how many of the last SEVEN DAYS did you take your recommended insulin injections?

0 1 2 3 4 5 6 7

8A. on how many of the last SEVEN DAYS did you take your recommended number of diabetes pills?

0 1 2 3 4 5 6 7

Foot Care

9A. On how many of the last SEVEN DAYS did you wash your feet?

0 1 2 3 4 5 6 7

10A. on how many of the last SEVEN DAYS did you soak your feet?

0 1 2 3 4 5 6 7

11A. on how many of the last SEVEN DAYS did you dry between your toes after washing?

0 1 2 3 4 5 6 7

Smoking

12A. at your last doctor's visit, did anyone ask about your smoking status?

0. No

1. Yes

13A. if you smoke, at your last doctor's visit, did anyone counsel you about stopping smoking or offer to refer you to a stop-smoking program?

0. No

1. Yes

2. Do not smoke.

14A. when did you last smoke a cigarette?

- More than two years ago, or never smoked
- One to two years ago
- Four to twelve months ago
- One to three months ago
- Within the last month
- Today

3.6. Summary of Diabetes Self-Care Activities Measure Questionnaire and 4-Items Morisky`s Medication Adherence Questionnaire (Turkish version)

Hastanın adı: _____

Yaş: _____

Cinsiyet: Erkek – Kadın

Kaç yıldır şeker hastasısınız: _____

Eğitim düzeyi:
- İlk Okul
- Orta Okul
- Lise
- Üniversite
- Hiç biri

Morisky'nin soruları

1. Hiç ilacınızı almayı unuttuğunuz oluyor mu?
   Evet \ Hayır

2. İlacınızı alma zamanına karşı dikkatsiz misiniz?
   Evet \ Hayır

3. Bazen ilacınızı almayı durdurduğunuzda kendinizi daha iyi hisseder misiniz?
   Evet \ Hayır

4. Bazen ilacınızı aldığınızda eğer kendinizi daha kötü hissederseniz onu almayı durdurur musunuz?
   Evet \ Hayır

EK 2. DİYABET ÖZ-BAKIM AKTİVİTELERİ ÖZETİ (DÖAÖ)

Diyet
Son 7 gün içerisinde kaç gün sağlıklı bir beslenme planını takip ettiniz?
0 1 2 3 4 5 6 7
Geçtiğimiz ay içerisinde haftada ortalama kaç gün sağlıklı bir beslenme planını takip ettiniz?

0 1 2 3 4 5 6 7
Geçtiğimiz son 7 gün içerisinde kaç gün 5 ya da daha fazla porsiyon meyve ve sebze yediniz?
0 1 2 3 4 5 6 7
Geçtiğimiz son 7 gün içerisinde kaç gün kırmızı et ya da tam yağlı süt ürünleri gibi yağ oranı yüksek yiyecekler yediniz?
0 1 2 3 4 5 6 7

Egzersiz
Geçtiğimiz son 7 gün içerisinde kaç gün, en az 30 dakikalık bir fiziksel aktiviteye katıldınız (yürümeyi de içeren, sürekli yapılan toplam aktivite süresi)?
0 1 2 3 4 5 6 7

Geçtiğimiz son 7 gün içerisinde kaç gün, evde ya da işinizin bir parçası olarak yaptıklarınızın dışında, özel bir egzersiz programına (yüzme, yürüme, bisiklete binme gibi) katıldınız?
0 1 2 3 4 5 6 7

Kan Şekerini Ölçme
Geçtiğimiz son 7 gün içerisinde kaç gün kan şekerinizi ölçtünüz?
0 1 2 3 4 5 6 7
Geçtiğimiz son 7 gün içerisinde kaç gün kan şekerinizi sağlık personelinin önerdiği zamanlarda ölçtünüz?
0 1 2 3 4 5 6 7

Ayak Bakımı
Geçtiğimiz son 7 gün içerisinde kaç gün ayaklarınızı kontrol ettiniz?
0 1 2 3 4 5 6 7
Geçtiğimiz son 7 gün içerisinde kaç gün ayakkabılarınızın içini kontrol ettiniz?
0 1 2 3 4 5 6 7

Sigara İçme
Geçtiğimiz son 7 gün içerisinde sigara (tek bir nefes bile) içtiniz mi?

- ☐ 0.Hayır
- ☐ 1. Evet, cevabınız EVET ise, günde ortalama kaç tane sigara içtiniz? Sigara sayısı…….

Öz-Bakım Önerileri
1A. Sağlık personeli (doktor, hemşire, diyetisyen ya da diyabet eğitimcisi gibi) aşağıdakilerden hangisini yapmanızı önerdi?
Lütfen size uygun olanların hepsini işaretleyiniz.

☐ a. Az yağlı bir beslenme planını takip ediniz.
☐ b. Basit karbonhidrat (şeker, reçel, bal gibi) içeren yiyecekler yerine kompleks karbonhidrat içeren yiyecekler (kepekli bisküvi, kepekli ekmek, bulgur pilavı gibi) tercih ediniz.
☐ c.Kilo vermek için aldığınız kalori miktarını azaltınız.
☐ d. Liften/posadan zengin yiyecekleri bol miktarda tüketiniz.
☐ e. Bol miktarda meyve ve sebze (günde en az 5 porsiyon) tüketiniz.
☐ f. Şekerli besinlerden (örneğin; tatlı, diyet olmayan soda, çikolata) çok az tüketiniz.
☐ g. Diğer
(Belirtiniz)……
☐ h. Sağlık personeli tarafından diyetim ile ilgili herhangi bir öneri almadım.

2A. Sağlık personeli (doktor, hemşire, diyetisyen ya da diyabet eğitimcisi) aşağıdakilerden hangisini yapmanızı önerdi?
Lütfen size uygun olanların hepsini işaretleyiniz.

☐ a. Günlük olarak hafif düzeyde egzersiz (yürüme gibi) yapınız.
☐ b. Haftada en az 3 kez ve en az 20 dakikalık sürekli/düzenli egzersiz yapınız.
☐ c.Egzersizi günlük rutinlerinize (örneğin; asansör yerine merdivenleri kullanmak, arabayı uzak bir yere ya da bir blok öteye park ederek yürümek gibi) uyumlandırınız.
☐ d.Belli tipte, miktarda, sürede ve düzeyde bir egzersiz yapınız.
☐ e. Diğer:
(Belirtiniz)……
☐ f. Sağlık personeli tarafından egzersiz ile ilgili herhangi bir öneri almadım.

3A. Sağlık personeli (doktor, hemşire, diyetisyen ya da diyabet eğitimcisi) aşağıdakilerden hangisini yapmanızı önerdi?
Lütfen size uygun olanların hepsini işaretleyiniz.

☐ a. Parmağınızdan aldığınız bir damla kan ve renkli bir stick/çubuk kullanarak kan şekerinizi ölçünüz.
☐ b. Sonuçları okumak için kan şekerinizi bir cihaz kullanarak ölçünüz.
☐ c. İdrarınızı şeker yönünden test ediniz.
☐ d.Diğer:
(Belirtiniz)……
☐ e. Sağlık personeli tarafından kan şekeri ve idrarda şeker ölçümü ile ilgili herhangi bir öneri almadım.

4A. Doktorunuz diyabetiniz için aşağıdaki ilaçlardan hangisini reçete etti?
Lütfen size uygun olanların hepsini işaretleyiniz.

☐ a. Günde 1 ya da 2 kez insülin enjeksiyonu
☐ b. Günde 3 ya da daha fazla sıklıkta insülin enjeksiyonu

☐ c. Kan şekeri düzeyimi kontrol etmek için diyabet hapları

☐ d. Diğer:
(Belirtiniz)……

☐ e. Diyabetim için insülin ya da hap reçete edilmedi.

Diyet

5A. Geçtiğimiz son 7 gün içerisinde kaç gün diyetinizde karbonhidratlara eşit oranda yer verdiniz?

0 1 2 3 4 5 6 7

İlaçlar

6A. Geçtiğimiz son 7 gün içerisinde kaç gün size önerilen diyabet ilaçlarınızı aldınız?

0 1 2 3 4 5 6 7

YA DA

7A. Geçtiğimiz son 7 gün içerisinde kaç gün size önerilen insülin enjeksiyonunu uyguladınız?

0 1 2 3 4 5 6 7

8A. Geçtiğimiz son 7 gün içerisinde kaç gün size önerilen sayıda diyabet haplarınızı aldınız?

0 1 2 3 4 5 6 7

Ayak Bakımı

9A. Geçtiğimiz son 7 gün içerisinde kaç gün ayaklarınızı yıkadınız?

0 1 2 3 4 5 6 7

10A Geçtiğimiz son 7 gün içerisinde kaç gün ayaklarınızı suya soktunuz?

0 1 2 3 4 5 6 7

11A. Geçtiğimiz son 7 gün içerisinde kaç gün ayaklarınızı yıkadıktan sonra parmaklarınızın aralarını kuruladınız?

0 1 2 3 4 5 6 7

Sigara İçme

12A. Doktorunuza gittiğiniz son kontrolde, herhangi biri size sigara içme durumunuzu sordu mu?

☐ 0.Hayır

☐ 1.Evet

13A. Sigara içiyorsanız, doktorunuza gittiğiniz son kontrolde herhangi biri sigarayı bırakmanız konusunda danışmanlık yaptı mı ya da bir sigara bırakma programına yönlendirmeyi önerdi mi?

- ☐ 0.Hayır
- ☐ 1.Evet
- ☐ 2.Sigara içmiyorum

14A. En son ne zaman sigara içtiniz?

- ☐ 2 yıldan daha önce ya da hiç içmedim
- ☐ 1-2 yıl önce
- ☐ 4-12 ay önce
- ☐ 1-3 ay önce
- ☐ Geçen ay
- ☐ Bugün

3.7. Covariates

Patients were divided according to their ages into 3 groups (less than 40, 40-65 and older than 65), and according to the educational level into 2 educational level groups, one group classified as lower educational level group which included (illiterate, primary and secondary school), and the second educational group included (high school and university) and has been classified as higher educational level. Also, patients were divided according to medication Adherence into (Adherent and non-Adherent groups), and the non-Adherent group were further divided according to their degree of Adherence.

3.8. Statistical Analysis

Statistical analyses was performed using SPSS software (Statistical Package for Science Service) version 25 Descriptive analyses were presented using means and standard deviations for continues data and frequencies and percentages for categorical data. The variables investigated using Kolmogorov Smirnov test to determine whether or not they are normally distributed. Since the variables were not normally distributed, Mann-Whitney U test was used to compare educational groups. Kruskall-Wallis test was used to

compare age groups. For the post-hoc test Mann-Whitney U test was performed and Bonferroni correction was applied to the results. The Chi-Square test, was used to compare the proportions of the groups. A 5% type-I error level was used to infer a statistical significance.

4. RESULTS

4.1 Demographics and Characteristic Patients` Information Regarding Age groups

In this thesis, 407 questionnaires answered by type 2 diabetic patients were reviewed. Out of the 407 questionnaires, 269 of the patients were male patients (66.1%) while 138 of them were female patients (33.9%). The mean age for all patients was 58.14 years with range (87-22=65 years). The patients were divided according to their ages into 3 groups as follows: only 45 patients (11.1%) were less than 40 years old, 226 of the patients (55.5%) were between 40 and 65 and 136 of the patients (33.4%) were older than 65 years of age.

Table 4.1- Gender and Age characteristics of patients

Gender	**Frequency**	**Percentage**
Male	269	66.1 %
Female	138	33.9 %
Total	407	100 %

Age groups	**n**	**Mean**	**Std. deviation**	**Median**	**Minimum**	**Maximum**
<40	45	31.36	4.227	31	22	39
40-65	226	54.37	7.457	56	40	65
>65	136	73.30	5.407	72	66	87
Total	407	58.15	14.384	60	22	87

4.2 The relationship between Age groups and General-Diet

In all of the 407 questionnaires, the total mean of days where patents followed a general diet plan was 4.134 days. and according to age groups, for <40 years old group the mean number of days patients had followed a general diet was 4.664 while for 40-65 age group the mean number of days was 3.970 and for those older than 65 the mean was found to be 4.232. The decrease in the number of days where patients had followed a general diet was found to be statistically significant (P value= 0.011) in the Kruskall-Wallis test.

Table 4.2 – The relationship between Age groups and General-Diet

Age groups	N	Mean	Std. Deviation	Median	Minimum	Maximum
<40	45	4.664	1.1154	4.500	2,5	7
40-65	226	3.970	1.5431	4.000	0	7
>65	136	4.232	1.3715	4.000	0	7
Total	407	4.134	1.4592	4.000	0	7

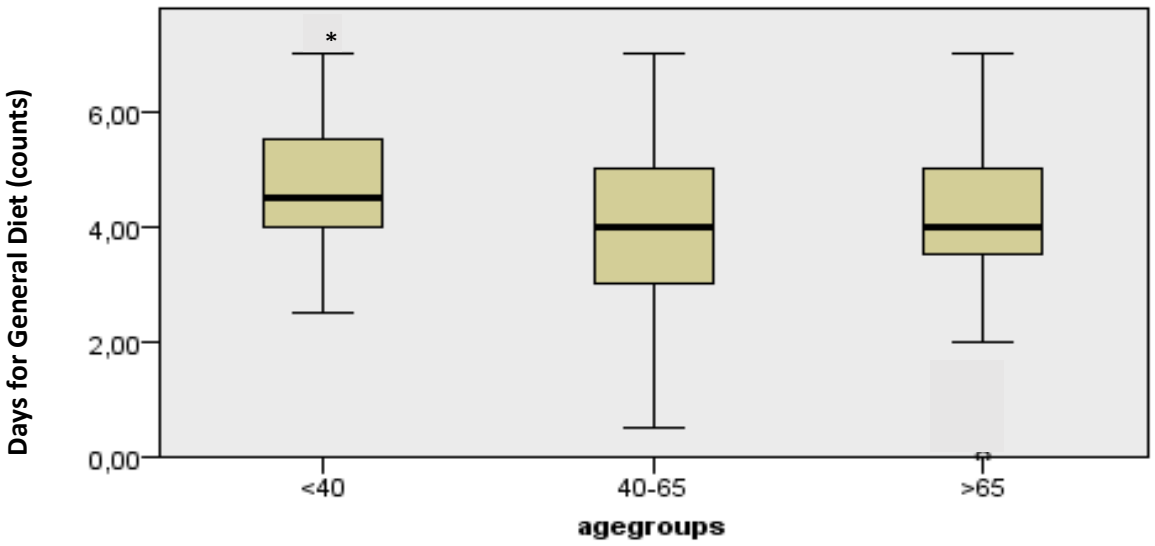


Figure 4.1 – The effect of age on the number of days where diabetic patients followed a general diet plan. The effect of age on the number of days diabetic patients followed a general diet decreased significantly as age increases. The significant relationship was between the patients who were <40 and 40-65 with a P value= 0.009.

*The significance between <40 and 40-65 years.

4.3 – The relationship between Age groups and Specific-Diet

Statistical analysis was performed between age groups and the number of days where patients followed a specific diet plan to determine wither there is a relationship between them or not in the Kruskall-Wallis test. The total mean of days where patients followed a specific diet was 3.428 days. And the mean of days for <40, 40-65 and >65 age groups was found to be 3.344, 3.398 and 3.504 respectively. There was a slight increase in the number of days specific diet been followed as the age increase, but yet, the relation was found to be statistically insignificant with a P value = 0.595

Table 4.3- The relationship between Age groups and Specific-Diet

Age groups	**N**	**Mean**	**Std. Deviation**	**Median**	**Minimum**	**Maximum**
<40	45	3.344	0.8516	3.500	1.5	5.5
40-65	226	3.398	1.0639	3.500	0	6
>65	136	3.504	0.9139	3.500	0	6.5
Total	407	3.428	0.9933	3.500	0	6.5

4.4 – The relationship between Age groups and Exercise

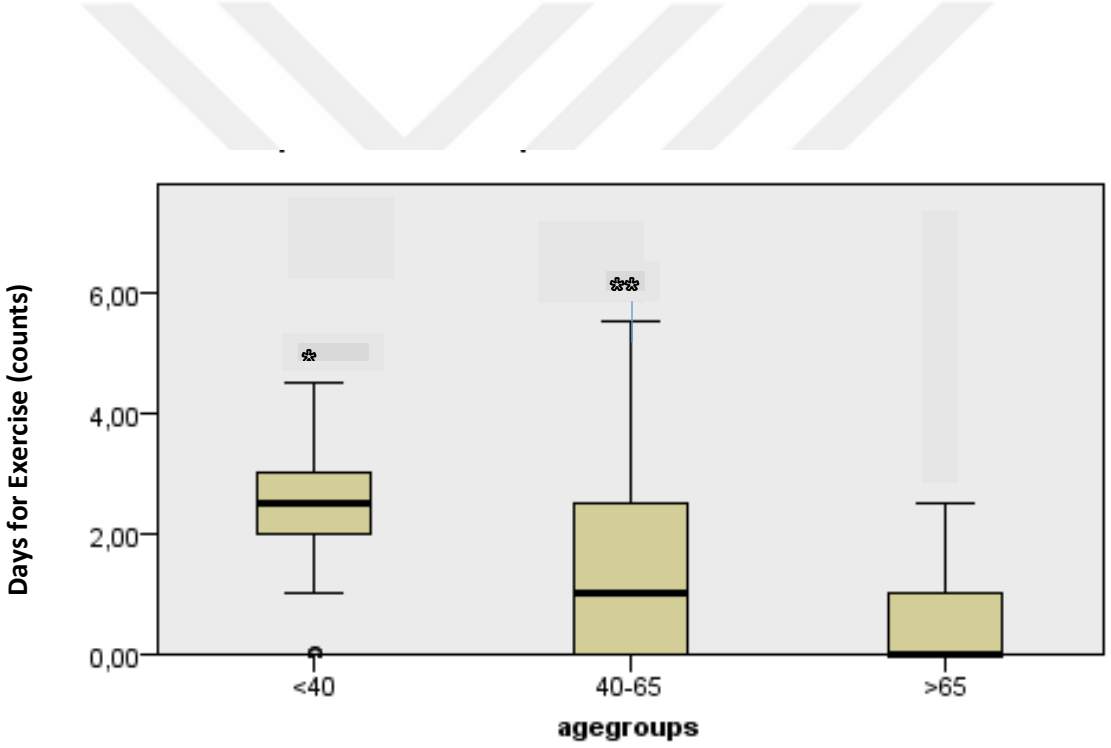
When we compared the relation between age groups and the number of days where patients had exercise, the total mean of days was 1.38 days. And there was a decrease in the mean of exercise days as the age increase. For <40 years of age patients, the mean of exercise days was 2.59 days, and for those 40-65 and >65, the mean of days was 1.50 and 0.78 days respectively. The relationship was found to be statistically significant (P value <0.01) in the Kruskall-Wallis test.

Table 4.4 – The relationship between Age groups and Exercise

Age groups	**N**	**Mean**	**Std. Deviation**	**Median**	**Minimum**	**Maximum**
<40	45	2.59	1.485	2.50	0	7
40-65	226	1.50	1.409	1.00	0	7
>65	136	0.78	1.288	0.00	0	7
Total	407	1.38	1.477	1.00	0	7

Figure 4.2- The effect of age on the number of days where diabetic patients followed their exercise. The number of days patients exercise decreased significantly as age increases. The significant relationship was between all of the three age groups with a (P value <0.01)

*Significant difference between 40-65 and >65 and the other age groups ** significant difference between <40 and >65.



4.5 – The Relationship between Age Groups and Blood Sugar Testing (BST)

The mean of days where patients performed blood sugar testing was analyzed for significance in the Kruskall-Wallis test. The total mean of days was 1.91 days. And the mean of days for <40, 40-65 and >65 were 2.00, 1.82 and 2.01 respectively, and the relationship was found to be insignificant with a P value = 0.190

Table 4.5 – Mean of days where Age groups performed BST

Ageg roups	**N**	**Mean**	**Std. Deviation**	**Median**	**Minimum**	**Maximum**
<40	45	2.00	1.689	2.00	0	7
40-65	226	1.82	2.139	1.00	0	7
>65	136	2.01	2.055	1.00	0	7
Total	407	1.91	2.064	1.00	0	7

4.6- The Relationship between Age Groups and Foot-Care

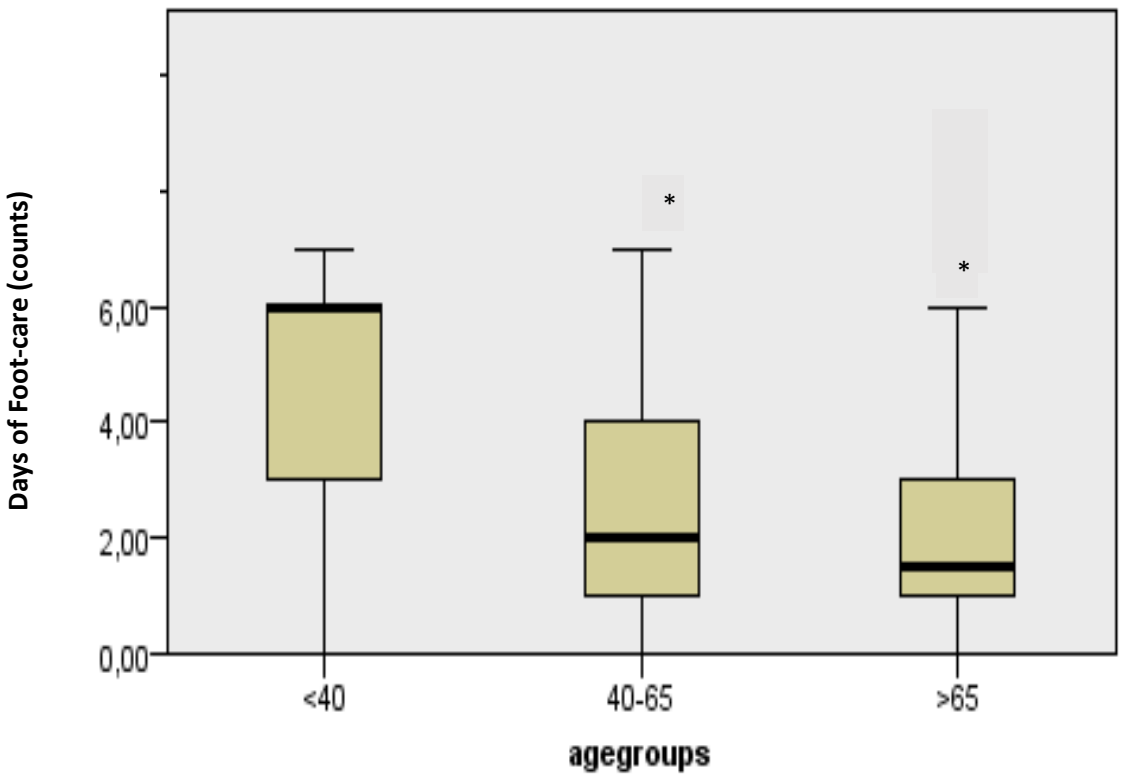
The relationship between age groups and the number of days where patients checked their feet was analyzed in Kruskall-Wallis test, and the total mean of days was 2.70 days. The mean of days for <40 age group was 4.50 and for those 40-65 and >65 was 2.66 and 2.17 respectively. There was a clear decrease in the number of days of foot-care as the age increase, and the relationship was found to be statistically significant with a (P value <0.01)

Table 4.6 – The relationship between Age groups and Foot-care

Age groups	N	Mean	Std. Deviation	Median	Minimum	Maximum
<40	45	4.50	2.271	6.00	0	7
40-65	226	2.66	2.116	2.00	0	7
>65	136	2.17	1.909	1.50	0	7
Total	407	2.70	2.169	2.00	0	7

Figure 4.3- The effect of age on the number of days where diabetic patients checked their feet. The number of days where patients checked their feet decreased significantly as age increases. The significant relationship was between <40 and >65 and also between <40 and 40-65 age groups with a (P value <0.01).

*The significance between <40 and >65 and the significance between <40 and 40-65 years.



4.7- The relationship between Age groups and Medications

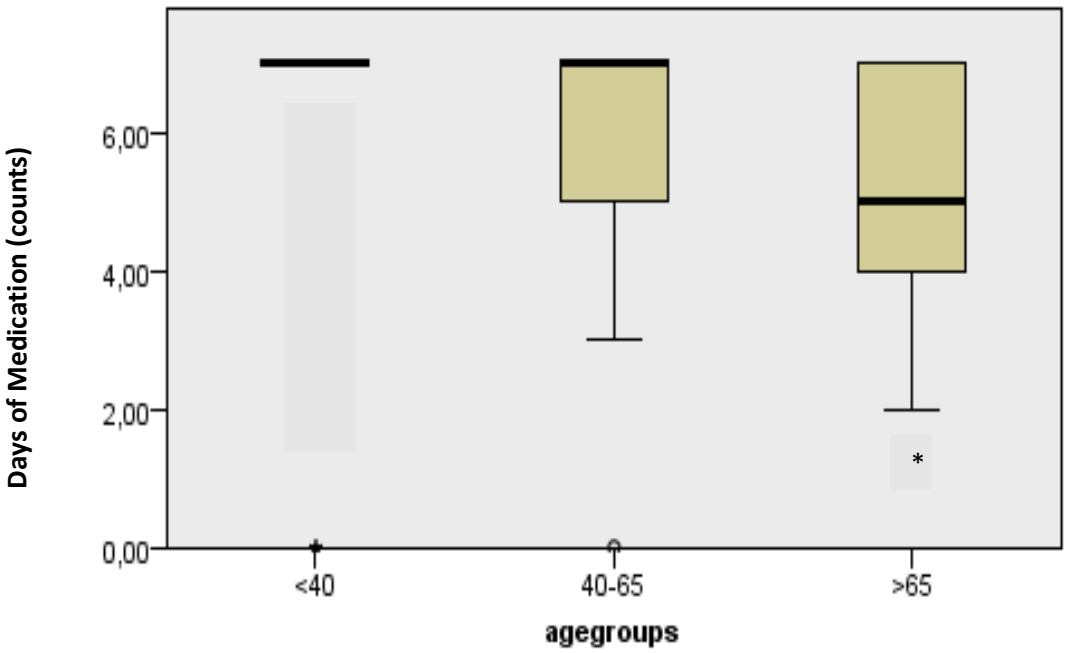
When we compare the relationship between age groups and the number of days where patients have toke their recommended medication, the total mean of days was 5.81 days. There was a slight decrease in the mean number of days as the age of patients group increase. The mean of days for <40 age group was 6.40, for 40-65 age group was 5.97 and for >65 age group was 5.34, and the relationship was found to be statistically significant in Kruskall-Wallis test with a (P value <0.01)

Table 4.7- The relationship between Age groups and Medications

Age groups	**N**	**Mean**	**Std. Deviation**	**Median**	**Minimum**	**Maximum**
<40	45	6.40	1.671	7.00	0	7
40-65	225	5.97	1.367	7.00	0	7
>65	136	5.34	1.384	5.00	2	7
Total	406	5.81	1.450	6.00	0	7

Figure 4.4- The effect of age on the number of days where diabetic patient toke their recommended medications. The number of days where patients toke their recommended medications decreased significantly as age increases. The significant relation was between all of the three age groups with a (P value <0.01).

*The significance between <40 and >65, and the significance between 40-65 and >65 years.



4.8- The relationship between Age groups and Medication Adherence

When we compared the relation between age groups and medication Adherence (whether the patients were fully Adherent or not) with a Chi-Square Test, the relation was found to be statistically insignificant with a P = 0.151

Table 4.8 – The relation between age groups and medication adherence.

		Age Groups			
		<40	**40-65**	**>65**	**Total**
Adherence	Count	5	13	15	33
	% within Adherence\non-Adherence group	15.2%	39.4%	45.5%	100%
	% within age group	11.1%	5.8%	11.0%	8.1%
Non-Adherence	Count	40	213	121	374
	% within Adherence\non-Adherence group	10.7%	57.0%	32.4%	100%
	% within age group	88.9%	94.2%	89.0%	91.9%
Total	Count	45	226	136	407
	% within Adherence\non-Adherence group	11.1%	55.5%	33.4%	100%
	% within age group	100%	100%	100%	100%

Table 4.9- The insignificant relation between age groups and Adherence.

	Value	**df**	**Asymptotic Significance (2-sided)**
Pearson Chi-Square	3.786[a]	2	0.151
Likelihood Ratio	3.764	2	0.152
Linear-by-Linear Association	0.573	1	0.449
N of Valid Cases	407		

a. 1 cells (16,7%) have expected count less than 5. The minimum expected count is 3,65.

P=0,151 p>0,05 not statistically significant.

4.9- The relationship between Age groups and the Degree of Non-Adherence

Statistical analysis was performed between the Age groups and the degree of Non-Adherence of patients in order to determine if there was a relationship between patient's age and degree of Non-Adherence. The total mean degree of Non-Adherence was 1.89. The detailed data for mean degree of patients Non-Adherence for each of the age groups is shown in Table 4.10 and Figure 4.9. There was an increase in the degree of Non-Adherence as the age of the patient increase, and the relation was found to be statistically significant in the Kruskall-Wallis test with a (P value <0.01)

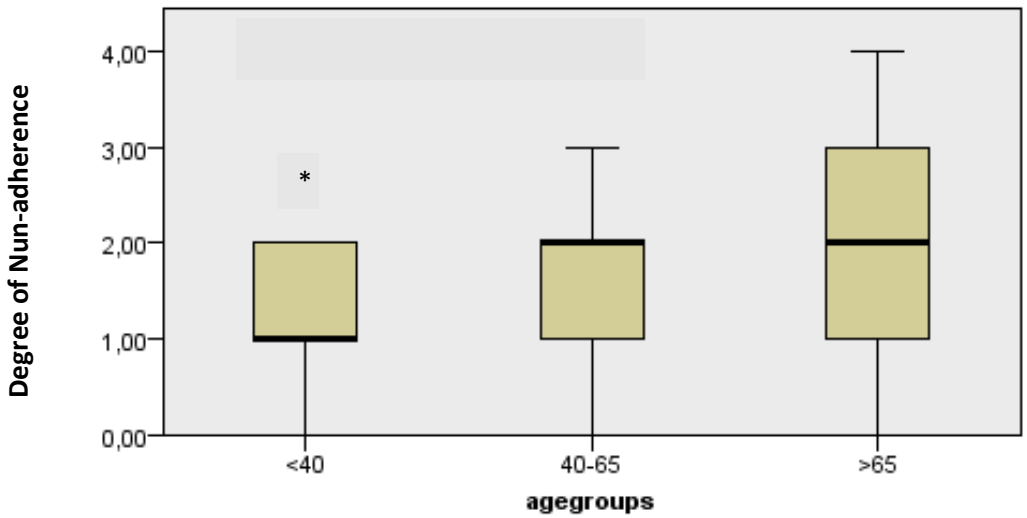
Table 4.10- The mean degree of patients Non-Adherence for each Age group

Age groups	N	Mean	Std. Deviation	Median	Minimum	Maximum
<40	45	1,22	0.735	1.00	0	4
40-65	226	1,90	0.954	2.00	0	4
65>	136	2,11	1.172	2.00	0	4
Total	407	1,89	1.042	2.00	0	4

Figure 4.5- The change in the degree of Non-Adherence according to different age groups.

The difference was found to be statistically significant in the Kruskall-Wallis test. The significant relation was found to be between <40 and 40-65 age groups, and also between <40 and >65 Age groups, with a (P value <0.01) for both of them.

*The significance between <40 and >65, and between <40 and 40-65 years.



4.10- Demographics and Characteristic Patients` Information regarding Educational level

In this thesis patients who had answered the questionnaire were divided into two educational level groups. The first group was Low Educational level and included (primary school, secondary school and none), and the second group was High educational level, and it included (high school and university). 142 patients out 407 were classified as lower education (34.9%), while the rest of the 265 patents were classified as higher education (65.1%).

Table 4.11- Percentage of patients according to their Educational level

	Educational groups		
	lower education	**higher education**	**Total**
Count	142	265	407
% within the educatinal group	34,9%	65,1%	100,0%
Total	100,0%	100,0%	100,0%

4.11- The relationship between Educational Groups and General Diet

We compare the relation between different educational level groups and the number of days where patients followed general diet plan. The total mean of days was 4.134 days. There was an increase in the mean of days where patients followed their general diet as the educational level increase. The mean of days for low education patients was 3.877 and for those with high education was 4.272, and the relation was found to be statistically significant in the Mann-Whitney U test with a (P value = 0.012).

Table 4.12- The relation between patient's educational level and General Diet

Educational level	**N**	**Mean**	**Std. Deviation**	**Median**	**Minimum**	**Maximum**
Low education	142	3.877	1.5451	4	0	7
High education	265	4.272	1.3945	4.5	0	7
Total	407	4.134	1.4592	4	0	7

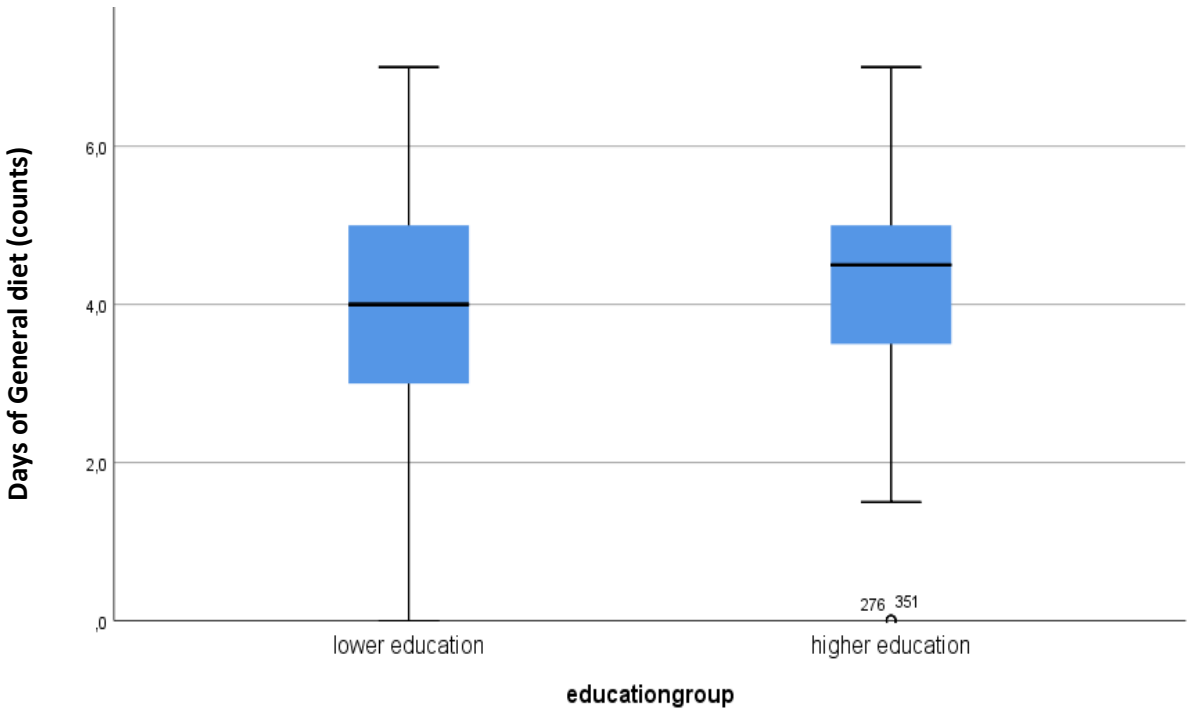


Figure 4.6- The significant relationship between Educational groups and General diet.

The number of days where patient followed general diet plan increased significantly as educational level increased with a (P value= 0.012).

4.12- The relationship between Educational Groups and Specific Diet and BST

We compared the relationship between Educational groups and the number of days where diabetic patients followed a specific diet plan, and also the relationship between educational groups and the number of days where patients tested their blood sugar. Although there was a slight decrease in the mean of days in both cases as the educational level increases, the relation was found to be statistically insignificant in the Mann-Whitney U test with a P value = 0.278 for specific diet, and P value= 0.394 for BST.

Table 4.13- The relationship between Educational groups and Specific diet

Educational level	**N**	**Mean**	**Std. Deviation**	**Median**	**Minimum**	**Maximum**
Low education	142	3.535	0.9333	3.5	1	6
High education	265	3.370	1.0211	3.5	0	6.5
Total	407	3.428	0.9933	3.5	0	6.5

Table 4.14- The relationship between Educational groups and BST

Educational level	N	Mean	Std. Deviation	Median	Minimum	Maximum
Low education	142	2.08	2.164	1	0	7
High education	265	1.82	2.006	1	0	7
Total	407	1.91	2.064	1	0	7

4.13- The relationship between Educational groups and Exercise

The relationship between Educational Groups and the Exercise days was found to be statistically significant in the Mann-Whitney U test with a (P value <0.01). The total mean of days was 1.38, and the mean of days of lower education was 0.79, and for higher education group was 1.70.

Table 4.15- The relationship between Educational groups and Exercise

Educational level	N	Mean	Std. Deviation	Median	Minimum	Maximum
Low education	142	0.79	1.177	0	0	5
High education	265	1.70	1.524	1.5	0	7
Total	407	1.38	1.477	1	0	7

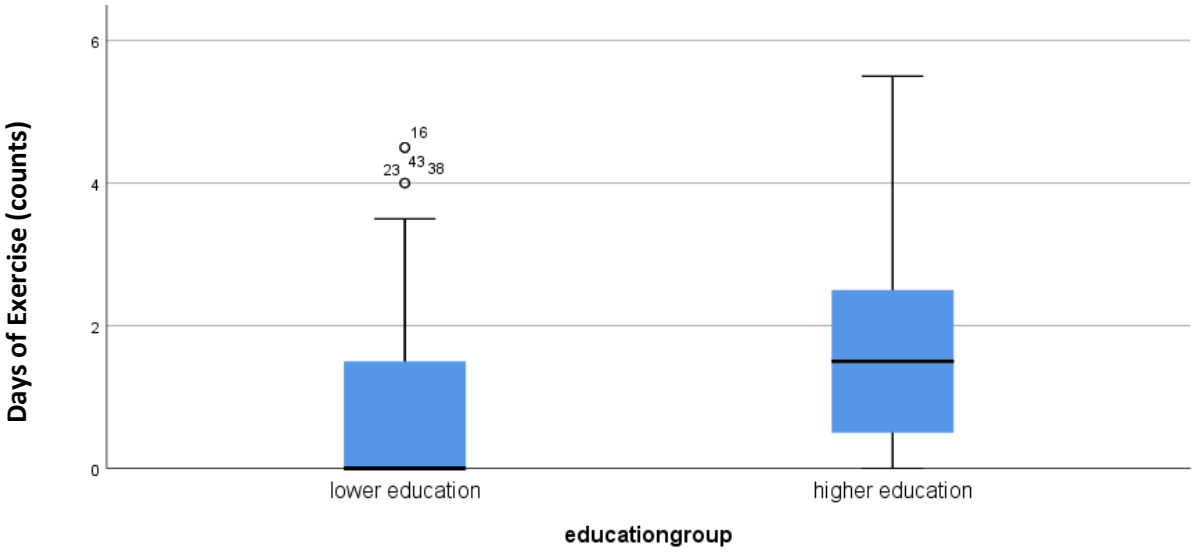


Figure 4.7- The significant relationship between Educational groups and Exercise.

The mean number of days where patient exercise increased significantly as educational level increased with a (P value <0.01).

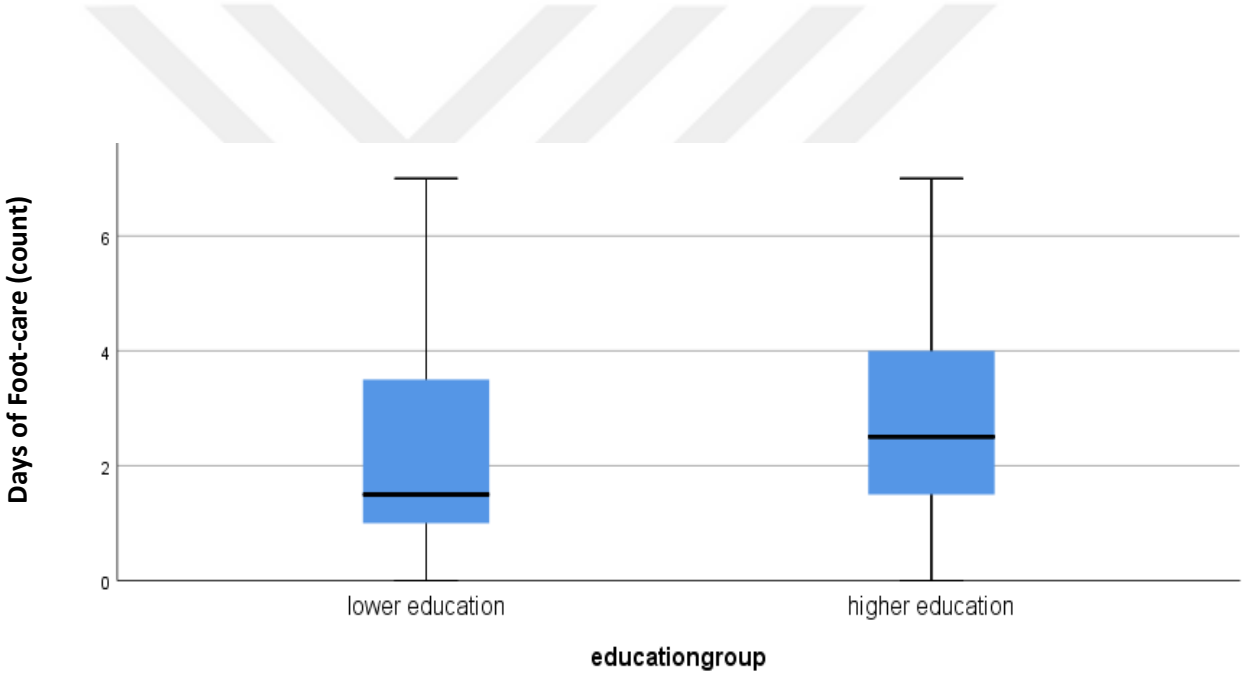
4.14- The relationship between Educational groups and Foot-care

For the relationship between Educational level groups and the number of days where patients checked their feet when analyzed in the Mann-Whitney U test, the total mean of days was 2.70. The Mean of days for lower educational groups was 2.32, and for those of higher education was 2.91. The number of days where patients checked their feet increased significantly as the educational level increased (P value= 0.003).

Table 4.16- The relationship between Educational groups and Foot care

Educational level	**N**	**Mean**	**Std. Deviation**	**Median**	**Minimum**	**Maximum**
Low education	142	2.32	2.144	1.5	0	7
High education	265	2.91	2.159	2.5	0	7
Total	407	2.70	2.169	2	0	7

Figure 4.8- The significant relationship between Educational groups and Foot-care. The mean number of days where patients had checked their feet increased significantly as educational level increased with a (P value= 0.003).



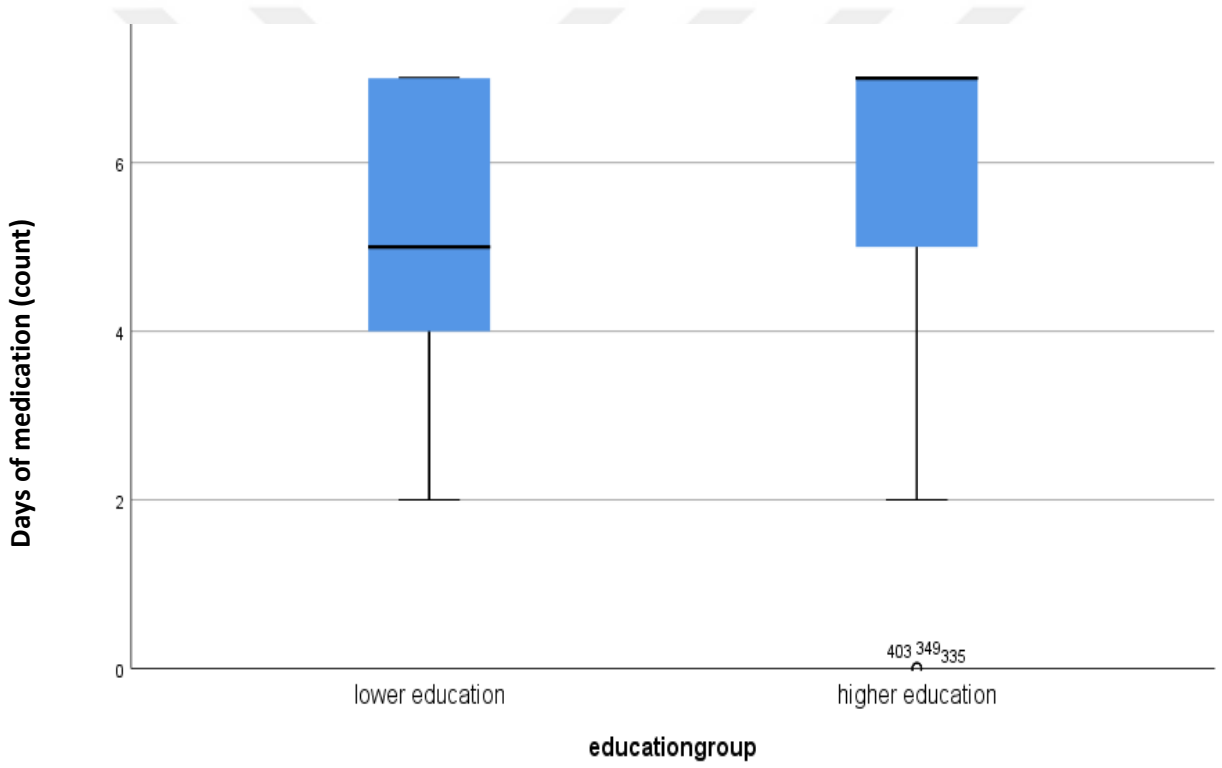
4.15- The relationship between Educational level and Medication

The relationship between Educational level groups and the number of days where they take their recommended medication has been statistically analyzed in the Mann-Whitney U test, and the relation was found to be statistically significant. The total mean of days was 5.81 days, and the mean has increased significantly as the educational level increased (P value <0.01).

Table 4.17- The relationship between Educational groups and Medication

Educational level	**N**	**Mean**	**Std. Deviation**	**Median**	**Minimum**	**Maximum**
Low education	142	5.33	1.422	5	2	7
High education	265	6.06	1.402	7	0	7
Total	407	5-81	1.450	6	0	7

Figure 4.9- The significant relationship between Educational groups and medication. The mean number of days where patients toke their recommended medication increased significantly as educational level increased with a (P value <0.01).



4.16- The relationship between Educational level and Medication Adherence

When we compared the relation between Educational level groups and medication Adherence (whether the patients were fully adherent to their medications or not) with a Chi-Square Test, the relation was found to be statistically insignificant with a (P value = 0.853).

Table 4.18 – The relation between Educational level groups and medication Adherence.

		Age groups		
		Lowe education	Higher education	Total
Adherence	Count	12	21	33
	%within Adherent\non-Adherent group	36.4%	63.6%	100%
	%within Educational level	5.8%	7.9%	8.1%
Non-Adherence	Count	130	244	374
	%within Adherent\non-Adherent group	91.5%	92.1%	100%
	%within Educational level	94.2%	89.0%	91.9%

Total	Count	142	265	407
	%within adherent\non-Adherent group	34.9%	65.1%	100%
	% within age group	100%	100%	100%

Table 4.19- The insignificant relation between Educational level groups and Adherence.

Chi-Square Tests

	Value	**Df**	**Asymptotic Significance (2-sided)**
Pearson Chi-Square	0.034[a]	1	0.853
Continuity Correction[b]	0.000	1	1.000
Likelihood Ratio	0.034	1	0.853
Fisher's Exact Test			
Linear-by-Linear Association	0.034	1	0.853
N of Valid Cases	407		

4.17- The relationship between Educational level and the Degree of Non-Adherence

Statistical analysis was performed between different Educational levels groups and the degree of Non-Adherence of patients in order to determine if there was a relationship between patient's educational level and the degree of Non-Adherence. The total mean degree of Non-Adherence was 1.89. The detailed data for mean degree of patients Non-Adherence for each of the educational groups is shown in Table 4.20. There was a decrease in the degree of Non-Adherence as the educational level of the patients increase, and the relation was found to be statistically significant in the Mann-Whitney U test, with a (P value <0.01)

Table 4.20- The mean degree of patients Non-Adherence for each Educational group

Educational level	**N**	**Mean**	**Std. Deviation**	**Median**	**Minimum**	**Maximum**
Low education	142	2.25	1.125	2	0	4
High education	265	1.71	0.944	2	0	4
Total	407	1.89	1.042	2	0	4

5. DISCUSSION AND CONCLUSION

5.1 Demographics and characteristic patient's information

In this thesis, 407 questionnaires were collected from 36 community pharmacies after diabetic patients had been interviewed and had been asked to answer the questionnaires in paper and pencil form. In pervious studied used to determine and assess the demographic factors effecting the self-care activities and medication adherence for Type 2 diabetic patients, the sample size was close to the size of our sample in most of the studies. (146) Out of the 407 questionnaires, 66.1% of the questionnaires were answered by male patients and 33.9% were answered by female patients. Therefore the male to female ratio between the patients was 2.1: 1. Although diabetic patients were divided into three age groups (<40, 40-65 and >65), more than half of the patients (55.5%) were in the 40-65 age group. Where the total mean of age for all age groups was 58.15 years. Diabetic patients who had been interviewed, had been also divided according to their educational level into two educational groups, lower education (illiterate, primary and secondary school) and higher education (high school and university). The percentage of patients who were classified as lower education was 34.9%, while those with higher education the percentage was 65.1%. And in the Mosisky`s questionnaire, most of the patients were non-adherent to their prescribed medication (MMAS ≥1). The most frequently answered reason for non-adherence was that patients forget to take their diabetic medications with a percentage of 73.7%, and this result was the same to that in a previous research done in 2012 in the US-Mexico borders (147).

5.2 The effect of Age and Educational level on Self-care Activities in Type 2 diabetic patients

In this thesis the relationship between different age groups and most of the self-care activities for the type 2 diabetic patients was found to be statistically significant. Where it has been found that as the age increased, the mean number of days where patients follow or adhere to their self-care activities decreased. For the relationship between educational level of the patients and self-care activities, the relation was also found to be statistically significant, where, as the educational level of the patient increases, the mean number of days where patient follow their self-care activities increases as well. Which is similar to a study done in Nekemte Referral hospital (Ethiopia) where participant with younger age were more likely to perform self-care activities compared to those with older age (148), and similar to another study done in the united states where the higher educational level was associated with good and regular diabetic self-care activities. This can be due to the fact that younger adults have a higher level of motivation and social support than elderly individuals (149). In case of the number of days where diabetic patients had followed a general healthy diet, the relationship between them was found to be statistically significant with a P value= 0.009 for age groups, where, as the age increased the mean number of days of following a general healthy diet decreased, and a P value= 0.012 for Educational groups, where, as the educational level of the diabetic patients increased, the mean number of days where they had followed a healthy diet plan increased.

For exercise, the relationship was also found to be statistically significant, where in this thesis it has been found that type 2 diabetic patient at older age did not exercise as often as younger age patients. These findings has been confirmed in other studies like Mohammad pour's study in Iran where, older age groups has been found to have lower mean scores of the quality of life in physical health dimension than younger aged groups (150) Furthermore, patients with higher educational level was found to be more physically active than those with lower educational level, and this result has also been dominated in the literature (151).

Regarding taking the recommended medication, in this study the relation between age groups and medication was also found to be statistically significant, where the mean number of days where patients toke their recommended medication were higher for younger age groups, and decreased significantly as age increased. These finding are supported with some findings in the literature, in a study done in Nigeria and Yemen which showed that the younger patients were most likely to retain what they were thought and that they remembered faster and had better recall abilities than older patients (152). On the other hand, some other studies showed the opposite (151). For the relationship between educational level groups and mean number of days of taking recommended medication, the relation was found to be statistically significant (P value <0.01). The patients with a higher educational level was found to be more stuck to their recommended medication regimen than those with lower educational level.

For foot-care and wither if there was a relation between different age groups and educational level with the number of days where patients checked their feet. In this research there was a statistically significant relationship between age and the mean number of days where diabetic patients checked their feet, where it has been found that younger patients were checking their feet more than older patient. And also regarding educational level, the number of days patients checked their feet had increased significantly as the educational level of the patient increased. These result has been found to be similar to those from a study in 2001 in North calorina US (153).

In contrast to some studies there was no significant relationship between both of age and educational level with the number of days where patients had done blood sugar testing. And the reason for that could be due to the difference in the sample sizes for the age groups and the educational groups.

According to these results, type 2 diabetic patients with older age and lower educational level are seemed to be less adherent to the diabetes Self-care activities and medications. There are many ways to improve the level of adherence for these patients by continues follow up and providing educational programs from time to time to enhance their diabetic knowledge. Intensive education about type 2 diabetes complications and the

advantages of frequent self-care behaviors should be the target of every one of these patients.

5.3 The effect of Age and Educational level on Medication Adherence and the Degree of non-Adherence of Type 2 diabetic patients

Regarding medication adherence, out of the 407 type 2 diabetic patients, most of the patients were reported non-adherent to their prescribed medication (MMAS ≥1). Only 33 patients (8.1%) were fully adherent to their medication, and the most frequently selected reason for patients not adhering to their medication was forgetting to take the diabetes medication (more than 73%). And this finding was similar to that in a study done in 2012 (147). According to the three different age groups, (15.2%) of the fully adherent patients were <40 years, (39.4%) of them were between 40 and 65 years, and (45.5%) of them were >65 years. and according to the educational level groups, only (36.4%) of the 33 fully adherent patients were of lower educational level, the percentage of the higher educational group were much higher that the lower educational group, and the percentage of patients in the older age group was higher than that in younger age groups. yet the relation was found to be statistically insignificant. And this is similar to a study done in Palestine, Gaza (154).

For the degree of medication non-adherence, We used the 4-item Morisky`s Medication Adherence Scale (MMAS), which scans obstacles that patients face during taking their medication. And when we come to see relation between different age groups and the degree of non-adherence, the relation was found to be statistically significant with a (P value <0.01), and the significance was between <40 age group and 40-65 age group. Where it has been found that as the age increased the degree of non-adherence also increased. And the relation between educational level and degree of non-adherence was also found to be statistically significant, where it has been found that patients of lower educational level are having a higher degree of non-adherence than those of higher educational level. And this result is similar to the results in the literature, like this study done in Kuwait where patients with a high school education or higher are more likely to be

adherent to their medication than those with a less than those with less than a high school education(155).

According to the data from this thesis, we can support the study that says, diabetic patients are suffering from the lack of sufficient knowledge about their disease and thus frequently have poor self-care skills (19). And older diabetic patients tend to have less education and facing more barriers to practice appropriate self-care behaviors than younger patients (20).

The limitation for this study was that patient tend to show the perfect side of their behaviors, and sometimes try to give false answers just to feel better. And our mission was to try to make sure that the answer which had been selected by the patients are the most correct answers.

CONCLUSION

In this thesis the number of days where diabetic patients followed their recommended self-care activities has decreased as the patient`s age increase. And it also increased as the educational level of the patient increased. There was no significant relationship between age and educational level with the number of days patients do a blood sugar testing. The degree of non-adherence increased significantly as the age increased, and increased as the educational level decreased.

According to these results, type 2 diabetic patients with older age and lower educational level are seemed to be less adherent to the diabetes Self-care activities and medications. So we need to pay more attention to these two categories through continues follow up and providing educational programs from time to time to enhance their diabetic knowledge. Intensive education about type 2 diabetes complications and the advantages of frequent self-care behaviors should be the target of every one of these patients.

6. REFRENCES

1) American Diabetes Association. (2010). Diagnosis and classifica-tion of diabetes mellitus. Diabetes Care, 33(Suppl. 1), S62—S69.
2) Boyle JP, Honeycutt AA, Narayan KM, Hoerger TJ, Geiss LS, Chen H and Thompson TJ. Pro-jection of diabete burden through 2050. Diabetes Care 2001; 24: 1936-1940.
3) Aschner P, Beck-Nielsen H, Bennett P, Boulton A, Colagiuri R. Diabetes and impaired glucose tolerance. 5th ed. Brussels: IDF Diabetes Atlas; 2012.
4) IDF: IDF Diabetes Atlas, 6th edition, Brussels, Belgium: International Diabetes Federation, 2013. (http://www.idf.org/diabetesatlas/update-2014)
5) Mathers CD, Loncar D. Projections of global mortality and burden of disease from 2002 to 2030. PLoS Med. 2006;3(11):e442.
6) WHO. World Health Organization. Global status report on noncommunicable diseases 2010. Geneva: World Health Organization, 2011; 2013.
7) International Diabetes Federation, Diabetes Atlas, 8th ed.,2017, Available at: http://www.diabetesatlas.org/. (Accessed28 December 2017).
8) I. Satman, B. Omer, Y. Tutuncu, et al., Twelve-year trends inthe prevalence and risk factors of diabetes and prediabetesin Turkish adults, Eur. J. Epidemiol. 28 (2) (2013) 169–180.
9) International Diabetes Federation, Diabetes Atlas, 8th ed.,2017, Available at: http://www.diabetesatlas.org/. (Accessed28 December 2017).
10) Frei, A., Svarin, A., Steurer-Stey, C., & Puhan, M. A. (2009).Self-efficacy instruments for patients with chronic diseases suf-fer from methodological limitations — A systematic review.Health Quality Life Outcomes, 7, 86—95. http://dx.doi.org/10.1186/1477-7525-7-86
11) Glasgow RE: Compliance to diabetes regimens: conceptualization, complexity, and determinants. In Patient Compliance in Medical Practice and Clinical Trials. Cramer JA, Spilker B, Eds. New York, Raven Press, 1991, p. 209–224
12) Feinstein AR: On white coat effects and the electronic monitoring of compliance. Arch Intern Med 150:1377–1378, 1990

13) World Health Organization: Report on Medication Adherence. Geneva, World Health Org., 2003
14) Wabe NT, Angamo MT, Hussein S. Medication adherence in diabetes mellitus and self management practices among type-2 diabetics in Ethiopia. N Am J Med Sci. 2011;3(9):418–23.
15) Tiv M, Viel J-F, Mauny F, Eschwege E, Weill A, Fournier C, Fagot-Campagna A, Penfornis A. Medication adherence in type 2 diabetes: the entred study 2007, a French population-based study. PLoS One. 2012;7(3):e32412.
16) WHO. World Health Organization. Global health risks: mortality and burden of disease attributable to selected major risks. 2009.
17) WHO. World Health Organization. Global recommendations on physical activity for health. 2010.
18) Gautam A, Bhatta DN, Aryal UR. Diabetes related health knowledge, attitude and practice among diabetic patients in Nepal. BMC Endocr Disord. 2015;15:25.
19) Via P, Salyer J. Psychosocial self-efficacy and personal characteristics of veterans attending a diabetes education program. Diabetes Educ. 1999; 25:727-37.
20) Klein L, Pearl G, McPhee S et al. Aging and its relationship to health knowledge and medication compliance. Gerontologist. 1982; 22:384-7.
21) Cramer JA (2004) A systematic review of adherence with medications for diabetes. Diabetes Care 27: 1218–1224.
22) Sokol MC, McGuigan KA, Verbrugge RR, Epstein RS (2005) Impact of medication adherence on hospitalization risk and healthcare cost. Med Care 43: 521–530.
23) Lee WC, Balu S, Cobden D, Joshi AV, Pashos CL (2006) Prevalence and economic consequences of medication adherence in diabetes: a systematic literature review. Manag Care Interface 19: 31–41.
24) Satman I, Yilmaz T, Sengul A et al. Population-based study of diabetes and risk characteristics in Turkey: results of the Turkish diabetes epidemiology study (TURDEP), Diab Care, 2002;25:1551-6.
25) American Diabetes Association. Diagnosis and classification of diabetes mellitus. Diabetes Care 2012;35:S64–71.

26) International Diabetes Federation. IDF Diabetes Atlas — 7th Edition. DiabetesAtlas http://www. diabetesatlas.org/ (2015).
27) International Diabetes Federation. IDF Diabetes. 1st ed. Brussels: International Diabetes Federation; 2000. http://www.diabetesatlas.org.
28) Wild S, Roglic G, Green A, Sicree R, King H. Global prevalence of diabetes – Estimates for the year 2000 and projections for 2030. Diabetes Care. 2004; 27:1047–53
29) American Diabetes Association. Diagnosis and classification of diabetes mellitus. Diabetes Care 2014;37(Suppl. 1):S81–S90
30) Holman, N., Young, B. & Gadsby, R. Current prevalence of type 1 and type 2 diabetes in adults and children in the UK. *Diabet Med.* **32**, 1119–1120
31) Fuchsberger, C. *et al.* The genetic architecture of type 2 diabetes. *Nature* **536**, 41–47 (2016).
32) Chatterjee, S., Khunti, K. & Davies, M. J. Type 2 diabetes. *Lancet* **389**, 2239–2251 (2017).
33) Schellenberg, E. S., Dryden, D. M., Vandermeer, B., Ha, C. & Korownyk, C. Lifestyle interventions for patients with and at risk for type 2 diabetes: a systematic review and meta-analysis. *Ann. Intern. Med.* **159**, 543–551 (2013).
34) Hu, F. B. *et al.* Diet, lifestyle, and the risk of type 2 diabetes mellitus in women. *N. Engl. J. Med.* **345**, 790–797 (2001).
35) Diabetes Mellitus: Disease Management," by Byron J. Hoogwerf, MD, and "Microvascular Complications of Diabetes," by Robert S. Zimmerman, MD.
36) Klein R, Klein BE, Moss SE, Davis MD, DeMets DL. The Wisconsin Epidemiologic Study of Diabetic retinopathy: II. Prevalence and risk of diabetic retinopathy when age at diagnosis is 30 or more years. Arch Ophthalmol 1984; 102:527–532.
37) Klein R, Klein BE, Moss SE, Davis MD, DeMets DL. The Wisconsin Epidemiologic Study of Diabetic retinopathy: II. Prevalence and risk of diabetic retinopathy when age at diagnosis is 30 or more years. Arch Ophthalmol 1984; 102:527–532.
38) Klein R, Klein BE, Moss SE, Davis MD, DeMets DL. The Wisconsin Epidemiologic Study of Diabetic retinopathy: II. Prevalence and risk of diabetic retinopathy when age at diagnosis is 30 or more years. Arch Ophthalmol 1984; 102:527–532.

39) Vinik AI, Pittenger GL, McNitt P, Stansberry KB. Diabetic neuropathies: an overview of clinical aspects, pathogenesis, and treatment. In: LeRoith D, Taylor SI, Olefsky JM, eds. Diabetes Mellitus: A Fundamental and Clinical Text 3rd ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2003:911–934.

40) Melton LJ 3rd, Macken KM, Palumbo PJ, Elveback LR. Incidence and prevalence of clinical peripheral vascular disease in a population-based cohort of diabetic patients. Diabetes Care 1980; 3:650–654.

41) Garber AJ, Abrahamson MJ, Barzilay JI, et al. Consensus statement by the American Association of Clinical Endocrinologists and American College of Endocrinology on the comprehensive type 2 diabetes management algorithm—2017 executive summary. Endocr Pract 2017; 23(1): 207-38.

42) Handelsman Y, Bloomgarden ZT, Grunberger G, et al. American Association of Clinical Endocrinologists and American College of Endocrinology: clinical practice guidelines for developing a diabetes mellitus comprehensive care plan--2015. Endocr Pract 2015; 21(0): 1-87.

43) American Diabetes Association. 6. Glycemic Targets. Diabetes Care 2017; 40(Suppl 1): S48-s56.

44) Wheeler ML. Nutrition management and physical activity as treatments for diabetes. Prim Care 1999;26:857-68

45) Meltzer S, Leiter L, Daneman D, et al. 1998 clinical practice guidelines for the management of diabetes in Canada. CMAJ 1998;159(8 Suppl):S1-29. Website: www.diabetes.ca/Files/cpg98eng.pdf

46) Wolever T, Barbeau MC, Charron S, et al. Guidelines for the nutritional management of diabetes mellitus in the new millenium: A position statement by the Canadian Diabetes Association. Can J Dia Care 1999;23:56-69. Website: http://www.diabetes.ca/Section_Professionals/nutriguide.asp

47) Inzucchi SE, et al. Management of Hyperglycemia in Type 2 Diabetes, 2015: A Patient-Centered Approach Update to a Position Statement of the American Diabetes Association and the European Association for the Study of Diabetes. Diabetes Care 2015; 38: 140–149

48) Evert AB, et al. Nutrition therapy recommendations for the management of adults with diabetes. Diabetes Care, 2013; 36: 3821-3842

49) Chamberlain JJ, et al. Diagnosis and Management of Diabetes: Synopsis of the 2016 American Diabetes Association Standards of Medical Care in Diabetes Ann Intern Med. 2016; 164: 542-552

50) Franz MJ, Powers MA, Leontos C, et al.The evidence for medical nutrition therapy for type 1 and type 2 diabetes in adults. J Am Diet Assoc 2010;110:1852–1889

51) EFSA NDA (EFSA Panel on Dietetic Products Nutrition and Allergies). Scientific opinion on the substantiation of health claims related to intense sweeteners and contribution to the maintenance or achievement of a normal body weight (ID 1136, 1444, 4299), reduction of post-prandial glycaemic responses (ID 4298), maintenance of normal blood glucose concentrations (ID 1221, 4298), and maintenance of tooth mineralisation by decreasing tooth demineralisation (ID 1134, 1167, 1283) pursuant to Article 13(1) of Regulation (EC) No 1924/2006. EFSA 2011 Journal 9: 2229.

52) Orozco LJ, Buchleitner AM, Gimenez-Perez G, Roque IFM, Richter B, Mauricio D. Exercise or exercise and diet for preventing type 2 diabetes mellitus. Cochrane Database Syst Rev 2008(3):CD003054.

53) Ryden L, Grant PJ, Anker SD, et al. ESC Guidelines on diabetes, pre-diabetes, and cardiovascular diseases developed in collaboration with the EASD: The Task Force on diabetes, pre-diabetes, and cardiovascular diseases of the European Society of Cardiology (ESC) and developed in collaboration with the European Association for the Study of Diabetes (EASD). Eur Heart J 2013;34(39):3035‑87.

54) Selvin E, Steffes MW, Zhu H, et al. Glycated hemoglobin, diabetes, and cardiovascular risk in nondiabetic adults. N Engl J Med 2010;362(9):800–11.

55) National Health and Medical Research Council. Clinical practice guidelines for the management of overweight and obesity in adults, adolescents and children in Australia. Melbourne: NHMRC, 2013.

56) Leslie WS, Hankey CR, Lean ME. Weight gain as an adverse effect of some commonly prescribed drugs: A systematic review. QJM 2007;100(7):395–404.

57) American Diabetes Association. Standards of medical care in diabetes - 2013. Diabetes Care. 2013;36(Suppl 1):S11–S66.

58) Foster SL, Smith EB, Seybold MR. Advanced counseling techniques: integrating assessment and intervention. *Am Pharm.* 1995; NS35(Oct):40–8.

59) Herrier RN, Boyce RW. Establishing an active patient partnership. Am Pharm. 1995; NS35(Apr):48–57.

60) American Society of Health-System Pharmacists. ASHP guidelines on pharmacist-conducted patient education and counseling. Am J Health- Syst Pharm. 1997; 54:431–4.

61) APhA special report: medication administration problem solving in ambulatory care. Washington, DC: American Pharmaceutical Association; 1994.

62) S Palaian, A Chhetri, M Prabhu, S Rajan, P Shankar. *Role Of Pharmacist In Counseling Diabetes Patients*. The Internet Journal of Pharmacology. 2004 Volume 4 Number 1.

63) MacCallum L, Consiglio G, MacKeigan L, Dolovich L. Uptake of community pharmacist-delivered MedsCheck diabetes medication review service in Ontario between 2010 and 2014. Can J Diabetes 2017;41:253-8.

64) . Cipolle RJ, Strand LM, Morley PC. Follow-up evaluation. In: Pharmaceutical care practice: the patient centered approach to medication management. 3rd ed. Minneapolis (MN): McGraw-Hill; 2012; 265-94.

65) MacCallum L, Dolovich L. Follow-up in community pharmacy should be routine, not extraordinary. *Can Pharm J (Ott)*. 2018;151(2):79-81. Published 2018 Feb 8. doi:10.1177/1715163518756586

66) Cooper H, Booth K, Gill G: Patients' perspectives on diabetes health care education. Health Educ Res 2003, 18(2):191–206.

67) Paterson B, Thorne S: Developmental evolution of expertise in diabetes self management. Clin Nurs Res 2000, 9(4):402–419

68) Etzwiler DD: Diabetes translation: a blueprint for the future. Diabetes Care 1994, 17(Suppl. 1):1–4.

69) Bradley C: Handbook of Psychology and Diabetes. Chur, Switzerland: Harwood Academic; 1994

70) McNabb WL: Adherence in diabetes: can we define it and can we measure it? Diabetes Care 1997, 20(2):215–218

71) American Association of Diabetes Educators: AADE7 Self-Care Behaviors. Diabetes Educ 2008, 34:445–449.

72) Povey RC, Clark-Carter D: Diabetes and healthy eating: A systematic review of the literature. Diabetes Educ 2007, 33(6):931–959.
73) Deakin T, McShane CE, Cade JE, Williams RD: Group based training for self management strategies in people with type 2 diabetes mellitus. Cochrane Database Syst Rev 2005, 2:CD003417
74) Herschbach P, Duran G, Waadt S, Zettler A, Amch C: Psychometric properties of the questionnaire on stress in patients with diabetesrevised (QSD-R). Health Psychol 1997, 16(2):171–174.
75) Shobhana R, Begum R, Snehalatha C, Vijay V, Ramachandran A: Patients' adherence to diabetes treatment. J Assoc Physicians India 1999, 47(12):1173–1175.
76) Glasgow RE, Strycker LA: Preventive care practices for diabetes management in two primary care samples. Am J Prev Med 2000, 19(1):9–14
77) Walker E: Characteristics of the adult learner. Diabetes Educ 1999, 25(6 Suppl):16–24.
78) American Diabetes Association: Standards of medical care in diabetes - 2011. Diabetes Care 2011, 34(Suppl 1):S11–S61.
79) Physical Activity Guidelines Advisory Committee: Physical Activity Guidelines Advisory Committee Report, 2008. Washington, DC, USA: US Department of Health and Human Services; 2008.
80) United States Department of Health and Human Services: Physical Activity Guidelines for Americans; 2008. http://www.health.gov/paguidelines/.
81) Haskell WL, Lee IM, Pate RR, Powell KE, Blair SN, Franklin BA, et al: Physical activity and public health: updated recommendation for adults from the American college of sports medicine and the American heart association. Med Sci Sports Exerc 2007, 39(8):1423–1434.
82) Holt T, Kumar S. ABC of diabetes. West Sussex: John Wiley & Sons; 2015.
83) Seaquist ER, Anderson J, Childs B, et al. Hypoglycemia and diabetes: a report of a workgroup of the American Diabetes Association and the Endocrine Society. Diabetes Care. 2013;36:1384–1395.
84) Zoungas S, Patel A, Chalmers J, et al. Severe hypoglycemia and risks of vascular events and death. N Engl J Med. 2010;363:1410–1418.

85) Inzucchi SE, Bergenstal RM, Buse JB, et al. Management of hyperglycemia in type 2 diabetes: a patient-centered approach position statement of the American Diabetes Association (ADA) and the European Association for the Study of Diabetes (EASD). Diabetes Care. 2012;35:1364–1379.

86) Nathan DM, Buse JB, Davidson MB, et al. Medical management of hyperglycemia in type 2 diabetes: a consensus algorithm for the initiation and adjustment of therapy a consensus statement of the American Diabetes Association and the European Association for the study of diabetes. Diabetes Care. 2009;32:193–203.

87) United Kingdom Prospective Diabetes Study (UKPDS) Group. Intensive blood-glucose control with sulphonylureas or insulin compared with conventional treatment and risk of complications in patients with type 2 diabetes (UKPDS33), Lancet. 1988;352:837-53.

88) American Diabetes Association 2006, 'Standards of Medical Care in Diabetes', Diabetes Care, 2006;28: S4-36.

89) Alto WA, Meyer D, Schneid J, Bryson P, Kindig J. Assuring the accuracy of home glucose monitoring. J Am Board Family Practice, 2002;15:1-6.

90) U.S Food and Drug Administration 2005, Glucose meter and diabetes management. Retrieved September 3, 2006, from http://www.fda.gov/diabetes/glucose. html#1

91) Gallichan M. Self monitoring of glucose by people with diabetes: evidence based practice. Br Med J. 1997; 314:964-7.

92) Currie CJ, Peyrot M, Morgan CL, et al. The impact of treatment noncompliance on mortality in people with type 2 diabetes. *Diabetes Care*. 2012;35(6):1279–1284.

93) Handelsman Y, Bloomgarden ZT, Grunberger G, et al. American association of clinical endocrinologists and American college of endocrinology – clinical practice guidelines for developing a diabetes mellitus comprehensive care plan – 2015. *Endocr Pract*. 2015;21(suppl 1):1–87.

94) Inzucchi SE, Bergenstal RM, Buse JB, et al. Management of hyperglycemia in type 2 diabetes, 2015: a patient-centered approach: update to a position statement of the American Diabetes Association and the European Association for the study of diabetes. *Diabetes Care*. 2015;38(1):140–149.

95) Ali MK, McKeever Bullard K, Imperatore G, et al; Centers for Disease Control and Prevention (CDC). Characteristics associated with poor glycemic control among adults with self-reported diagnosed diabetes – National Health and Nutrition Examination Survey, United States, 2007–2010. *MMWR Morb Mortal Wkly Rep*. 2012;61(suppl):32–37.

96) Ford ES. Trends in the control of risk factors for cardiovascular disease among adults with diagnosed diabetes: findings from the National Health and Nutrition Examination Survey 1999–2008. *J Diabetes*. 2011;3(4):337–347.

97) Wong ND, Patao C, Wong K, Malik S, Franklin SS, Iloeje U. Trends in control of cardiovascular risk factors among US adults with type 2 diabetes from 1999 to 2010: comparison by prevalent cardiovascular disease status. *Diab Vasc Dis Res*. 2013;10(6):505–513.

98) Egede LE, Gebregziabher M, Echols C, Lynch CP. Longitudinal effects of medication nonadherence on glycemic control. *Ann Pharmacother*. 2014;48(5):562–570.

99) RozenfeldY,HuntJS, PlauschinatC, WongKS. Oral antidiabetic medication adherence and glycemic control in managed care. *Am J Manag Care.* 2008; 14:71–75

100) Ho PM, Rumsfeld JS, Masoudi FA. Effect of medication nonadherence on hospitalization and mortality among patients with diabetes mellitus. Arch Intern Med. 2006; 166: 1836–1841.

101) Osterberg L, Blaschke T: Drug therapy. Adherence to medication. N Engl J Med 2005;353:487–497.

102) World Health Organization: Report on Medication Adherence. Geneva: World Health Organization, 2003.

103) Sabate´ E: Adherence to Long-Term Therapies. Evidence for Action. Geneva: World Health Organization, 2003.

104) Munger MA, VanTassel BW, LaFleur J: Medication nonadherence: an unrecognized cardiovascular risk factor. Med Gen Med 2007;9:58.

105) Blakeslee D: Adherence to therapy. JAMA HIV/AIDS 1998:33–48.

106) World Health Organization. Adherence to Longterm Therapies: Evidence for Action. World Health Organization, Geneva, Switzerland 2003.

107) Sokol MC, McGuigan KA, Verbrugge RR, Epstein RS. Impact of medication adherence on hospitalization risk and healthcare cost. Med Care. 2005; 43(6):521-530.

108) Farmer KC: Methods for measuring and monitoring medication regimen adherence in clinical trials and clinical practice. Clin Ther 1999;21:1074–1090; discussion 1073.

109) Wagner JH, Justice AC, Chesney M, et al.: Patient- and provider-reported adherence: toward a clinically useful approach to measuring antiretroviral adherence. J Clin Epidemiol 2001;54(Suppl 1):S91–S98.

110) Spilker B: Methods of assessing and improving patient compliance in clinical trials. In: Cramer JA, Spilker B, eds. Patient Compliance in Medical Practice and Clinical Trials. New York: Raven Press, 1991:37–56.

111) Osterberg L, Blaschke T: Drug therapy. Adherence to medication. N Engl J Med 2005;353:487–497.

112) Kalogianni, A., 2011. Factors affect in patient adherence to medication regimen. Health Science Journal, 5(3), p.157.

113) World Health Organization. Adherence to long-term therapies—evidence for action 2003.

114) Singh N, Squier C, Sivek C, Wagener M, Nguyen MH, Yu VL. Determinants of compliance with antiretroviral therapy in patients with human immunodeficiency virus: prospective assessment with implications for enhancing compliance. AIDS Care. 1996;8:261–269.

115) EI-Hadiyah, T.M., Madani, A.M., Abdelrahim, H.M. and Yousif, A.K. (2016) Factors Affecting Medication Non Adherence in Type 2 Sudanese Diabetic Patients. *Pharmacology & Pharmacy*, **7**, 141-146.

116) Cramer JA, Spilker B. eds. Patient Compliance in Medical Practice and Clinical Trials. New York: Raven Press, 1991: 387-392.

117) Gottlieb H. Medication Nonadherence: Finding Solutions to a Costly Medical Problem. Drug Benefit Trends. 2000; 12(6): 57-62.

118) Fincham JE. Advancing Prescription Medicine Compliance: New Paradigms, New Practices. Journal of Pharmacoepidemiology, 1995: Vol.3, No. 2.

119) Health Literacy: A Prescription to End Confusion. Institute of Medicine. Washington, DC. National Academies Press. 2004.

120) Jin J, Sklar GE, Min Sen Oh V, Chuen Li S. Factors affecting therapeutic compliance: A review from the patient's perspective. *Ther Clin Risk Manag*. 2008;4(1):269-86.

121) Kelloway JS, Wyatt RA, Adlis SA. 1994. Comparison of patients' compliance with prescribed oral and inhaled asthma medications. Arch Intern Med, 154:1349–52

122) Nichols-English G, Poirier S. 2000. Optimizing adherence to pharmaceutical care plans. J Am Pharm Assoc, 40:475–85.

123) Claxton AJ, Cramer J, Pierce C. A Systematic Review of the Association Between Dose Regimens and Medication Compliance. Clin Ther. 2001; 23: 1296-1310.

124) Menzies R, Rocher I, Vissandjee B. 1993. Factors associated with compliance in treatment of tuberculosis. Tuber Lung Dis, 74:32–7

125) Farmer KC, Jacobs EW, Phillips CR. 1994. Long-term patient compliance with prescribed regimens of calcium channel blockers. Clin Ther, 16:316–26

126) Sharkness CM, Snow DA. 1992. The patient's view of hypertension and compliance. Am J Prev Med, 8:141–6.

127) Garay-Sevilla ME, Nava LE, Malacara JM, et al. 1995. Adherence to treatment and social support in patients with non-insulin dependent diabetes mellitus. J Diabetes Complications, 9:81–6.

128) Caro JJ, Salas M, Speckman JL, et al. 1999. Persistence with treatment for hypertension in actual practice. CMAJ, 160:31–7.

129) O'Donoghue MN. 2004. Compliance with antibiotics. Cutis, 73(Suppl 5):30–2.

130) Dusing R, Weisser B, Mengden T, et al. 1998. Changes in antihypertensive therapy-the role of adverse effects and compliance. Blood Press, 7:313–5.

131) Ponnusankar S, Surulivelrajan M, Anandamoorthy N, et al. 2004. Assessment of impact of medication counseling on patients' medication knowledge and compliance in an outpatient clinic in South India. Patient Educ Couns, 54:55–60.

132) Grunebaum M, Luber P, Callahan M, et al. 1996. Predictors of missed appointments for psychiatric consultations in a primary care clinic. Psychiatr Serv, 47:848–52.

133) Balkrishnan R, Rajagopalan R, Camacho FT, et al. 2003. Predictors of medication adherence and associated health care costs in an older population with type 2 diabetes mellitus: a longitudinal cohort study. Clin Ther, 25:2958–71.

134) Moore PJ, Sickel AE, Malat J, et al. 2004. Psychosocial factors in medical and psychological treatment avoidance: the role of the doctor-patient relationship. J Health Psychol, 9:421–33.

135) Lawson VL, Lyne PA, Harvey JN, et al. 2005. Understanding why people with type 1 diabetes do not attend for specialist advice: a qualitative analysis of the views of people with insulin-dependent diabetes who do not attend diabetes clinic. J Health Psychol, 10:409–23.

136) Wai CT, Wong ML, Ng S, et al. 2005. Utility of the Health Belief Model in predicting compliance of screening in patients with chronic hepatitis B. Aliment Pharmacol Ther, 21:1255–62.

137) Cummings KM, Kirscht JP, Binder LR, et al. 1982. Determinants of drug treatment maintenance among hypertensive persons in inner city Detroit. Public Health Rep, 97:99–106.

138) Vlasnik JJ, Aliotta SL, DeLor B. 2005. Medication adherence: factors infl uencing compliance with prescribed medication plans. Case Manager, 16:47–51.

139) Spikmans FJ, Brug J, Doven MM, et al. 2003. Why do diabetic patients not attend appointments with their dietitian? J Hum Nutr Diet, 16:151–8.

140) Gascon JJ, Sanchez-Ortuno M, Llor B, et al. 2004. Treatment Compliance in Hypertension Study Group. Why hypertensive patients do not comply with the treatment: results from a qualitative study. Fam Pract, 21:125–30.

141) Dias, A. M., Cunha, M., Santos, A., Neves, A., Pinto, A., Silva, A, Castro, S. Adesão ao regime Terapêutico na Doença Crónica: Revisão da Literatura Millenium. 2011;40:201-9

142) Feinstein S, Keich R, Becker-Cohen R, et al. 2005. Is noncompliance among adolescent renal transplant recipients inevitable? Pediatrics, 115:969–73

143) Seo MA, Min SK. 2005. Development of a structural model explaining medication compliance of persons with schizophrenia. Yonsei Med J, 46:331–40.

144) Kamradt, Martina, et al. "Assessing self-management in patients with diabetes mellitus type 2 in Germany: validation of a German version of the Summary of Diabetes Self-Care Activities measure (SDSCA-G)." *Health and quality of life outcomes* 12.1 (2014): 185.

145) Toobert, Deborah J., Sarah E. Hampson, and Russell E. Glasgow. "The summary of diabetes self-care activities measure: results from 7 studies and a revised scale." Diabetes care 23.7 (2000): 943-950.

146) *Elsous A, Radwan M, Al-Sharif H and Abu Mustafa A (2017) Medications Adherence and Associated Factors among Patients with Type 2 Diabetes Mellitus in the Gaza Strip, Palestine. Front. Endocrinol. 8:100. doi: 10.3389/fendo.2017.00100*

147) Parada Jr, Humberto, et al. "Correlates of medication nonadherence among Latinos with type 2 diabetes." The Diabetes Educator 38.4 (2012): 552-561.

148) Sorato MM, Tesfahun C, Lamessa D (2016) Levels and Predictors of Adherence to Self-care Behaviour among Adult Type 2 Diabetics at Arba Minch General Hospital, Southern Ethiopia. J Diabetes Metab 7: 684. doi:10.4172/2155-6156.1000684

149) Olshansky, Ellen, et al. "Living with Diabetes." The diabetes educator 34.6 (2008): 1004-1012.

150) Mohammad pour Y, Haririan HR, Moghaddasian S, Ebrahimi H. Surveying the quality of life and its dimensions among the type 2 diabetes patients referred to the Diabetes Center of Tabriz

151) Jordan, D. N., & Jordan, J. L. (2010). Self-care behaviors of Filipino-American adults with type 2 diabetes mellitus. Journal of Diabetes and Its Complications, 24, 250–258.

152) Bonger, Zeleke, Solomon Shiferaw, and Eshetu Zerihun Tariku. "Adherence to diabetic self-care practices and its associated factors among patients with type 2 diabetes in Addis Ababa, ethiopia." *Patient preference and adherence* 12 (2018): 963.

153) Bell, Ronny A., et al. "Diabetes foot self-care practices in a rural, triethnic population." The diabetes educator 31.1 (2005): 75-83.

154) Elsous A, Radwan M, Al-Sharif H and Abu Mustafa A (2017) Medications Adherence and Associated Factors among Patients with Type 2 Diabetes Mellitus in the Gaza Strip, Palestine. Front. Endocrinol. 8:100. doi: 10.3389/fendo.2017.00100

155) Al-Majed, Hana T., et al. "Adherence of type-2 diabetic patients to treatment." Kuwait Med J 46.3 (2014): 225-32.

7. APPENDICES

7.1. Ethical Approval

Ethical approval of the study was accepted by; Yeditepe University Clinical Researches Ethical committee (Report date: 31 January 2018, Number: 802).

8. CURRICULUM VITAE

Personal Information

Name	HASSAN	**Surname**	AUN FARAG BADER
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Nationality	LIBYAN	**ID No.**	HP68FLG9
E-mail	castaliabader@gmail.com	**Phone No.**	+905385894494 +218925565545

Education

Degree	**Domain**	**Graduated From**	**Graduation Year**
Master Degree	Clinical Pharmacy	Yeditepe University	2019
License	Pharmacy	Omer-almukhtar University	2011
High school	Sciences	Shuhada El-brega	2004

Foreign Languages

Languages	**Grade**
Arabic	Mother language
English	IELTS 5.5
Turkish	A1

Work Experience

Position	**Institution**	**Period**
Pharmacist	Sirte oil company (Family clinic)	2011
Field supervisor	Castalia Company	2012-2015

Computer Skills

Program	**Level**
Microsoft Office (Word, Excel, PowerPoint)	Good