



An-Najah National University
Faculty of Graduate Studies

**DRUG UTILIZATION PATTERN AMONG
TYPE II DIABETIC PATIENTS IN
PALESTINE**

By
Mai Ayed Ahmad Awad

Supervisors
Dr. Murad Abu Al Hasan
Prof. Waleed Sweileh

**This Thesis is Submitted in Partial Fulfillment of the Requirements for the Degree of
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Mai Ayed Ahmad Awad

This Thesis was Defended Successfully on 24/9/2023 and approved by

Dr. Murad Abu Al Hasan

Supervisor

Prof. Waleed Sweileh

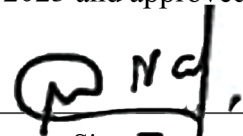
Co-Supervisor

Prof. Maher Khadorr

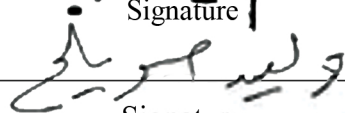
External Examiner

Prof. Rowa' Al-Ramahi

Internal Examiner



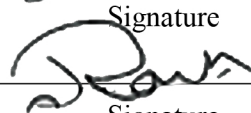
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Dedication

أهدي هذا العمل ،،
إلى من علمني الوقوف و الشموخ،،،
أبي المحترم
إلى نبع العطاء و الكرم و السخاء،،،
أمي الموقرة
إلى أقرب من الروح ،،
زوجي المحب
وإلى سندي في هذه الحياة ،،
إخوتي الأعزاء
و إلى جميع من تلقَّيتُ منهم النصح والدعم و المساعدة

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Declaration

I, the undersigned, declare that I submitted the thesis entitled:

DRUG UTILIZATION PATTERN AMONG TYPE II DIABETIC PATIENTS IN PALESTINE

I declare that the work provided in this thesis, unless otherwise referenced, is the researcher's own work, and has not been submitted elsewhere for any other degree or qualification.

Student's Name:

محمد عبد الله محمد

Signature:

محمد

Date:

24/9/2023

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Abstract

Background: Diabetes mellitus is a type of frequent metabolic illnesses that leads to hyperglycemia from a number of different pathogenic pathways. Drug utilization studies on anti-diabetic agents is essential for encouraging responsible drug use and providing useful data for health planning.

Objective: This study aims to describe the drug utilization and the drug description pattern of Type 2 Diabetes Mellitus (T2DM) in Palestine and determine whether it follows the international guidelines of taking hypoglycemic medications in T2DM specially the initial drug prescribed after diagnosis with T2DM mainly in patients treated in diabetic health care centers in MOH.

Methods: A cross-sectional survey was conducted in patients treated in diabetic health care centers in Ministry of Health (MOH). The study participants were selected randomly, and 400 patients were interviewed from the diabetic clinics in the northern and middle areas of the West Bank, Palestine. All ethical guidelines were taken into consideration in this study.

Results: The results showed that 400 patients were interviewed, 138 (34.5%) were males and 262 (65.5%) were females. The mean age of the patients is 60 years old. The most initial drug prescribed for diabetic patients was metformin. The study's adherence showed that 68% of patients take their medicines as directed yet 24% occasionally forget. Also, vast majority of diabetic patients (about 90%) follow their prescribed medication regimen, taking the recommended dosage exactly as indicated and neither more nor less. Our analysis's findings indicated that there isn't a statistically significant difference in the way that metformin is prescribed in various areas. Glimepiride prescriptions, however, differed statistically significantly ($p=0.01$) throughout the areas that were visited.

Conclusion: Findings of the study have revealed that the most often used medication was metformin as initial therapy, followed by glimepiride. Combination treatment was

more frequently used. Therefore, steps may be taken to promote rational prescription by studying the present prescribing practices.

Keywords: Drug utilization review, Diabetes mellitus type II, oral hypoglycemic agents, hyperglycemia.

Chapter one

Introduction

1.1 Background

Among the quartet of significant non-communicable maladies, diabetes stands as a prominent member alongside cardiovascular diseases, cancer, and chronic respiratory conditions(1). Diabetes has a significant negative influence on mortality worldwide, accounting for anything from 6.8% of death in the Africa Region to a startling 16.2% in the Middle East and North Africa , contributing to 11.3% of total global fatalities(2). Worryingly, projections foresee a surge in diabetes prevalence within the Middle East and North Africa Region, with a projected increase of 13.3% and 13.9% over the subsequent 22 years, respectively(3).

Elevated blood glucose levels brought on by impaired insulin production, reduced functioning of insulin, or both of these elements make up the metabolic condition known as diabetes mellitus. This condition gives rise to hyperglycemia, a hallmark feature. The ramifications of diabetes are substantial, contributing to significant health complications such as blindness, kidney dysfunction, heart attacks, strokes, and even the necessity for lower limb amputations. Classic symptoms encompass frequent urination, excessive hunger, persistent thirst, and overwhelming fatigue, all of which collectively signify the presence of diabetes.(4,5).

1.2 Diabetes disease

Acute and chronic diabetic problems are its main side effects. Acute problems include dangerously high blood sugar levels and unusually low blood sugar as a result of diabetic treatments. Chronic complications are linked to blood vessel illnesses, both small and big, which can harm the heart, kidneys, eye, nerves, and nervous system(6, 7). Kidney failure is one of the most common complications of diabetes, although its prevalence varies throughout groups and is also influenced by how severe and long the condition has been(7, 8).

Polyuria, polydipsia, polyphagia, weight loss, and eyesight impairment may occur in people with severe hyperglycemia, particularly in children with complete insulin insufficiency. Asymptomatic diabetes is a condition that affects certain diabetics,

especially those with type 2 diabetes in its early stages. Untreated ketoacidosis or, less commonly, nonketotic hyperosmolar syndrome brought on by uncontrolled diabetes may induce stupor, coma, and, if left untreated, death.(9, 10, 11).

The complex etiology of diabetes mellitus involves environmental variables including obesity linked to current living standards, the constant flow of urban migration, and lifestyle changes together with genetic influences. Among other major contributing factors to this rise in T2DM in the Arab world are increased urbanization and a lack of exercise(12, 13).

Diabetes comes in three different forms: type 1, type 2, and gestational diabetes. Insulin-dependent diabetes, often known as type 1 diabetes, typically manifests during adolescent or infancy. The immune system accidentally targets and kills the pancreatic cells that make insulin, which is how it happens. Therefore, type 1 diabetics need insulin injections or an insulin pump to control their blood sugar levels.

Most often diagnosed in adulthood, type 2 diabetes is the most prevalent kind of the disease. When the body is unable to generate enough insulin to keep blood sugar levels within normal range or develops resistant to insulin, it leads to this condition. Obesity, sedentary activity, and unhealthy eating habits are all highly linked to type 2 diabetes.

Gestational diabetes affects pregnant women who have never had diabetes before. Hormonal changes during pregnancy can cause insulin resistance, leading to high blood sugar levels. Although gestational diabetes usually resolves after childbirth, affected women are at a higher risk of developing type 2 diabetes later in life(14, 15, 16).

The destruction of the pancreatic islets of beta cells and complete insulinopenia are two features of type 1 diabetes, which is one of the most prevalent chronic illnesses in children and whose incidence is increasing, especially in children under the age of five.(17). Particularly because of its chronic or long-term consequences, which commonly result in morbidity and dramatically decrease life expectancy, type 1 diabetes has a considerable influence on the general public's health(18). Type 2 diabetes, which has an obvious increase in morbidity and mortality in recent years, is a chronic, degenerative, incurable, but treatable illness that is thought to have one of the biggest impacts on the quality of life of the worldwide population. Additionally,

because of the variety of unpleasant effects it has on numerous organ systems, it is among the disorders that cause physical incapacity(19, 20).

Diagnosing diabetes can be accomplished through various methods, including the hemoglobin A1C criteria test (HbA1c) or plasma glucose concentration assessments like fasting tests or the 2-hour plasma glucose test[(21). Optimal blood glucose levels should fall within the range of 90 to 130 mg/dL, while the HbA1c measurement should ideally remain below 7%. Managing diabetes is a complex endeavor, necessitating a multifaceted approach to achieve effective disease management[30].

Furthermore, diabetes presents itself as a formidable challenge confronting global healthcare systems[6]. The prevalence of diabetes mellitus on a global scale is staggering, with an estimated 387 million individuals affected, and this number is projected to rise even higher to 592 million by the year 2035 among those aged 20 to 79 years. Notably, the International Diabetes Federation (IDF) reported a total prevalence of 366 million cases of diabetes in 2011, forecasting a substantial escalation to 552 million by the year 2030. (22).

Early death rates are higher in older diabetic patients with functional inability and having other diseases than patients without DM [(23). According to estimates, the illness caused 1.5 million fatalities in 2019 and that many in 2012. From the ages of 20 and 79, diabetes is considered to be a role in 4.2 million adult deaths.(2). As per the World Health Organization (WHO), around one million individuals lost their lives due to high blood sugar levels. Furthermore, the quality of life will be decrease with diabetic patients[8] .

1.3 Cost of Diabetes complications

The cost of diabetes diagnosis was estimated by the ADA to be \$327.2 billion in 2017 (24). The overall annual amount of \$403.9 billion includes the previously estimated amount for confirmed diabetes as well as the amounts for undiagnosed diabetes (7.9%, \$31.7 billion), but the prediabetes cost (10.7%, \$43.4 billion), and gestational diabetes mellitus cost (0.4%, \$1.6 billion). (25). Of this total, diagnosed diabetes made up 81.0% (25). In addition, related to average economic cost per person for gestational diabetes mellitus, confirmed diabetes, undiagnosed diabetes, and prediabetes was estimated to be \$5,800, \$13,240, \$4,250, and \$500, respectively. These estimates took into account

indirect costs resulting from lost productivity owing to linked Death and morbidity, as well as higher-than-expected medical costs, are all associated with diabetes and prediabetes. The fact that diagnosed diabetes has among of the highest medical expenditures shouldn't be shocking. (26, 27). The ability to situate the 2017 total medical and indirect expenditures inside the U.S. economy since the \$403.9 billion economic costs of diabetes and prediabetes constitute about 2.1% of the united states gross domestic product. (28).

1.4 Guidelines of diabetes treatment

As a result, many professionals are baffled about the best approaches for their patients. In order to review the data and develop guidelines for antihyperglycemic medication in non-pregnant individuals with type 2 diabetes, the American Diabetes Association (ADA) and the European Association for the Study of Diabetes (EASD) formed a joint task force Members of these two organizations (29)as well as other societies and federations have created a number of guideline (30, 31, 32, 33, 34). The need for an update was determined to be necessary, though, in light of the most recent knowledge regarding the advantages and risks of glycemic control, the efficacy and safety of several new drug classes(35, 36), the withdrawal or restriction of others, and the growing calls for a shift toward patient-centered care (37, 38).

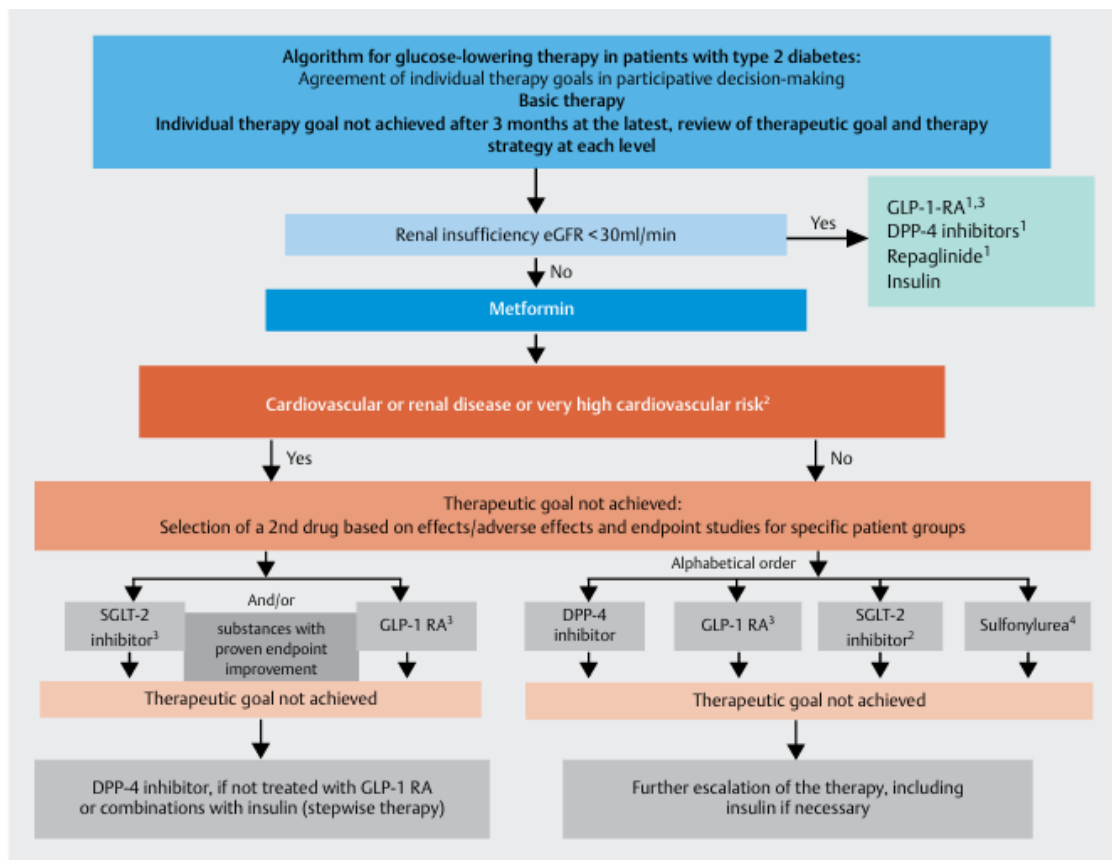
The gradual and step-by-step use of medications to treat diabetes is supported by the American Diabetes Association (ADA), American College of Endocrinology, and the American Association of Clinical Endocrinologists (AACE). This plan includes setting individual goals for the HbA1c measurement, which represents the average blood sugar levels. These goals depend on the particulars of each patient (along with their other illnesses) and the negative consequences of the medication, notably the potential for low blood sugar(39, 40).

The initial HbA1c goal for the majority of patients should be around 6.5%, according to AACE/ACE. This recommendation resulted from studies comparing different blood sugar-lowering strategies. They do emphasize the need for personalized treatment for each patient. Therefore, if a person has a short life expectancy, a history of very low blood sugar, or major medical issues, it may be reasonable to establish a goal higher than 6.5%, perhaps between 7% and 8%(39, 40).

In a manner similar to this, the ADA recommends that the majority of people who are not pregnant strive for a HbA1c goal of less than 7%. They claim that if it's safe, aiming for even lower levels (below 6.5%) may be considered. On the other hand, it could be OK to set less demanding goals, such as below 8%, for those who have already had very low blood sugar, aren't expected to live a long time, have advanced issues, have a number of other illnesses, or have had diabetes for a significant amount of time(39, 40).

Scheme 1

Algorithm for glucose-lowering therapy in type 2 diabetes(41)



Note: Landgraf R, Aberle J, Birkenfeld AL, Gallwitz B, Kellerer M, Klein H, et al. Therapy of Type 2 Diabetes. *Exp Clin Endocrinol Diabetes*. 2019;127(S 01):S73-s92.

The algorithm shown in Scheme 1. for controlling glucose-lowering therapy in people with Type 2 Diabetes uses a thorough strategy. The background material included in these practical recommendations outlines the therapeutic significance of each single medicine or pharmacological group. The criteria for therapy stratification include both adherence to the current European Society of Cardiology (ESC) definition of very high risk individuals as well as the indications in the relevant product inserts. The latter group consists of those who have cardiovascular disease (CVD) that has been clinically

or imaging-based confirmed. A history of acute myocardial infarction (AMI), acute coronary syndrome (ACS), different revascularization techniques, stroke, transient ischemic attack (TIA), aneurysm of the aorta, and peripheral arterial disease (PAD) are all considered clinical CVD. Significant plaque can be seen in coronary angiography or carotid artery ultrasonography during imaging-verified CVD. Patients with diabetes mellitus who additionally have organ damage and a CVD that has been detected by imaging are likewise considered to be at very high risk. People with severe chronic kidney disease (CKD), defined as a glomerular filtration rate (GFR) less than 30 ml/min/1.73 m², as well as those whose computed SCORE is 30 or higher, fall under this categorization. Evidence-based renal protection methods should also be taken into account. Remember that some people who have not had severe hypoglycemia might benefit from the sulfonylurea medication class. It is accepted that not all of the active ingredients in this group offer the same advantages. By taking into account the complexity of patient risk profiles and treatment responses, this algorithm offers a formal foundation for customizing glucose-lowering medication.(41)

1.5 Management of diabetes disease

Managing Diabetes can be achieved by the following:

- Blood Glucose Monitoring: It's crucial for diabetics to regularly check their blood sugar levels. A glucose meter may be used to do this at home. Individuals may make wise choices about their food, exercise, and medicine by monitoring their levels.(42).
- Medication: People with type 1 diabetes need to use an insulin pump or administer daily insulin injections. Medication may be administered for type 2 diabetes to increase insulin sensitivity or reduce blood sugar levels. Healthcare experts decide the exact treatment strategy based on each patient's requirements.(43).
- Healthy Eating: Adopting a balanced diet is crucial in managing diabetes. Emphasize whole grains, lean proteins, fruits, vegetables, and healthy fats. Limit the consumption of sugary foods, refined carbohydrates, and saturated fats. Meal planning, portion control, and carbohydrate counting can assist in maintaining stable blood sugar levels(44).
- Regular Physical Activity: Engaging in regular exercise helps improve insulin sensitivity and can assist in weight management. Aim for a combination of aerobic

exercises (e.g., brisk walking, swimming) and strength training. Consult a healthcare professional before starting an exercise routine, especially if there are any existing complications(45).

- Diabetes Education and Support: Education about diabetes management, including self-care practices, is crucial. Diabetes support groups, counseling, and educational programs can provide valuable information and emotional support. These resources help individuals navigate the challenges of living with diabetes and promote a better quality of life(46).

1.6 Risk factors of diabetes mellitus

Furthermore, there are several risk factors for DMT2 include:

- Genetic Influences: Type 2 Diabetes (T2DM) development is significantly influenced by genetic factors. T2DM often involves changes to many genes and appears in a polygenic way. Additionally, there are less common cases of diabetes called monogenic diabetes that result from single-gene mutations. It's critical to distinguish these situations from Type 1 Diabetes (T1DM), highlighting the need of a precise diagnosis for the right course of therapy(47).
- Environmental Factors: New insights into the evolution of T2DM emphasize the interaction between lifestyle choices and the dynamics of the gut microbiota, which results in microbiome dysbiosis (48). This change in microbiota composition alters the way the intestinal barrier works and sets off signaling and metabolomic pathways related to insulin resistance(47).
- Age: T2DM, which was formerly only seen in adults and the elderly, has changed as a result of changing body composition, slowed sugar metabolism, and declining physical activity (49). Because of the alarming rise in obesity rates and the subsequent prevalence of diabetes even in youngsters, recent years have seen a reduction in the average age of onset(47).
- Obesity: According to standard definitions, obese people have a body mass index (BMI) of 30 kg/m² or more (50). The risk of diabetes is mostly influenced by increased adipose tissue. When extra fat gathers around the abdomen, the relationship between adipose percentage and insulin-resistant cells is very strong. Obesity is a common condition among T2DM patients, however it is not a necessary condition for the development of diabetes(47).

- Lack of physical fitness: T2DM risk is increased by a sedentary lifestyle. Exercise has several benefits, including helping you manage your weight and helping to regulate your blood sugar levels(51).
- Hypertension and High Triglyceride Levels: Insulin resistance is often linked to hypertension and high triglyceride levels, which increases the risk of developing diabetes(47).
- Smoking: Smoking increases the risk of diabetes and is linked to other illnesses including cancer and cardiovascular disease(52).

1.7 Anti diabetic medication

Effective type 2 diabetes treatment must include personalized glucose goals and glucose-lowering medications. Diet, exercise, and education should always be the cornerstones of any treatment program in order to provide a strong foundation. Metformin is regarded as the best option as a first-line medication unless there are certain contraindications. Beyond metformin, there is little information available to guide choices for other therapies. In these circumstances, a combination of 1-2 more oral or injectable medications may be thought of in an effort to reduce side effects as much as feasible. Some people may eventually need insulin therapy as the illness worsens, either by alone or in conjunction with additional drugs, to keep their blood sugar levels under control. All treatment choices must be made with the patient's preferences, requirements, and values in mind, with a focus on collaborative decision-making to develop a personalized plan of care.(53)

Several kinds of anti-diabetic medications, such as oral hypoglycemic agents (OHA) and insulin, are now used to treat diabetes. Each of these medications works in a different way to lower blood glucose levels and maintain good glycemic control(6, 54).

Although the anti-diabetic medications now in use are quite effective, there is insufficient management of hyperglycemia due to patient non-compliance, clinical inertia, insulin resistance, lack of exercise, and lack of nutritional control(55, 56, 57, 58, 59, 60, 61, 62, 63).

Metformin is the preferred as initial pharmacologic agent for the treatment of type 2 diabetes(64, 65, 66). It is most commonly used as the first-line therapy for type 2 diabetes also known as a biguanide; it works by lowering the production of hepatic

glucose. It been suggested that the combination of metformin and another agent tends to be more effective than any other monotherapy or combination therapy. Combination therapies are associated with an increased risk of adverse effects compared with monotherapy(65).

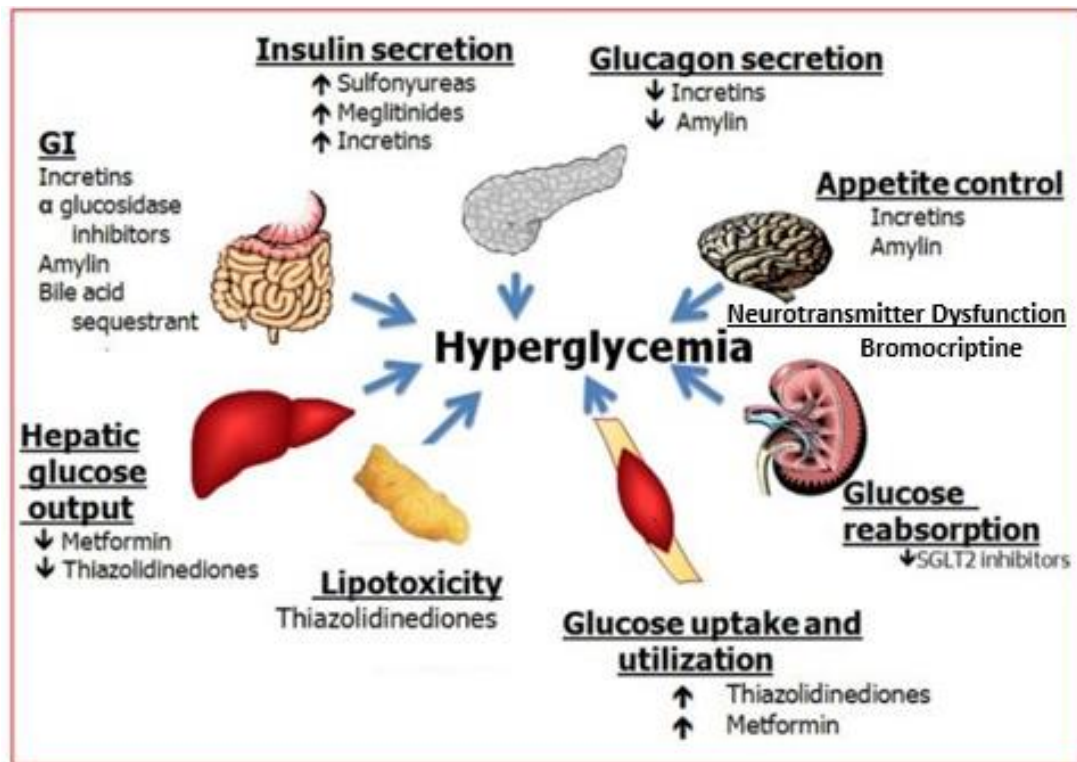
While sulfonylureas being the most common class, researchers noticed that metformin was the most often given individual OHA, with a prescription rate of 31.65 percent, which is consistent with previous research(67, 68, 69, 70, 71).

The American college of medicines strongly recommends metformin as oral monotherapy drug and a sulfonylurea, a thiazolidinedione, sodium-glucose cotransporter type 2 inhibitor (SGLT2) and dipeptidyl peptidase-4 inhibitor (DPP4) as other agents combined with metformin to lower the blood glucose level(72). Similarly, the American association and European association for the study of diabetes e ensured that the initial drug of choice for diabetes mellitus type 2 is metformin(73).

Patients with Type 2 Diabetes Mellitus (T2DM) experience hyperglycemia due to a variety of abnormalities (9). Consequently, the pharmacological interventions designed for T2DM treatment exhibit diverse mechanisms aimed at reducing glucose levels. The intricate interplay of these mechanisms is depicted in Figure 2, illustrating the multiple sites of action targeted by these therapies. This multifaceted approach highlights the complexity of T2DM management, as medications work on different pathways to collectively achieve glycemic control. Understanding these various modes of action is crucial for tailoring treatment strategies to individual patients and optimizing their overall diabetes management(74).

Scheme 2

Sites of action for pharmaceutical therapies used to treat type 2 Diabetes (74).



Note: Feingold KR, Anawalt B, Boyce A, Chrousos G, Dungan K, Grossman A, et al. Oral and injectable (non-insulin) pharmacological agents for type 2 diabetes. Endotext South Dartmouth (MA). 2020.

1.8 Drug utilization review (DUR)

Drug Utilization Review (DUR), characterized as a structured approach, serves as a valuable tool for appraising the quality of medication therapy. This method involves the systematic evaluation of patient drug usage, prescription dispensing practices, and drug prescription patterns against established criteria. DUR provides a means to meticulously analyze and scrutinize data related to drug consumption, ensuring that medications are being used in an appropriate and beneficial manner. As a potent investigative technique, DUR plays a pivotal role in discerning the role and impact of drugs within society, guiding healthcare professionals, policymakers, and stakeholders in optimizing medication use and ultimately enhancing patient care outcomes. (75).

Insights into the effectiveness, efficiency, and safety of medication use can be gained from (DUR)(76, 77, 78, 79, 80, 81), which also helps to set priorities for the wise allocation of healthcare budgets(82). DUR also looks at the effects of pharmaceutical

policies, such as those that aim to reduce self-purchasing of medicines (the practice of buying medications without a prescription) when appropriate(83, 84). DUR is a crucial component of pharmacoepidemiology because it describes the range, nature, and factors that influence drug exposure(85), which can be connected to outcomes(86).

A wealth of antidiabetic drug utilization studies published across global medical journals holds the potential to significantly benefit individuals managing diabetes mellitus (DM) by promoting rational medication use. These studies not only bring to light instances of illogical prescription practices but also offer invaluable insights into the current therapeutic approaches being employed. The intricate nature of DM, coupled with its often coexisting conditions like hypertension, renders individuals more susceptible to polypharmacy and, at times, inappropriate medication prescriptions. This complexity arises from the challenges of addressing multiple health concerns within a single patient, such as those with DM, leading to a heightened likelihood of multiple drug usage. By leveraging the insights from these studies, healthcare providers and patients alike can make more informed decisions regarding medication management, thereby enhancing the overall quality of diabetes care.(87, 88).

According to research conducted in the Arab area, the prevalence rates of diabetes mellitus (DM) among persons aged 20 to 79 were respectively 20.2%, 20.1%, 20.2%, and 19.9% in Qatar, Kuwait, Lebanon, and Bahrain (89).

Several studies have been performed regarding the prescribed treatments of diabetic patients worldwide. In southern Italy the prescription pattern of anti-diabetic treatment in elderly people showed increasing in prescribing metformin (18.2% in 2010 to 23.7% in 2014), while decreasing in using sulfonylurea (from 11.0% in 2010 to 7.2% in 2014 (90).An epidemiological study in India, clarified that the utilization of metformin was 22.83 %, which is the highest oral hypoglycemic drug prescribed among cross sectional study of 250 cases of diabetic patients type 2(91). In England, the preference for metformin as the initial choice for first-line therapy has been consistent since 2001. However, there have been variations in practice across different regions when it comes to the addition of second-line oral medications if needed(92).

1.9 Diabetes in Palestine

With a frequency of 9.1% in patients aged 20 to 79 years, diabetes mellitus is regarded as the fourth most common cause of death in Palestine and is expected to reach 20.6% by 2020. An increased risk of acquiring type 2 diabetes (T2DM) and its consequences is linked to lifestyle changes and uncontrolled glucose levels.(13)

About 29.8% of diabetics in primary health care clinics in the West Bank are treated with insulin only, and about 5.2% of diabetics have a mixed treatment regimen of hypoglycemic agent and insulin. The study shows that 57.9% of patients rely on anti-diabetic pills, only 7.1% of diabetes patients in the West Bank rely on diet and lifestyle changes. However, 66.5% of diabetes patients in the West Bank have poor diabetes control (93)

1.10 Objectives of the study

This study aims to describe the drug utilization and the drug description pattern of Type 2 Diabetes Mellitus (T2DM) in Palestine and determine whether it follows the international guidelines of taking hypoglycemic medications in T2DM specially the initial drug prescribed after diagnosis with T2DM mainly in patients treated in diabetic health care centers in MOH. The objectives in our study is to describe the prescribing behavior among patients with T2DM treated in diabetic health care centers in MOH in different districts. The study will involve a comprehensive review and analysis of the prescribed anti-diabetic medications, with a particular emphasis on their alignment with international guidelines for diabetes management. Additionally, the research will delve into the extent of patient compliance and adherence to the prescribed drug regimens. The analysis will encompass various statistical approaches, including descriptive analysis, which will provide an in-depth overview of the prescribing practices. Furthermore, the study will investigate potential variations in prescription behaviors between general practitioners (GPs) and specialists, shedding light on any discernible differences. Moreover, the research will explore discrepancies in prescription patterns across different healthcare centers and cities, aiming to identify regional variations. Overall, this study holds the potential to enhance our understanding of diabetic treatment approaches, patient adherence, and the factors influencing prescription decisions, ultimately contributing to more effective diabetes management strategies.

To date, there exists a notable gap in published research concerning the prescribing patterns and utilization of anti-diabetic medications within the context of Palestine. This study marked a pioneering endeavor, being the inaugural effort to meticulously examine and assess the prescription practices related to Type 2 Diabetes patients in Palestine. The study's primary objective was to offer a comprehensive situational analysis, shedding light on the prevailing scenario of prescribed medications for individuals with Type 2 Diabetes in the region. The findings of this study hold significance not only in their immediate implications but also extend to providing essential insights and recommendations for decision-makers and policy shapers, including influential entities like the World Health Organization (WHO) and the Ministry of Health (MOH). By addressing this research gap, the study aims to contribute to the enhancement of healthcare practices and policies, ultimately fostering better diabetes management and patient care within Palestine.

Chapter two

Methodology

2.1 Study context

The present study was carried out within the diabetic clinics operated by the Palestinian Ministry of Health (MOH) in the northern and middle regions of the West Bank, encompassing areas such as Ramallah, Nablus, Tulkarm, Salfit, Qalqilia, and Tubas. This research was conducted with the official authorization of the MOH. The study population consisted of four hundred patients diagnosed with Type 2 Diabetes Mellitus (T2DM) who were undergoing treatment at the MOH diabetic clinics. Prior to the interviews, each patient provided informed consent, indicating their willingness to participate. This ethical procedure ensured that the patients were fully aware of the study's objectives, methods, and potential implications before their participation.

2.2 Study design

From March 2021 to October 2022, a comprehensive cross-sectional survey was meticulously carried out across various cities in the West Bank, Palestine. The survey was specifically conducted within the diabetic clinics situated within the facilities of the Palestinian Ministry of Health (MOH).

2.3 Sampling method

For the purpose of this study, participants were selected from the pool of patients attending the diabetic clinic through a randomized sampling approach. On each occasion, an average of three patients were interviewed, collectively amounting to a total of 400 patients who were included in the study. They were chosen randomly upon convenience sampling method. I chose patients randomly, and some of them were waiting for their turn to dispense medicines, waiting for their appointment with the doctor, or waiting for the results of their laboratory tests. The distribution of these participants across different locations within the West Bank was as follows: Tubas (70 patients), Ramallah (71 patients), Tulkarm (67 patients), Salfit (49 patients), Qalqilia (70 patients), and Nablus (73 patients). This balanced representation across various

cities ensured a diverse and comprehensive sample that captures a range of perspectives and experiences within the population under investigation.

2.3 Study tool

The thorough questionnaire was developed using data from numerous studies (94, 95) . to ensure relevance from previously published and validated research carried out globally. The majority of the generated questions were then modified to meet the regional situation.

An English language expert was consulted for proofreading and to verify the accuracy of the questionnaire's words and terms prior to its final submission, which is included in Appendix A.

In order to accommodate the native language of the participants, Arabic, the questionnaire was subsequently translated into Arabic Appendix B.

Similar to the English version, an Arabic language expert was recruited to examine, revise, and ensure that the Arabic questionnaire's terms and vocabulary were accurate.

The survey encompasses five distinct sections: general information, medical history, treatment details, adherence and compliance assessment, as well as additional general inquiries. This comprehensive structure aims to collect a holistic range of data to effectively explore and analyze the various dimensions of the research topic. It included in the first section (general information): Age ,Gender. Education level, Status, Weight, and Location.

The second section evaluated the patients' medical histories by inquiring whether they had suffered from other diseases. In this section there were other queries regarding diabetes disease history, including the date of initial diagnosis and glucose readings at the time of initial diagnosis and last measurement. In addition, it asked if they smoke, how often they check their blood glucose, if they routinely monitor their blood glucose, if their blood glucose is under control, and if they visit the doctor regularly.

The third part of the questions indicated whether the doctor is a general practitioner or a specialist, the medications described by the physician since the onset of T2DM, and any other diabetic medications recently described or removed early. In addition, section three asked whether the patient is taking any other medications or dietary supplements, and they were asked to mention them. Probability of stopping the diabetic medicine condition were tested by asking the patient if he asked the doctor to stop taking the

medicine or the doctor advise the patient to stop it according to options described briefly. The patient medication stopping reasons options were cost, side effect, deciding to stop the medicine or to take less medication.

The fourth section examined patient adherence and compliance. They select never, sometimes, frequently, or always in response to the following questions: forgetting to take medication, taking medication on time, missing medication when feeling fine, not taking medication due to running out, forgetting to take medication while traveling, and whether they are taking more or less medication without consulting their doctor.

Last part the patient was asked two general questions (How well does this drug work for you?) and (How much does this drug bother you?). These questions were asked in order to determine whether the patient was satisfied with the treatment provided, which was based on his general state of health.

2.4 Population

Diabetic patients receiving treatment for T2DM in the MOH clinics in northern and central regions of the West Bank in Palestine.

Inclusion criteria

- Any adult patient attending MoH clinic age above 18 years old .
- Diabetic patients undergoing treatment for T2DM in the MOH facilities in the northern and central West Bank of Palestine.

Exclusion criteria

- Diabetic patients receiving T2DM treatment in a hospital or a clinic other than the MOH diabetic clinics.
- T2DM living outside of the West Bank.
- Those who, for some reason, do not finish the survey interview (These patients were in a hurry, or it was their turn to see the doctor or to do medical test).
- Diabetic patients with other type of diabetes rather than type II.

2.5 Sample size

To establish an appropriate sample size, the RaoSoft, Inc. sample size calculator was employed as a reference point. The population size, representing the number of individuals with diabetes in the West Bank, was considered with a 95% confidence level and a specified margin of error of 5%. This analysis yielded a suggested sample size of 375 individuals. To account for potential factors like incomplete responses, non-responses, and errors in questionnaire completion, the researcher opted to increase the sample size by 10%. This pragmatic approach was taken to ensure the robustness of the data collected. Consequently, the final sample size was adjusted to encompass 400 participants, a number that provides an ample buffer to address any possible instances of missing data or non-response rates during the study.

2.6 Validity and reliability

The questionnaire's content validity underwent a rigorous evaluation and validation process conducted by experts well-versed in the subject matter. These experts carefully examined the questionnaire, making necessary adjustments to ensure that the questions accurately and comprehensively addressed the research topic. To assess the internal consistency of the questionnaire, Cronbach's Alpha (CA) was employed, resulting in a noteworthy score of 0.85. This high internal consistency coefficient reinforces the reliability and coherence of the questionnaire's items, indicating that the questions collectively contribute to a cohesive assessment tool.

2.7 Statistical analysis

Data analysis was carried out employing the Statistical Package for Social Sciences (SPSS) version 21. A comprehensive analysis was conducted, beginning with a descriptive examination of both participant characteristics and questionnaire responses. For categorical variables, frequencies and percentages were computed, while numerical variables were summarized using means and standard deviations, or medians as applicable. In order to assess statistical significance, Pearson's Chi-Square test and Analysis of Variance (ANOVA) were performed.

2.8 Ethical consideration

All procedures undertaken in this study strictly adhered to pertinent guidelines and regulations. Approval for the study was granted by the Institutional Review Board (IRB) of An-Najah National University, with an archived approval number of Mas.12.2020/1, as documented in Appendix D. The utilization of the data was solely confined to research purposes. Prior to their participation, participants were provided with a clear understanding of the study's core objectives and relevance. Furthermore, informed consent was sought and obtained from all individuals involved in the study. These measures collectively ensure that ethical considerations were rigorously upheld, safeguarding the rights, well-being, and privacy of the study's participants.

Chapter Three

Results

3.1 Sociodemographic data of study population

A cross-sectional study involving 400 patients, ages 26 to 95, was conducted. There were 262 female and 138 male patients, and they were all T2DM patients. 18(4.5%) people were single, 370(92%) were married, 1 (0.3%) was divorced, and 11 (2.8%) were widowed. There were also 70(17.5%) people from Tubas, 70(17.5%) from Qalqilia, 67 (16.8%)from Tulkarm, 73 (18.3%) from Nablus, 71 (17.8%)from Ramallah, and 49(12.3%) from Salfit. The majority of the patients, 322 patients, finished high school, 33 finished university, 7 got a diploma, and 37 were not educated. Of the 400 participants, only 85 were smokers. The average age for the study population was 60 years old. The ages of the patients were between 26 and 95. The detailed results are shown in Table 1.

Table 1

Sociodemographic data of study population

Marital status	Frequency	Percent
Single	18	4.5
Married	370	92.5
Divorced	1	0.3
Widow	11	2.8
Place of residence	Frequency	Percent
Tubas	70	17.5
Qalqilia	70	17.5
Tulkarm	67	16.8
Nablus	73	18.3
Ramallah	71	17.8
Salfit	49	12.3
Education level	Frequency	Percent
High school	322	80.5
University	33	8.25
Diploma	7	1.75
Not educated.	37	

3.2 Clinical characteristics of the study population:

There were 324 (81%) diabetic patients who also had other diseases in addition to diabetes. However, 76 (19.0%) individuals had diabetes type 2 as their only illness. The results show 36 (9.0%) of them had hyperlipidemia, making up the greatest percentage of those with hypertension at 133 (33%) overall. A heart diseases condition affected 10 (2.5%) of the total patients. The combined disease prevalence of hypertension and heart disease was seen in 23 (5.7%) of patients while hypertension and hyperlipidemia combined was seen in 55 (13.8%) of patients. **Table 2** listed the frequency of other ailments experienced by the diabetic patients that were surveyed.

Table 2

Other associated diseases with the study population

Diseases	Frequency	Percent
Hyperlipidemia	36	9.0
Hypertension	133	33.3
Heart disease	10	2.5
Hypertension & hyperlipidemia	55	13.8
Hypertension & heart disease	23	5.7
Hypertension, heart disease & hyperlipidemia	13	3.3
Hypertension & Kidney disease	4	1.0
Hypertension & hyperlipidemia and arthritis	5	1.3
Others	45	11.0
None	76	19.0

3.3 Glucose levels monitoring of interviewed diabetic patients:

The patients' glucose levels were taken the first since they were given a diagnosis of type 2 diabetes and, if they cannot recall it then the data was considered missing data. The average of the most recent reading in the table below indicates that the glucose level is still not under control.

When the patients' most recent blood sugar level conducted by patients themselves at home or in a medical facility was inquired; the average test result of fasting blood sugar was 189.6 mg/dL. However, 108 of the patients either forgot to do the test or did not recall the exact result. The results of the most recent glycated hemoglobin (HBA1c) test revealed to be 8.07%. The average time (days) to the patients for checking their blood glucose was about 2 months (51.5 days). The detailed results are shown in **Table 3**.

Table 3

Glucose monitoring in interviewed patients

	Last glucose test done (days)	Last fasting glucose test reading (mg/dL)	last. HBA1c reading
No Valid	370	292	125
No Missing	30	108	275
Mean	51.5730	189.6062	8.0760
Minimum	1.00	60.00	5.30
Maximum	539.00	600.00	14.00

Moreover, 87,5% (350) patients regularly monitored their blood glucose levels. However, the results indicated that the patients did not accurately assess their own performance, as 47% of them responded negatively when asked if their blood sugar was under control.

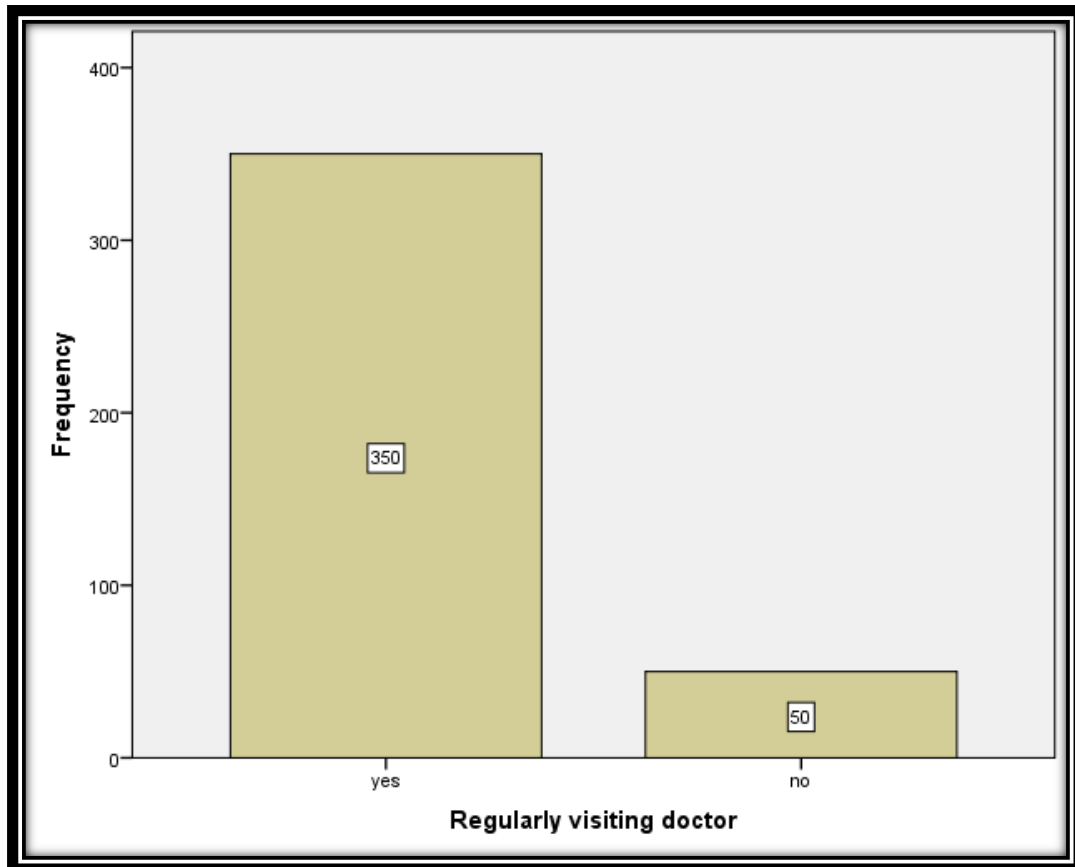
Monitoring blood sugar regularly is an essential aspect of managing diabetes. If the result indicates that 87.5% of patients regularly monitor their blood sugar, then the vast majority of patients in the study or population are actively engaged in self-monitoring of blood sugar.

Depending on the study or population under consideration, the proportion of patients who monitor their blood sugar can vary. However, an adherence rate of 87.5% indicates

a relatively high level of blood sugar monitoring engagement, which is encouraging for the effective management of diabetes. (Figure 1).

Figure1

Number of patients who regularly visit the doctor or not



All the patients who were interviewed were seen by the general doctor (GP). GPs are trained to handle a wide range of medical conditions, but they may not have the same level of expertise as specialists in specific areas. The fact that all the patients interviewed were seen by a general doctor (GP) and not a specialist can indeed be considered a weakness in the study. Specialists have advanced knowledge and expertise in specific medical fields, which allows them to provide more in-depth and specialized care for certain conditions or diseases. Specialists often have access to specialized diagnostic tools, treatments, and therapies that can provide more accurate and targeted care for

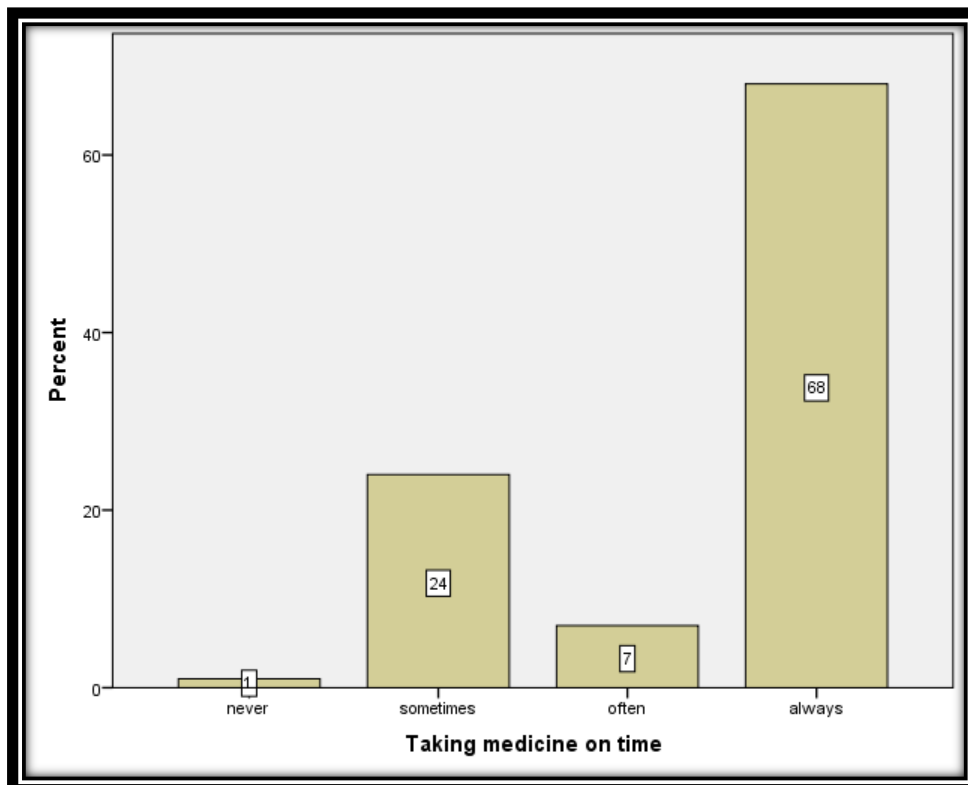
3.4 Adherence and compliance of diabetic patients:

Adherence and compliance to medication refer to the extent to which patients follow their prescribed treatment plans as instructed by healthcare professionals. It is a crucial aspect of successful medical treatment and can significantly impact the effectiveness of medications in managing various health conditions.

The study's results indicating that 68% of patients take their medications as prescribed, but 24% occasionally forget to take them, can indeed be influenced by the number of medications they are prescribed (Figure 2). Taking multiple medications can increase the complexity of medication regimens, making it more challenging for patients to adhere to their prescribed treatment plans. When individuals have to manage multiple medications, they may face difficulties in organizing and remembering each medication's specific instructions and schedule. This can lead to occasional forgetfulness or unintentional non-adherence to the prescribed medication regimen.

Figure 2

patients answers for taking the medicine on time



The findings suggest that diabetes patients are more likely to remember and continue taking their medications when they are feeling well (Figure 3). Contrary to expectations, feeling good actually increases the proportion of patients who adhere to their medication regimen. Specifically, the rate of medication adherence rises to around 80% when patients are in a state of well-being.

This information is valuable because medication adherence is crucial for effectively managing diabetes. It indicates that patients may be more motivated to follow their prescribed treatment when they experience positive health outcomes or an absence of symptoms.

Figure 3

Patients answers for missing medicine when feeling well

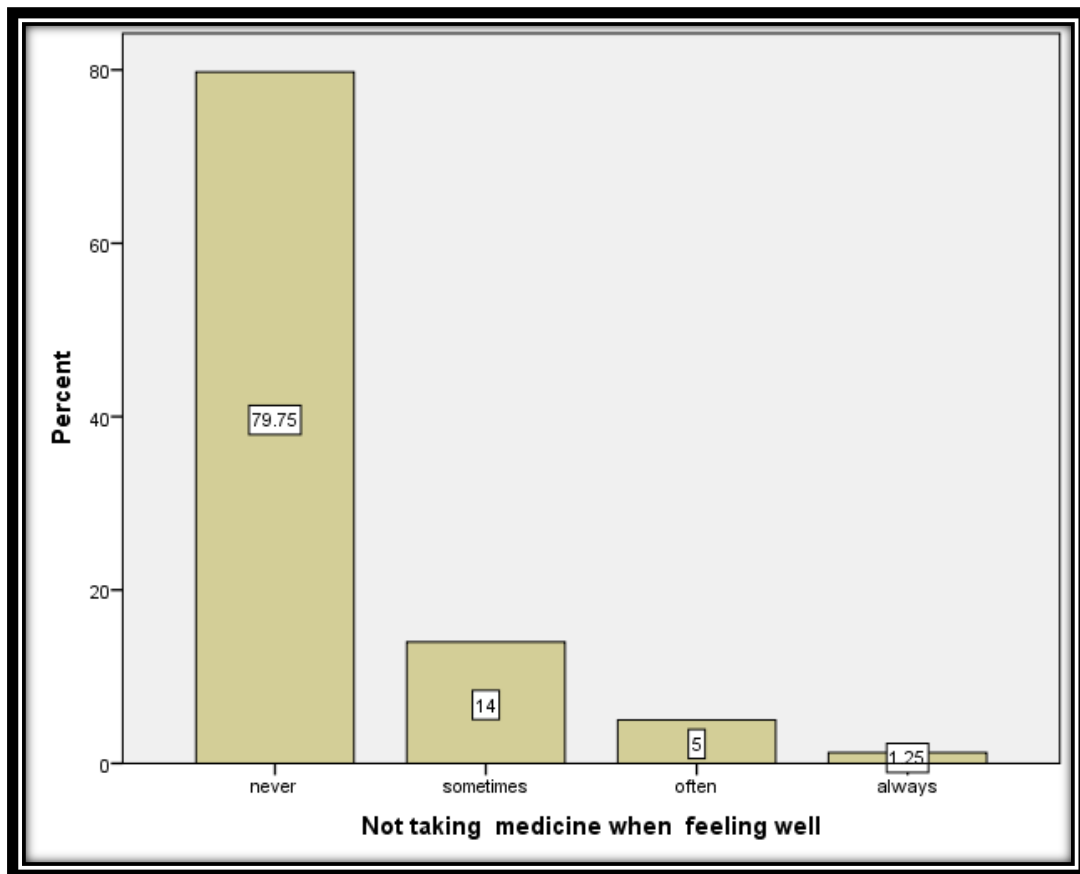
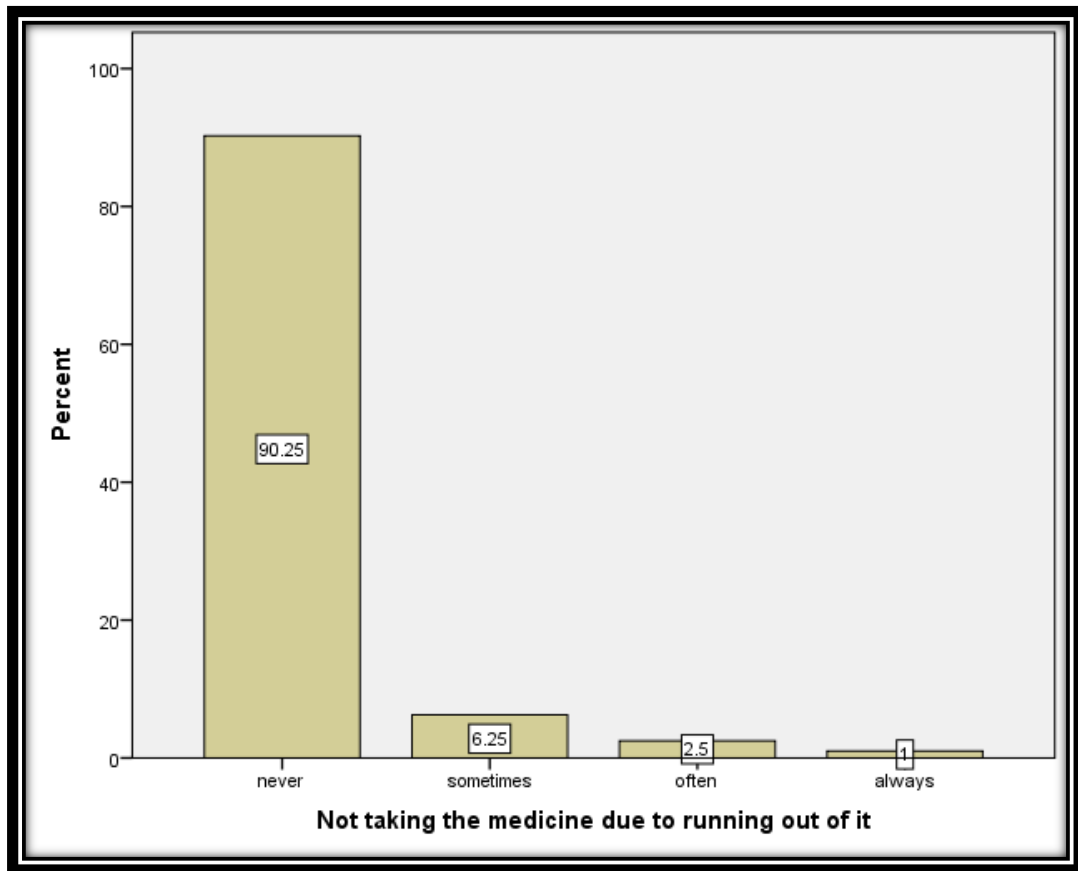


Figure 4

Patients answers for not taking the medicine due to running out of it



The results indicate that a significant majority of diabetes patients (approximately 90%) adhere to their prescribed medication regimen by taking the exact dose as directed neither more nor less than the prescribed (Figures 5 &6). This finding suggests that most patients are careful about following their healthcare provider's instructions and are neither taking more nor less medication than prescribed .

Figure 5

Patients answers for if they taking more dose than the doctor prescribed

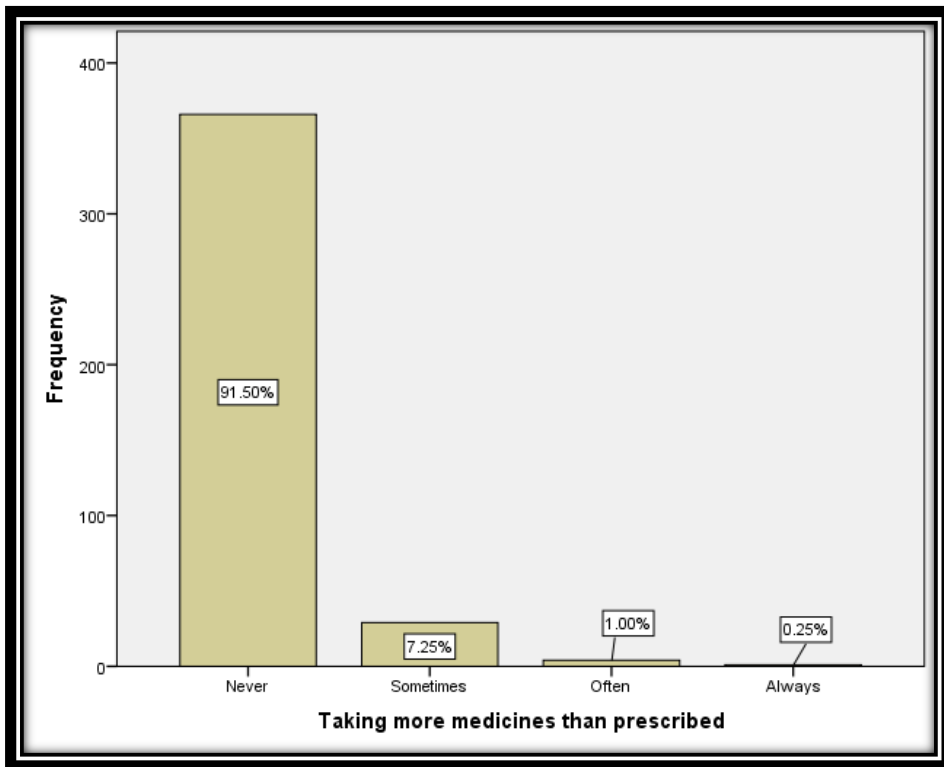
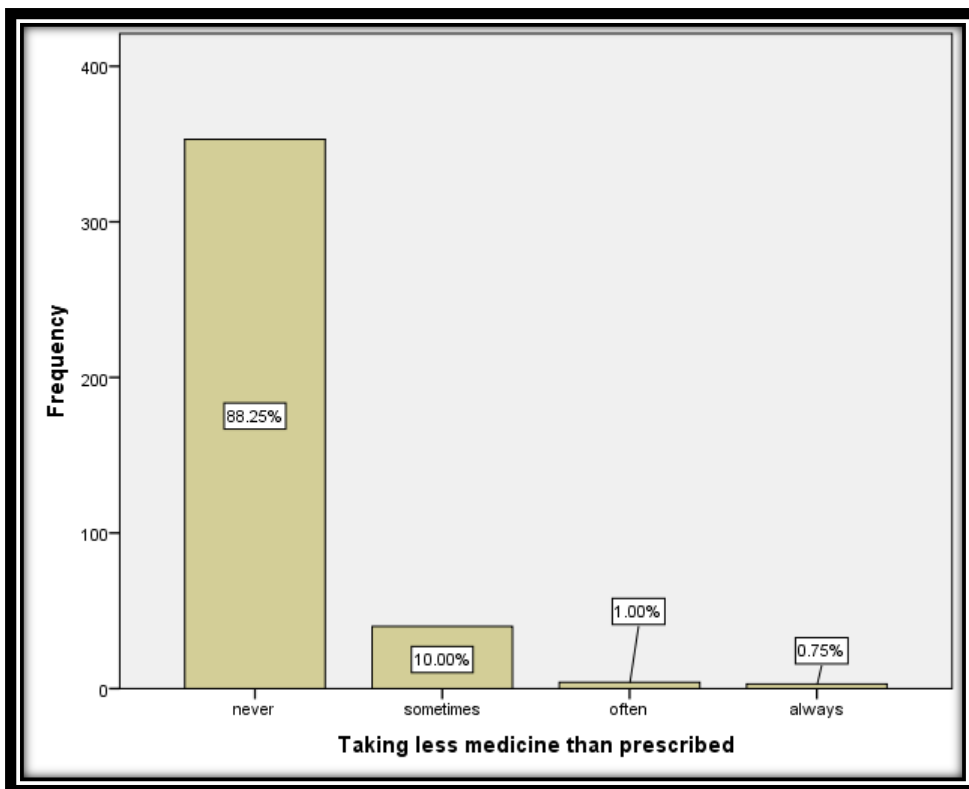


Figure 6

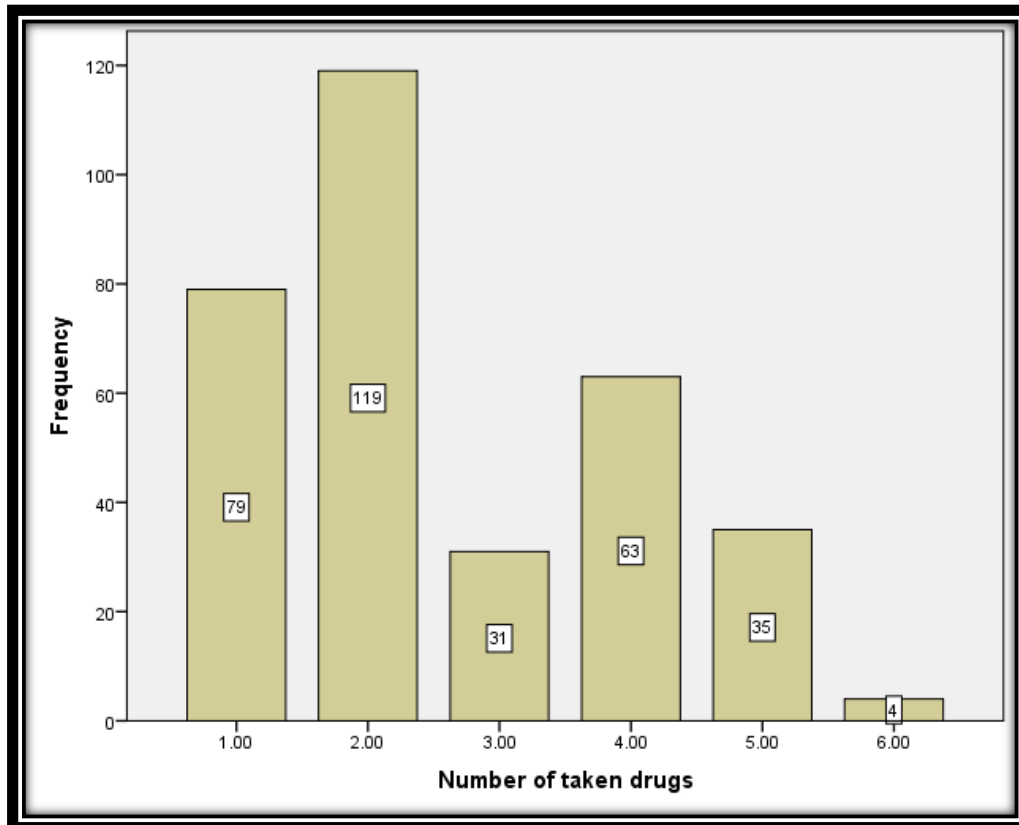
patients answers if they taking less dose than the doctor prescribed



The findings indicate that, of the 400 patients who were interviewed, the biggest percentage (29.7%, 119 patients) use two medicines for DM. Meanwhile, 79 of the individuals surveyed only take one medication. However, 63 people use four medicines, making up 15% of those who are subtly high, and (10%, 39 patients) take more than five drugs (Figure 7).

Figure 7

Number of taken medicines



Several factors, such as regional treatment guidelines, the availability of various medications, the prevalence of comorbidities, and the healthcare practices of the treating physicians in each region, may influence these differences in drug utilization patterns.

Our findings indicate a significant association between the number of medications a patient takes and the likelihood of administering them on time. A significant value ($p < 0.05$) for the Pearson test, indicating a statistically significant association between the number of medications consumed and the likelihood of taking the substance at the appropriate time.

In addition, the results indicate that 77% of those who are prescribed a single medication always take it on time. In contrast, only 45% of those who are prescribed more than five medications always take them on time. The detailed results are illustrated in (Table 4).

Table 4

number (percentages) of patients taking medicine on time

Number of taken drugs	Taking medicine on time			
	Never	Sometimes	Often	Always
1.00	2 (2.5%)	14 (17.7%)	2 (2.5%)	61(77.2%)
2.00	0 (0.0%)	27(22.7%)	10 (8.4%)	82(68.9%)
3.00	0(0.0%)	14(45.2%)	4(12.9%)	13(41.9%)
4.00	0(0.0%)	16(25.4%)	3(4.8%)	44(69.8%)
5.00	2(5.7%)	12(34.3%)	5(14.3%)	16(45.7%)

The study findings underscore the importance of addressing these factors to improve medication adherence and overall disease management in patients with multiple chronic conditions. Healthcare providers should consider these challenges and work collaboratively with patients to develop personalized treatment plans that address their specific needs and barriers to adherence. Patient education, clear instructions, medication reminders, regular follow-up visits, and support systems can all play crucial roles in promoting adherence and ultimately improving health outcomes for these individuals.

Cross-tabulation analysis revealed that a higher percentage (72%) of metformin users reported feeling well. The detailed results with the satisfaction values are illustrated in Table 5. However, the proportion of people using sitagliptin and reporting great health was lower, at 67.5%.

This evidence suggests that taking current generation oral hypoglycemic pills rather than first generation antidiabetic medications does not necessarily result in a patient's overall health being improved

Table 5*Perception of people taking metformin*

	Count	Percentage
Not at all well	12	3.6%
Moderately well	73	22.1%
Very well	240	72.5%
don't know	6	1.8%

It's important to note that this evidence indicates an association between medication use and self-reported feelings of well-being, but it does not establish a causal relationship. There could be various factors at play that influence how patients perceive their health status while taking different medications. Factors like individual patient responses to medications, specific health conditions, medication adherence, lifestyle habits, and other co-existing medical issues can all impact how patients feel while on a particular medication(127, 128).

3.5 Prescribing behavior towards diabetes type 2

Based on the analysis of the data, it appears that the percentages of prescribing medications in the districts visited were comparable, as shown in the Table 6. The Chi-square test performed on the prescribing patterns of these medications revealed no statistically significant differences ($p=0.305$), indicating that the distribution of most drugs across districts was comparable.

Table 6*Percentage of patients prescribed Metformin in different districts*

Place of residence	Percent	Frequency
Tubas	18.4%	64
Qalqilia	18.1%	63
Tulkarm	16.1%	56
Nablus	17.0%	59
Ramallah	17.5%	61
Salfit	12.9%	45
Total	100.0%	348

However, prescribing of glimepiride varied statistically significantly between the visited districts ($p=0.01$). This indicates that glimepiride prescription rates varied substantially between districts, suggesting that factors unique to each district may be influencing prescribing patterns for this drug. The percentages and frequency of glimepiride prescription is illustrated in Table 6.

Table 7

Percentage of patients prescribed Glimepiride in different districts

Place of residence	Percentage	Frequency
Tubas	13.3%	11
Qalqilia	25.3%	21
Tulkarm	16.9%	14
Nablus	7.2%	6
Ramallah	25.3%	21
Salfit	12.0%	10
Total	100.0%	83

Sulfonylurea therapy, which has been used for a long time, can cause low blood sugar, especially in older and sicker patients. The risk depends on the type of sulfonylurea medication(129). A study in Germany found that severe low blood sugar events happened between 0.9 and 5.6 times per 1000 patients per year(130). These medications can also make people gain weight. Some studies (but not conclusive) suggest that sulfonylureas may increase the chance of heart problems more than metformin(131, 132, 133, 134, 135). These medications may also stop working faster than metformin(136). Repaglinide is another option for patients with kidney problems, but it has similar side effects as sulfonylureas and works for a shorter time(137).

The study results of the treatment and outcomes for patients with type 2 diabetes mellitus (T2DM) in Table 7 showed that Metformin was the most commonly prescribed initial medication for T2DM patients, accounting for 87% of prescriptions. Other medications prescribed included glimepiride (25.3%), Glibenclamide (10.0%), insulin (5.3%), sitagliptin (3.0%), and vildagliptin/metformin (1.0%). Interestingly the Pearson Chi-square test showed no significant difference in glucose levels of diabetic patients based on the type of medication they were taking. This suggests that various types of

medications used by diabetic patients had no statistically significant effect on their glucose levels.

Table 8

Initial drug prescribed for the diabetic patients

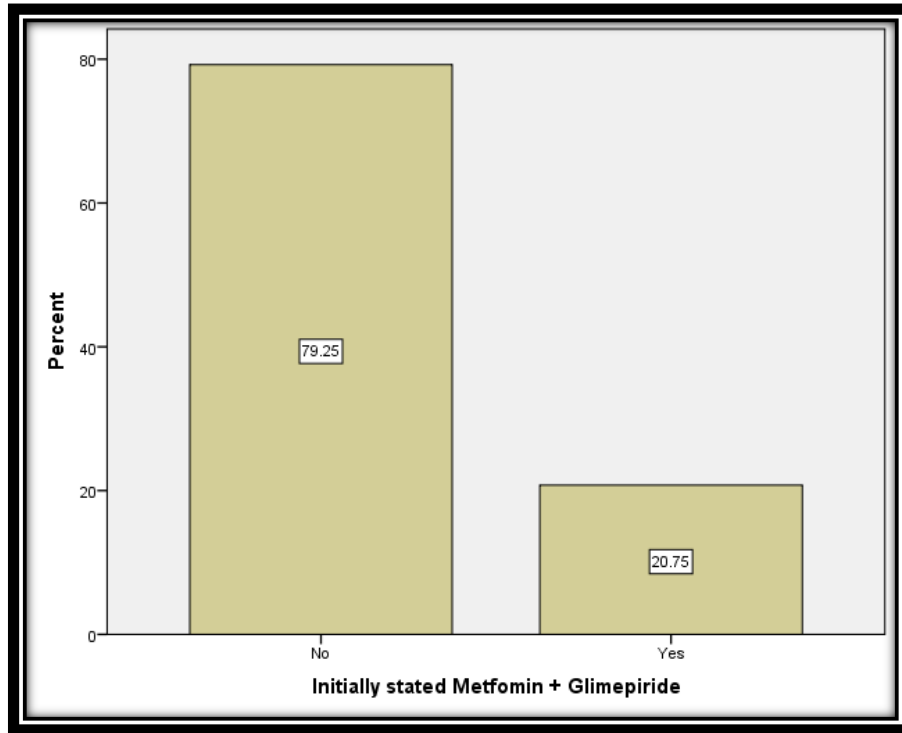
Drug name	Frequency	Percentage
Metformin	348	87%
Glimepiride	101	25.3%
Sitagliptin	12	3.0%
Glibenclamide	40	10.0%
Vildagliptin/metformin	4	1.0%
Insulin	21	5.3%

Percentages of patients who were initially prescribed a multidrug combination of metformin and glimepiride versus patients who are currently using metformin and glimepiride showed a slight but not significant increase in the percentage of prescribing (20 vs 25%) (Figure 8A & 8B). It worth to mention that while the difference in percentages was not statistically significant, the slight increase in prescribing the metformin and glimepiride combination could still be meaningful in clinical practice. It might reflect the growing recognition of the benefits of combination therapies and a shift towards earlier initiation of dual therapy in certain patients

Figure 8

(a) frequency of Patients initially prescribed metformin and Glimepiride (b) currently patients prescribe Metformin and glimepiride

(a)



(b)

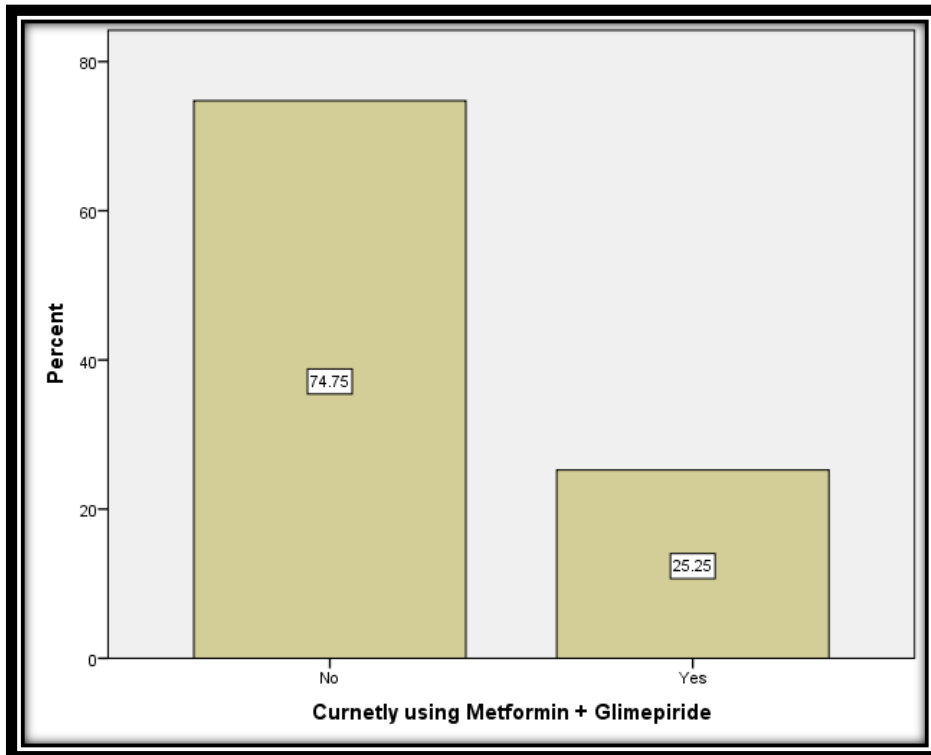


Table 9: summarizes the medication usage in the sample population. The data includes the following categories of medications and their corresponding percentages of use by the diabetic patients. The Antihypertensive medicines were taken by 243 individuals (60.8%) which was the highest medicine taken by the patients to manage hypertension (high blood pressure) beside diabetes .also, 161 patients (40.3%) were administered Antiplatelets or Anticoagulants were using medications to prevent blood clotting or thin their blood.

Furthermore, Hypolipidemic drugs were taking by 216 individuals (54.0%) to lower their lipid levels (cholesterol and triglycerides), 83 individuals (20.8%) were using vitamin supplements and 45 individuals (11.3%) were using Diuretics to promote diuresis or increased urination. 54 individuals (13.5%) were taking medications belonging to other diseases such as asthma , arthritis , cancer and other various diseases

Table 9

Other medication used by the diabetic patients

Medication	Frequency	Percent
Antihypertensive	243	60.8
Antiplatelets & anticoagulants	161	40.3
Hypolipidemic	216	54.0
Vitamins	83	20.8
Diuretics	45	11.3
Others	54	13.5

Recent research explored the perceptions of diabetic patients regarding their medication, revealing intriguing insights. Significantly, 73.75 percent of these patients reported a positive response, attesting to the effectiveness of the anti-diabetic treatment. In contrast, a small minority of 3.25 percent reported distress after receiving the medication, raising concerns about possible adverse effects. Interestingly, 1.75 percent of participants remained dubious about the medication's effects, indicating sense of ambiguity. Significantly, 21.75 percent of respondents reported a moderate sense of well-being as a consequence of the drug's effects, indicating a balanced perspective.

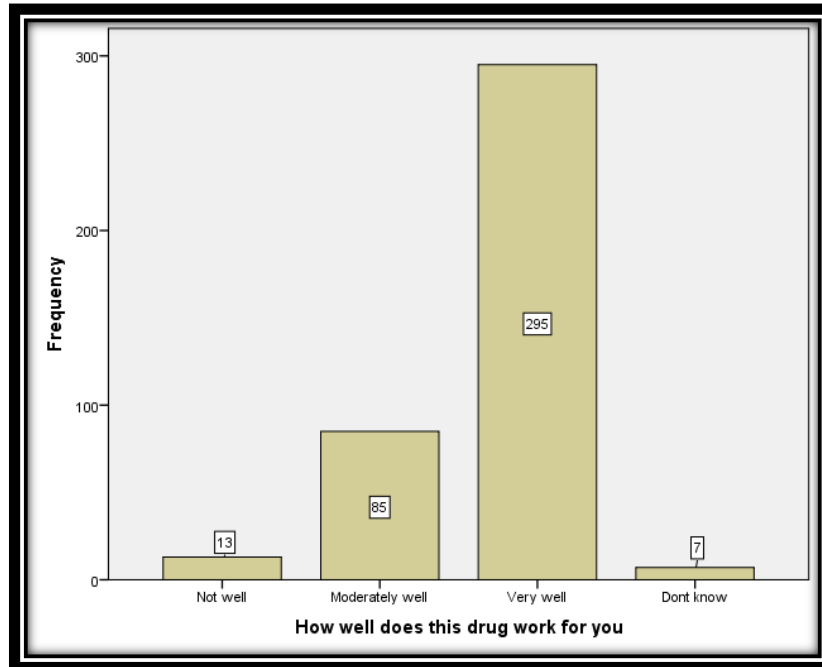
Surprisingly, 77% of patients displayed discouraging apathy toward their prescribed regimen, with a resounding chorus of "not at all" reflecting their lack of motivation to adhere to the treatment plan. 15.75% were able to maintain a moderately positive outlook, demonstrating the resilience of the human spirit in the face of health obstacles. In contrast, 6% of patients were visibly distressed by the medication, highlighting the complex emotional landscape that accompanies medical interventions. Curiously, 1.25 percent appeared to be entangled in a web of uncertainty, debating whether the diabetes medication genuinely disrupted their daily lives.

These findings highlight the intricate relationship between patient perceptions, emotional states, and medication adherence in the context of diabetes management. As healthcare professionals endeavor to improve patient well-being, these nuanced insights provide a valuable compass for navigating the diverse experiences of those coping with this chronic condition. Figure 9A shows the patient perspective regarding the efficacy of the drugs, showcasing how individuals perceive the impact of the medications. On the other hand, Figure 9B displays the frequency with which interviewed patients experienced any discomfort or bother caused by the drugs.

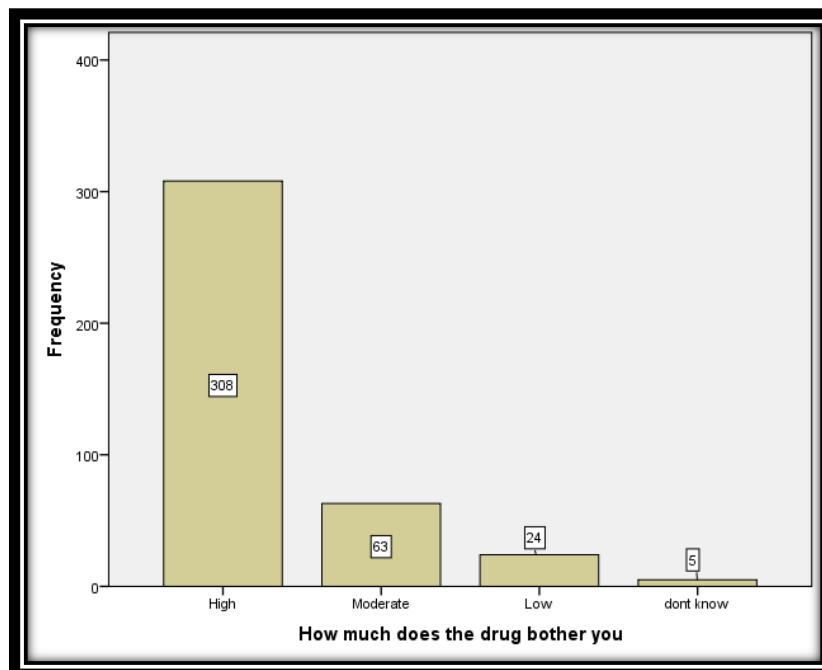
Figure 9

(a) Frequency of patient answering how the drug effect is (b) frequency of patient answering how much the drug bother them.

(a)



(b)



Chapter Four

Discussions

4.1 Discussions of the results

4.1.1 Glucose levels monitoring of interviewed diabetic patients

An adherence rate of 87.5% in our study, however, shows a rather high degree of blood sugar monitoring involvement, which is positive for the efficient management of diabetes. Numerous studies underscore the significance of blood sugar monitoring and the potential advantages of continuous glucose monitoring (CGM) for diabetes management(96, 97). Based to the study "Continuous glucose monitoring: a review of the evidence in type 1 and 2 diabetes mellitus," the use of continuous glucose monitoring (CGM) in individuals with type 1 diabetes is strongly supported by a number of benefits, such as decreased glycated hemoglobin (HbA1c) levels, decreased hypoglycemia episodes, and increased time spent within the target glucose range. The evidence strongly supports these benefits.(98).

The evidence supporting the use of CGM in type 2 diabetes is relatively weaker. Similar benefits, like a reduced HbA1c, less hypoglycemia, and higher patient satisfaction, have, however, been noted in certain trials. It's crucial to remember that the quality of the data can vary and that not all studies have found conclusive benefits from using CGM in type 2 diabetes(99).

The proportion of patients who monitor their blood sugar can vary based on the examined population or study. In our study, the 87.5% adherence rate indicates a relatively high level of blood sugar monitoring engagement, which is encouraged for diabetes management. Several benefits significantly support the use of continuous glucose monitoring (CGM) in individuals with type 1 diabetes, including decreased glycated hemoglobin (HbA1c) levels, decreased hypoglycemia episodes, and increased time spent within the target glucose range. (100).

While CGM has been shown to have positive effects in type 1 diabetes, its efficacy in type 2 diabetes may be more variable and reliant on personal circumstances. People with type 2 diabetes advised to talk to their doctors about the advantages and disadvantages of continuous glucose monitoring (CGM). This conversation is meant to

help people make decisions based on accurate information, so that they can choose the best course of action for themselves.(101).

All the patients who were interviewed were seen by the general doctor (GP). GPs are trained to handle a wide range of medical conditions, but they may not have the same level of expertise as specialists in specific areas. The fact that all the patients interviewed were seen by a general doctor (GP) and not a specialist can indeed be considered a weakness in the study. Specialists have advanced knowledge and expertise in specific medical fields, which allows them to provide more in-depth and specialized care for certain conditions or diseases. Specialists often have access to specialized diagnostic tools, treatments, and therapies that can provide more accurate and targeted care.

4.1.2 Adherence and compliance of diabetic patients

The study's findings, which reveal that 68% of patients adhere consistently to their prescribed medication regimen while 24% occasionally forget doses, could potentially be affected by the complexity of their medication regimens. Interestingly, the data also highlights that the majority of patients (90.25%) did not encounter issues with drug availability, which might contribute to medication non-adherence. Overall, the study results underscore a positive trend, demonstrating that a substantial proportion of individuals with diabetes (approximately 90%) diligently adhere to their prescribed medication as directed regimen dose . This dedication is reflected in their precise adherence to prescribed dosages, neither exceeding nor falling short of the prescribed regimen. These encouraging adherence rates emphasize the importance of continued support and education to further enhance medication compliance and subsequently improve overall diabetes management outcomes.

Patient compliance and therapy adherence are challenged by medication prices, regimen complexity, and irrational prescription, which results in poor glycemic control and raises morbidity and mortality(102, 103, 104).

The findings suggest that diabetes patients are more likely to remember and continue taking their medications when they are feeling well (**Figure 3**). Contrary to expectations, feeling good actually increases the proportion of patients who adhere to

their medication regimen. Specifically, the rate of medication adherence rises to around 80% when patients are in a state of well-being.

This information is valuable because medication adherence is crucial for effectively managing diabetes. It indicates that patients may be more motivated to follow their prescribed treatment when they experience positive health outcomes or an absence of symptoms.

Healthcare professionals can indeed use this knowledge to emphasize the importance of consistent medication use, even during periods of well-being, to maintain stable blood sugar levels and prevent complications associated with diabetes. It's crucial for patients to understand that managing diabetes is not just about addressing symptoms during active phases but also about adopting a proactive approach to long-term management(105).

Multidisciplinary strategies are highly valuable when treating chronic diseases like diabetes. This study highlights the importance of involving various healthcare professionals, including general practitioners (GPs), nurses, and medical secretaries, in the treatment of diabetes. Each member of the healthcare team plays a complementary role, and when they collaborate effectively, patient outcomes can be significantly improved(106).

Key components of multidisciplinary strategies for diabetes management include Patient Education; Healthcare professionals can educate patients about diabetes, its management, and the importance of regular blood sugar monitoring and medication adherence. Educating patients empowers them to take an active role in their own care(107).

Building trust between patients and healthcare professionals fosters open communication and ensures that patients feel comfortable discussing their concerns and challenges related to diabetes management(108).

Adopting a multidisciplinary approach that focuses on patient education, trust-building, and emotional support, healthcare professionals can improve patient engagement and adherence to treatment plans. This can lead to better long-term health outcomes and reduced complications associated with diabetes. Moreover, managing a chronic

condition like diabetes can be emotionally challenging for patients. Offering emotional support and understanding their emotional needs can positively impact their overall well-being and motivation to manage their condition effectively(109).

Regarding to (Figure 4) that the drugs were consistently available to them. This finding can be explained by the fact that most patients tend to purchase their medications from the private sector when they are unable to obtain them from the primary sector of the Ministry of Health (MoH). It's important to note that this information is based on our study, and the situation may vary depending on the healthcare system and geographical location(110, 111, 112).

Adherence to the prescribed dose is crucial for the effective management of diabetes. Taking the prescribed dosage of medication helps maintain stable blood sugar levels and prevents disease-related complications. The encouragingly high adherence rate observed in this study reflects patients' attention to their treatment. Adherence and compliance with medication regimens are essential for the effective administration of various health conditions. Healthcare providers can improve patient outcomes and overall treatment efficacy by catching the factors that influence adherence and implementing effective strategies. Encouragement of open communication and patient participation in their treatment plan can significantly improve adherence rates. Indeed, adherence to the prescribed dosage of medications is essential for effectively managing diabetes and preventing disease-related complications. Maintaining stable blood sugar levels is essential for long-term health and well-being. (113)

Adherence to drug regimens may be affected by factors such as the intricacy of the treatment plan, undesirable effects, financial restrictions, forgetfulness, and an inability to appreciate the necessity of adherence. Providers of medical treatment should keep these things in mind and collaborate with patients to overcome adherence barriers.(114). For the effective management of diabetes and other diseases, it is crucial to implement strategies to increase adherence. Providing patients with comprehensive education about diabetes, its complications, and the importance of adhering to their prescribed treatment plan can empower them to actively manage their condition. When feasible, healthcare providers can collaborate with patients to optimize their treatment plans, thereby making it easier for patients to adhere to their medication regimens. Promoting open communication between healthcare providers and patients fosters a supportive and confident relationship. Patients are more likely to communicate their concerns and

difficulties, leading to collaborative adherence-enhancing solutions. Medication reminder applications, pill organizers, and alarms can help patients remember to take prescribed medications. Regular follow-up visits should be scheduled in order to monitor patients' progress, rectify any issues, and stress the importance of adherence. By implementing these strategies and involving patients in their treatment plans, healthcare providers can improve diabetes management and treatment efficacy by increasing medication adherence. This can ultimately lead to improved patient outcomes and a reduced risk of diabetes-related complications. (115, 116).

In 2014, a cross-sectional study in India yielded insightful data regarding treatment adherence among type 2 diabetes and hypertension patients. The compliance rate for type 2 diabetes was reported to be 83.6% in the study. This suggests that a substantial proportion of study participants with type 2 diabetes adhered to their prescribed treatments.(117).

The systematic review and meta-analysis of 34 studies cast light on the reasons for non-adherence to oral antidiabetic medications (OADs) among patients with type 2 diabetes. The leading causes of non-adherence were neglect, experiencing adverse effects, and high costs. These factors are common barriers that can hinder patients from taking their medications as prescribed(118).

To address the issue of non-adherence, the researchers recommended focusing on novel medications or delivery methods that do not require daily, weekly, or monthly doses. By making these innovative treatments readily accessible in the near future, healthcare providers can potentially improve adherence rates among patients with type 2 diabetes(119).

4.1.3 Prescribing behavior towards diabetes type 2

In the study conducted at a university teaching hospital in India in 2010, it was observed that the majority of type 2 diabetic patients received multi-antidiabetic medicine treatments (71.8%), meaning they were prescribed more than one antidiabetic medication. Only a smaller proportion of patients (24.7%) received single drug treatments. Among those on multi-drug therapy, the use of two drugs was most common (31.65%), followed by three drugs (28.44%), and four drugs (11.46%)(120).

In contrast, the study conducted in the Canary Islands, Spain, among 2,467 type 2 diabetic patients, showed a different pattern of drug utilization. In this population, a significant proportion (71.7% of patients) were treated with a single anti-diabetic medication as monotherapy. A lesser proportion of patients (13.1%) were administered two anti-diabetic medications, and an even smaller proportion (1.4%) were administered three anti-diabetic drugs(121).

The systematic review study highlights various common causes of non-adherence in people with multiple chronic conditions, including polypharmacy, drug side effects, unclear instructions, poor memory, financial constraints, disagreements over therapy necessity, and overall poor health. Additionally, low literacy, the presence of "silent" diseases (e.g., hyperlipidemia, hypertension, osteoporosis), and cultural variables can contribute to non-adherence in this population. These factors can collectively make managing multiple chronic conditions more challenging for patients(122).

The study conducted in India focusing on antihypertensive therapy revealed that a considerable proportion (68.14%) of patients were non-compliant to their prescribed treatment. Several factors were identified as potential contributors to non-compliance, including the number of drugs prescribed, the duration of hypertension, the interval between follow-up visits to the physician, the patient's attitude towards medication adherence, the role of the physician in patient education, and the accessibility to healthcare centers(123).

In addition , polypharmacy or the use of more than one drug, is especially common in people with various long-term illnesses. Keeping track of many medicines can be hard, which can lead to misunderstanding and unintentional non-adherence. In a similar way, drug side effects, confusing directions, and bad memory can make it hard for patients to follow their treatment plans.(124).

Patients may also not be able to get their medicines because they can't afford them because of the Financial limitations , which leads to non-adherence. If patients don't fully understand how important their treatments are, they may disagree about whether or not they need them.(125).

The presence of "silent" diseases, which may not have noticeable symptoms, can make patients less motivated to adhere to their treatment plans. Additionally, cultural factors can influence beliefs and attitudes toward healthcare and medication, potentially affecting adherence rates(126).

The study findings underscore the importance of addressing these factors to improve medication adherence and overall disease management in patients with multiple chronic conditions. Healthcare providers should consider these challenges and work collaboratively with patients to develop personalized treatment plans that address their specific needs and barriers to adherence. Patient education, clear instructions, medication reminders, regular follow-up visits, and support systems can all play crucial roles in promoting adherence and ultimately improving health outcomes for these individuals.

It's important to note that this evidence indicates an association between medication use and self-reported feelings of well-being, but it does not establish a causal relationship. There could be various factors at play that influence how patients perceive their health status while taking different medications. Factors like individual patient responses to medications, specific health conditions, medication adherence, lifestyle habits, and other co-existing medical issues can all impact how patients feel while on a particular medication(127, 128).

Sulfonylurea therapy, which has been used for a long time, can cause low blood sugar, especially in older and sicker patients. The risk depends on the type of sulfonylurea medication(129). A study in Germany found that severe low blood sugar events happened between 0.9 and 5.6 times per 1000 patients per year(130). These medications can also make people gain weight. Some studies (but not conclusive) suggest that sulfonylureas may increase the chance of heart problems more than metformin(131, 132, 133, 134, 135). These medications may also stop working faster than metformin(136). Repaglinide is another option for patients with kidney problems, but it has similar side effects as sulfonylureas and works for a shorter time(137).

Vildagliptin and vildagliptin/metformin are approved as new drug in more than 110 nations throughout the world. Vildagliptin and vildagliptin/metformin have received approval for use in the European Union (EU) to treat individuals with type 2 diabetes.

Vildagliptin is authorized for use as a single agent, as a duo with metformin, a sulfonylurea, or a thiazolidinedione, as a triple agent with a sulfonylurea and metformin, or as a combination with insulin (with or without metformin)(138).

A study in China entitled: 'Efficacy and safety of combination therapy with vildagliptin and metformin vs. metformin monotherapy for Type 2 Diabetes Mellitus therapy: a meta-analysis' showed that vildagliptin in combination with metformin might considerably lower fast blood glucose(FPG), HbA1c, and body weight when compared to metformin alone. The results revealed a substantial reduction in HbA1c and FPG when the dose of metformin in the combination group of vildagliptin and metformin is less than 1500 mg/dL(139).

A similar study showed that sulphonyl urea (SU) did not appear to reduce with the development of DPP-4 inhibitors and GLP-1 receptor agonists, a number of patient-specific traits were associated with either an increase or a decrease in the likelihood of SU use. Results indicated The percentages of patients who received an SU were 25.7%, 23.4%, and 23.7%, respectively, in the research years 2003 to 2004, 2007 to 2008, and 2009 to 2010 ($P = 0.57$)(140).

Biguanide metformin hydrochloride is the most often prescribed oral glucose-lowering medicine in the world, and it is sometimes referred to as "foundation therapy" for those with newly diagnosed type 2 diabetes. This ranking is due to its powerful glucose-lowering capabilities, low cost, weight-neutrality, generally positive safety profile (especially the lack of hypoglycemia as a side effect), and moderate cardioprotective findings Several guidelines, including those from the EASD and the ADA, now recommend it as first-line therapy(141, 142).

Similar to our study results; metformin was the most commonly used initial therapy for T2DM in practically every European country, according to a study. In the Netherlands, Spain, and the United Kingdom, the majority of patients switched from metformin alone to metformin plus a sulfonylurea derivative (SU). However, because of the widespread usage of repaglinide, outweighed metformin combined with an SU in Italy. DPP-4 inhibitor-containing treatments were most commonly utilized as second- and fourth-line therapy in France. Metformin monotherapy was reinstated as the third line of defense in all countries. Metformin with an SU was the most commonly recommended fourth line

of therapy in the Netherlands and Spain; dipeptidyl peptidase-4 inhibitors were the most commonly prescribed fourth line of therapy in the UK and France(143).

Alternatively, clinical trials and other studies have demonstrated that in prediabetes and T2DM, combination therapy with new hypoglycemic medicines can provide adequate glucose control; however, early combination therapy appears to have faster, more significant, and longer-lasting effects(144, 145, 146).

The American Diabetes Association (ADA) and the Research Society for Study of Diabetes in India (RSSDI) wheel claim that modern sulfonylureas, like glimepiride, are more effective than traditional sulfonylureas and have a lower risk of hypoglycemia with a neutral risk for cardiovascular disease(147). Considering the efficiency and cost-effectiveness of the combination therapy (metformin and glimepiride) , doctors in India frequently prescribe all strengths of the drugs glimepiride and metformin(148, 149).

Initiating a treatment regimen involving both glimepiride and metformin at an early stage may offer the advantage of establishing a lasting positive impact by achieving timely glucose regulation. This approach can help prevent the development of adverse glycemic memory associated with complications affecting both micro- and macrovascular systems(149, 150).

Overall, the evidence presented emphasizes the importance of individualizing treatment plans for patients with T2DM based on their specific health needs and responses to medications. The choice of medications should be carefully considered, and close monitoring of blood glucose levels and potential drug-related problems can help optimize diabetes management and improve patient outcomes.

4.2 Conclusion

The study's conclusions showed that metformin was the most typically prescribed drug for beginning therapy, followed by glimepiride. The utilization of combination treatments was increasingly common. Furthermore, our study shown that a patient's condition may not always improve when they transition from first-generation anti-diabetic medications to the newest generation of oral hypoglycemic pills. The results of our investigation showed that there isn't a statistically significant variation in the manner that metformin is given across different regions. Prescriptions for glimepiride,

however, varied statistically considerably ($p=0.01$) among the locations that were examined. As a result, by examining current prescribing habits, efforts can be taken to encourage sensible prescription.

The significance of this research lies in its pioneering role as a Pharmacoepidemiological study, marking a novel endeavor in the context of Palestine. This study represents the first of its kind within the region, adding to its uniqueness and importance. The insights and findings garnered from this research are poised to hold considerable relevance for the Ministry of Health (MOH) and other pertinent organizations, including the World Health Organization (WHO). By shedding light on the prescription patterns and adherence behaviors among diabetic patients, this research has the potential to inform and guide healthcare strategies, facilitating more informed decision-making and improved patient care. The results of this study could ultimately contribute to the enhancement of diabetes management protocols and the optimization of healthcare services in Palestine and potentially even serve as a reference point for similar studies in other contexts.

4.3 Recommendations

Regarding to our results and discussions, we recommend the following to improve the management of treatment diabetes mellitus disease in general .also , this points can enhance the general public health care which confirm our goals to make a complete care program specially for diabetic patients connected with other common chronic disease .

Therefore the health system workers can collaborates to achieve and make correct , suitable and accurate derisions for patient treatments .

1. **Improve the Public Awareness:** Develop targeted educational initiatives to educate patients, healthcare practitioners, and the wider public about proper medication utilization, potential side effects, and the importance of adhering to prescribed treatment plans. Addressing education and raising public awareness stand as crucial steps forward. The development of focused educational campaigns holds the potential to enlighten not only patients but also healthcare providers and the broader community. These initiatives would emphasize the significance of appropriate medication usage, shed light on possible side effects, and underscore the essential nature of adhering diligently to recommended treatment regimens. By

enhancing understanding through education, we can empower individuals to make informed decisions about their health and medication, resulting in better overall outcomes and improved health management.

2. **Making Individualized Treatment Approaches:** Highlight the significance of tailoring treatment plans to align with each patient's medical history, lifestyle, and preferences. This approach can help minimize unnecessary polypharmacy and optimize treatment outcomes. Recognizing the importance of individualized care is paramount. Emphasizing the customization of treatment strategies based on a patient's medical background, lifestyle, and personal choices is essential. By adopting this approach, we can mitigate the risk of unnecessary polypharmacy – the concurrent use of multiple medications – and enhance the effectiveness of treatment outcomes. Tailoring treatments to align with each patient's unique circumstances ensures that interventions are precisely suited to their needs, promoting both therapeutic efficacy and a more patient-centered healthcare approach.
3. **Updated Prescription Guidelines:** The implementation of current and succinct prescription guidelines is of utmost importance. These guidelines should take into account the latest advancements in medications and evidence-based methodologies. By doing so, they can facilitate informed decision-making among healthcare professionals when prescribing treatments. A key objective of these guidelines should be to foster rational drug utilization, particularly among patients who are managing multiple medical conditions simultaneously. By aligning prescriptions with established best practices, we can enhance patient safety, optimize treatment outcomes, and contribute to more streamlined and effective healthcare practices.
4. **Regular Medication Assessments:** It is imperative to encourage healthcare providers to consistently evaluate the medication regimens of diabetic patients, particularly those who are concurrently managing multiple medications. This proactive approach plays a pivotal role in pinpointing potential drug interactions, identifying duplications in therapy, and recognizing the necessity for dose adjustments. By routinely reviewing and reassessing medication plans, healthcare professionals can ensure the safety, efficacy, and optimal outcomes of the treatment protocol, ultimately contributing to the overall well-being of individuals grappling with diabetes.

5. **Interdisciplinary Collaboration:** cultivating interdisciplinary collaboration within the realm of healthcare is paramount. By promoting effective communication and collaboration among diverse healthcare disciplines such as endocrinologists, primary care physicians, pharmacists, and dietitians, we can forge a comprehensive and holistic approach to patient care. This concerted effort ensures that the management of patients' health becomes a collective endeavor, minimizing the chances of medication-related challenges and enhancing overall treatment effectiveness. The synergy among professionals from different fields brings forth a well-rounded perspective that can identify potential concerns, facilitate proactive interventions, and lead to a higher quality of care for patients.

Electronic health records and health information: technology have the potential to revolutionize how healthcare professionals collaborate and maintain precise medication records. This integration facilitates communication by digitally connecting various stakeholders, allowing healthcare teams to seamlessly communicate patient data and medication information. Moreover, it ensures that medication records remain current, reducing the chances of errors and enhancing overall patient safety. Use electronic health records and health information technology can help healthcare workers talk to each other better and keep accurate and up-to-date notes of medications.

6. **Continuing Professional Development:** Establish ongoing educational programs for healthcare professionals to keep them informed about the latest advancements in diabetes treatment and management. It is imperative to underscore the importance of conducting additional studies focused on diabetes and other prevalent diseases. By dedicating resources to research in these areas, we can substantially advance the management of chronic illnesses, particularly within the Palestinian context. Through in-depth investigations into the underlying mechanisms and treatment options, we can garner invaluable insights that have the potential to revolutionize healthcare practices. By prioritizing research, we are equipping ourselves with the knowledge needed to devise more targeted and efficient strategies for disease management, ultimately leading to improved health outcomes for individuals grappling with these conditions.
7. **Make more studies:** We strongly believe that more study should be done on diabetes and other common illnesses. These kinds of studies have the ability to

make a big difference in how these long-term illnesses are treated, especially in Palestine. By digging deeper into the details of these diseases, we can learn more about their causes, how they progress, and how to treat them. This, in turn, can lead to better and more personalized ways to care for patients, which can improve the general health and well-being of people in the area who have these diseases.

8. **Patient Counseling:** Enhance patient counseling sessions to ensure clear comprehension of prescribed medications, proper dosages, and potential adverse effects. Addressing concerns or erroneous beliefs can improve medication adherence. Improving the caliber of counseling sessions with patients is essential. These interactions should be bolstered to ensure that patients have a thorough comprehension of their prescribed medications, accurate dosages, and potential adverse effects. We can strengthen the patients' commitment to the prescribed treatment plan by addressing any questions, concerns, or misunderstandings they may have.
9. **Continuous Monitoring and Follow-Up:** Set up a reliable way to track how patients respond to their medications and do regular follow-ups. This method can help find and deal with dangerous side effects and medicines that don't work right away. It is important to set up a complete method for monitoring and following up. By putting in place such a system, doctors can keep track of how patients react to their drugs. This lets them act quickly if there are side effects or problems with the treatment. With regular checkups, the doctor can see how well the treatments are working and make any changes that are needed. By keeping a close eye on a patient's growth, doctors can quickly spot any new problems, address any worries, and improve care. This practice not only helps make healthcare operations more efficient and unique, but it also makes patients safer.
10. **Insert Pharmacovigilance related programs or systems :** It is important to put pharmacovigilance steps into place. Creating ways to track and report bad drug reactions (ADRs) from anti-diabetic drugs is important for better prescribing practices and making sure that the safety of medications is always being evaluated. By tracking and studying ADRs in an organized way, medical workers can learn a lot about how these drugs work in real life, which helps them make better treatment choices. This proactive method not only protects patient health, but also creates a

mindset of awareness and response within the healthcare system. This makes drug use safer and more efficient.

By putting these suggestions into clinical practice, healthcare systems can improve the results for patients, lower risks, and make sure that anti-diabetic drugs are given in a smart and effective way. This diverse method shows how important it is to have complete plans for managing diabetes medications.

4.4 Study limitation

Despite the fact that the study's findings provide valuable insights into the perspectives of diabetic patients, it is essential to recognize its limitations, which provide context for interpreting the results. The geographic scope of the investigation is a significant limitation. Excluding the southern region of Palestine, which includes Hebron and Bethlehem, creates a potential gap in the representation of patient experiences. This coverage gap may result in an incomplete comprehension of the attitudes of the general population toward antidiabetic medications.

A further limitation pertains to participant selection. By concentrating solely on patients within the Ministry of Health (MOH)encout, the study overlooks potential insights from patients seeking care through non-governmental organizations or community clinics. This could lead to a distorted sample that does not adequately represent the diversity of perspectives among diabetic patients.

In addition, the study's reliance on general practitioners (GPs) as opposed to specialists introduces an additional limitation. Patients under the care of general practitioners may offer different perspectives than those under the care of specialists, whose specialized knowledge may influence treatment approaches and patient perceptions. The absence of specialist input may therefore limit the comprehensiveness of the study's findings, obscuring crucial nuances in the patient experience and the efficacy of antidiabetic treatments.

Future research efforts could consider expanding the geographical scope, incorporating a broader range of healthcare sectors, and involving specialists in order to provide a more comprehensive comprehension of the intricate relationship between patient perceptions and diabetes management strategies.

List of Abbreviations

Abbreviation	Meaning
T2DM	Type 2 Diabetes Mellitus
HbA1c	hemoglobin A1C criteria test
WHO	World Health Organization
ADA	American Diabetes Association
EASD	European Association for the Study of Diabetes
AACE	American Association of Clinical Endocrinologists
ESC	European Society of Cardiology
CVD	cardiovascular disease
AMI	acute myocardial infarction
ACS	acute coronary syndrome
TIA	transient ischemic attack
PAD	peripheral arterial disease
CKD	chronic kidney disease
GFR	glomerular filtration rate
OHA	oral hypoglycemic agents
SGLT2	sodium-glucose cotransporter type 2 inhibitor
DPP4	dipeptidyl peptidase-4 inhibitor
DUR	Drug Utilization Review
DM	diabetes mellitus
GPs	general practitioners
GP	general practitioner
MOH	the Ministry of Health
CA	Cronbach's Alpha
SPSS	Statistical Package for Social Sciences
ANOVA	Analysis of Variance
IRB	Institutional Review Board
CGM.	continuous glucose monitoring
OADs	oral antidiabetic medications
FPG	fast blood glucose
EU	European Union
SU	sulphonyl urea
RSSDI	Research Society for Study of Diabetes in India
ADRs	adverse drug reactions

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Appendices

Appendix A

English version of questionnaire

- **General information:**(put check in the suitable choice):

- Age:..... .
- Gender: male, female .
- Education level : school , university , diploma , undergraduate .
- Marital status:single,married.
- Weight:
- Place of residence(city name):

- **Medical History**

- When was the diagnosed for first time
(date/year).....
- What was the first glucose reading when you first diagnosed with DM2
.....
- Do you Smoke :Yes,no.
- Do you suffer from other Diseases: - (put check if you have other disease exist):

- None	
- Hyperlipidemia	
- Hypertension	
- Kidney disease	
-Liver disorders	
-Asthma	
-Heart disease	
- Cancer	
- Arthritis	
-Obesity	
-Depression	
-Others	

- Last blood glucose reading test done?
- What is the blood glucose test reading was in the last time ?.....
- Did you regularly monitor your blood glucose? yes , no .
- Is your blood glucose under control? yes , no .
- Do you regularly visit the doctor to observe the DM2?
- **Treatment :**
- Who is the Prescriber: GP , Specialist .
- What is the medicines prescribed for you after initial diagnosis with DM2.....
- Did the doctor add any drugs combined with initial drug for DM2 above :
- Did any drug removedwhich drug

- Metformin 850 mg	
- Glibenclamide	
- Glimepride(Dose.....)	
- Sitagliptin 50 mg	
- Other Oral hypoglycemic medication.....	
- Insulin (Type.....)	

- Do you take other medication or supplements : yes , no .
- If yes , name the other medication or the supplements

Stopping medication:

- The doctor advise to stop taking any medicine for you ? yes , no
- Which medicine was stopped ?
- For what reason he stopped it for you ? (choose from the options):
- I ask him to stop it for me ()
- Because of a sick side effect ()
- For other reason
- Did you stop medication (Yes/ No)
- I asked to stop medication due to :
 - Cost
 - Deciding to stop the medicine to take less medication
 - Side effect
- What is the side effect ?
- Which medicine cause this side effect ?

Patient compliance:

Patient compliance and adherence	Never	Sometimes	often	Always
- Forgetting to take the medicine				
- Taking medicine on time				
- Stopping medicine when feeling ok				
- Did not take medication due to running out of it				
- Forgetting to take medicine in travelling				
- Taking more medicines than prescribed by my doctor				
- Taking less medicines than prescribed by my doctor				

General questions:

- How well does this drug work for you? (put check on one option)
 - Not at all well ()
 - Moderately well ()
 - Very well ()
 - Don't know ()

- How much does this drug bother you?
 - Not at all well ()
 - Moderately well ()
 - Very well ()
 - Don't know ()

Appendix B

Arabic version of questionnaire

- معلومات عامة: (ضع علامة الاختيار في الاختيار المناسب):

- عمر:.....
- الجنس ذكر أنثى .
- مستوى التعليم: مدرسة ، جامعة ، دبلوم ، جامعي.
- الحالة الاجتماعية: أعزب ، متزوج.
- وزن:
- مكان الإقامة (اسم المدينة):

- تاريخ طبي

- متى تم التشخيص لأول مرة
(التاريخ / السنة)
- ما كانت القراءة الأولى للجلوكوز عند تشخيصك لأول مرة بـ DM2
.....
- هل تدخن: نعم ، لا.
- هل تعاني من أمراض أخرى: - (ضع علامة في حالة وجود مرض آخر):

- لا أحد	
- ارتفاع شحوم الدم	
- ارتفاع ضغط الدم	
- مرض كلوي	
- اضطرابات الكبد	
-الربو	
-مرض قلبي	
- سرطان	
- التهاب المفاصل	
-بدانة	
-اكتئاب	
-آخرون	
.....	

- آخر اختبار لقراءة جلوكوز الدم؟
- ما هي قراءة اختبار جلوكوز الدم آخر مرة؟
- هل كنت تراقب جلوكوز الدم بانتظام؟ نعم / لا .
- هل جلوكوز الدم لديك تحت السيطرة؟ نعم / لا .
- هل تزور الطبيب بانتظام لمراقبة DM2؟
- علاج :
- من هو الوكيل: طبيب عام ، اخصائي.
- ما هي الأدوية الموصوفة لك بعد التشخيص الأولي بـ DM2
-
- هل أضاف الطبيب أي أدوية مقترنة بالعقار الأولي لـ DM2 أعلاه:
- هل تمت إزالة أي دواء أي عقار

- ميتفورمين 850 مجم	
- جليبنكلاميد	
- Glimepride (جرعة	
- سيتاجليبيتين 50 مجم	
- أدوية سكر الدم الأخرى التي تؤخذ عن طريق الفم	
- الأنسولين (النوع ..)	

- هل تتناول أدوية أو مكملات أخرى: نعم ، لا .
- إذا كانت الإجابة بنعم ، فقم بتسمية الدواء الآخر أو المكملات الغذائية

وقف الدواء:

- ينصح الطبيب بالتوقف عن تناول أي دواء لك؟ نعم / لا
- أي دواء توقف؟
- لأي سبب أوقفه من أجلك؟ (اختر من بين الخيارات):
- أطلب منه أن يوقفها من أجلي ()
- بسبب تأثير جانبي مريض ()
- لسبب آخر
- هل توقفت عن تناول الدواء (نعم / لا)

- طلبت التوقف عن تناول الدواء بسبب:
- يكلف
- اتخاذ قرار بوقف الدواء لأخذ دواء أقل
- أثر جانبي
- ما هي الآثار الجانبية؟
- أي دواء يسبب هذا التأثير الجانبي؟
- التزام المريض بالعلاج:

دائماً	غالباً	أحياناً	أبداً	امتثال المريض والالتزام
				- نسيان تناول الدواء
				- تناول الدواء في الوقت المحدد
				- التوقف عن تناول الدواء عندما تشعر بأنك بخير
				- لم تتناول الدواء بسبب نفاذ منه
				- نسيان تناول الدواء في السفر
				- تناول أدوية أكثر مما وصفه طبيبي
				- تناول أدوية أقل مما وصفه طبيبي

اسئلة عامة:

- ما مدى فعالية هذا الدواء بالنسبة لك؟ (ضع علامة الاختيار على خيار واحد)
- ليس جيداً على الإطلاق ()
- جيد إلى حد ما ()
- جيد جداً ()
- لا أعرف ()

- كم يزعجك هذا الدواء؟
- ليس جيداً على الإطلاق ()
- جيد إلى حد ما ()
- جيد جداً ()
- لا أعرف ()

Appendix C

Ministry of Health (MOH) approval

<p>State of Palestine Ministry of Health - Nablus General Directorate of Education in Health</p>		<p>دولة فلسطين وزارة الصحة نابلس الإدارة العامة للتعليم الصحي</p>
<hr/>		
Ref: _____ Date: _____		الرقم: 501/2019 التاريخ: 2019/03/20
<p>الأخ مدير عام الإدارة العامة لرعاية الصحة الأولية المحترم... تحية واحترام.</p>		
<p><u>الموضوع: تسهيل مهمة</u></p>		
<p>يرجى التكرم بتسهيل مهمة الطالبة: مي عوض - ماجستير علم أنوية - جامعة النجاح، لعمل بحث بعنوان:</p>		
<p>" Drug utilization pattern among type II diabetic patients in Palestine"</p>		
<p>حيث ستقوم الطالبة بجمع معلومات من خلال مقابلات مع المرضى (بعد أخذ موافقتهم) مع العلم أن مشرفي الدراسة: د. مراد أبو الحسن و د. وليد صويلح.</p>		
<p>وذلك في مديريات صحة: نابلس - جنين - قلقيلية - طولكرم - سلفيت - طولبس - رام الله على أن يتم الالتزام بجميع تعليمات وإجراءات الرقابة الصادرة عن وزارة الصحة بخصوص جامعة كورونا، وثقت طائلة المسؤولية.</p>		
<p>على أن يتم تزويدنا بنسخة من نتائج البحث والتعمد بعدم النشر.</p>		
<p>مع الاحترام..</p>		
<p>د. عبد الله الكواسي مدير التعليم الصحي والبحث العلمي</p>		
		
		
<p>نسخة : معالي وزيرة الصحة مطلقا له : مشرفي الدراسة المحترمين/ جامعة النجاح</p>		
<hr/>		
P.O. Box: 14 Tel. 09-2333901		ص.ب. 14 الرقم: 09-2333901

Appendix D

Institutional Review Board (IRB) approval

An-Najah
National University
Faculty of Graduate Studies
Dean's Office

جامعة
النجاح الوطنية
كلية الدراسات العليا
مكتب العميد

التاريخ: 2020/12/20

حضرة الدكتور صهيب خطاب المحترم
مستشار برنامج ماجستير علم الأوبئة
تحية طيبة وبعد،

الموضوع: الموافقة على عنوان الأطروحة وتحديد المشرف

في مجلس كلية الدراسات العليا في جلسته رقم (400) المنعقدة بتاريخ 2020/11/29، الموافقة على مشروع الأطروحة المقدم من الطالب/ة من حنايد احمد عوض، رقم التسجيل 11952068، تخصص ماجستير علم الأوبئة، عنوان الأطروحة:

نمط استخدام الدواء بين مرضى السكري من النوع الثاني في فلسطين
Drug Utilization Pattern among Type II Diabetic Patients in Palestine

بشرف: د. محمد مراد ابو الحسن (2) د. وليد صويلح

يرجى اعلام المشرف والطالب بضرورة تسجيل الأطروحة خلال اسبوعين من تاريخ اصدار الكتاب. وفي حال عدم تسجيل الطالب/ة للأطروحة في الفترة المحددة لهما ستقوم كلية الدراسات العليا بإلغاء اعتماد العنوان والمشرف

وتفضلوا بقبول وفاء الاحترام ...

عميد كلية الدراسات العليا
د. عوني ابو حجة

نسخة: 2. رئيس قسم الدراسات العليا للعلوم الطبية والصحية المحترم
عميد القبول والتسجيل المحترم
مشرف الطالب
مف الطالب

ملاحظة: على الطالب/ة مراجعة النشرة المالية (حساسية الطالب) قبل دفع رسوم تسجيل الأطروحة للتسجيل

فلسطين، نابلس، من 7-797 هاتف: 2345115، 2345114، 2345113 (09)؛ فاكسيل: (972)09:2342907
Nablis, P. O. Box (7) * Tel. 972 9 2345113, 2345114, 2345115
* Facsimile 972 92342907 * www.najah.edu - email fgs@najah.edu



Ref: Mas. Dec. 2020/1

IRB Approval Letter

Study Title:

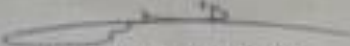
"Drug utilization pattern among type II diabetic patients in Palestine"

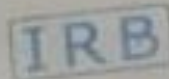
Submitted by:
Mai Awad

Supervisor:
Waleed M. Sweileh , Murad Abuathasan

Date Approved:
1st December 2020

Your Study Title "Drug utilization pattern among type II diabetic patients in Palestine" viewed
by An-Najah National University IRB committee and was approved on 1st Dec. 2020

Hasan Fitian, MD

IRB Committee Chairman
An-Najah National University





جامعة النجاح الوطنية

كلية الدراسات العليا

نمط استخدام الدواء بين مرضى السكري من النوع الثاني في فلسطين

إعداد

مي عايد أحمد عوض

إشراف

د.مراد أبو الحسن

د.وليد صوالح

قدمت هذه الرسالة استكمالاً لمتطلبات الحصول علي درجة الماجستير في علم الأدوية، من كلية الدراسات العليا، في جامعة النجاح الوطنية، نابلس - فلسطين.

2023

نمط استخدام الدواء بين مرضى السكري من النوع الثاني في فلسطين

اعداد

مي عايد أحمد عوض

اشراف

الدكتور مراد أبو الحسن

الأستاذ وليد صويلح

الملخص

الخلفية: مرض السكري هو نوع من الأمراض الأيضية الشائعة التي تؤدي إلى ارتفاع مستوى السكر في الدم من مسارات أمراضية مختلفة. تعتبر الدراسات حول استخدام الأدوية المضادة للسكري أمرًا أساسيًا لتشجيع استخدام الأدوية بشكل مسؤول وتوفير بيانات مفيدة لتخطيط الصحة.

الأهداف: تهدف هذه الدراسة إلى وصف إدارة مرض السكري من النوع الثاني في فلسطين وتحديد ما إذا كانت تتبع المبادئ الدولية لتناول الأدوية المخفضة للسكر في هذا النوع من المرض.

المنهجية: تم إجراء دراسة مقطعية على مرضى يعالجون في مراكز الرعاية الصحية للسكري التابعة لوزارة الصحة (MOH). تم اختيار المشاركين في الدراسة بشكل عشوائي، حيث تم استجواب 400 مريض من عيادات السكري في مناطق شمال ووسط الضفة الغربية في فلسطين. تم اتباع جميع المبادئ الأخلاقية في هذه الدراسة

النتائج: أظهرت النتائج أنه تم استجواب 400 مريض، حيث كان 138 منهم (34.5%) ذكورًا و 262 منهم (65.5%) إناثًا. متوسط عمر المرضى هو 60 عامًا. كانت أكثر الأدوية الموصوفة لمرضى السكري هي الميتفورمين. أظهرت نسبة الالتزام بالعلاج أن 68% من المرضى يتناولون أدويتهم كما هو موصى به، بينما ينسى 24% منهم أحيانًا. وأيضًا، يتبع الغالبية العظمى من مرضى السكري (نحو 90%) جدولهم الموصوف لتناول الأدوية، حيث يتناولون الجرعات الموصى بها بالضبط كما هو مشار إليه ولا أكثر ولا

أقل. أشارت نتائج تحليلنا إلى عدم وجود فرق ذي دلالة إحصائية في طريقة وصف الميتفورمين في مختلف المجالات. ومع ذلك، اختلفت وصفات جليبيبيريد إحصائياً بشكل ملحوظ ($P = 0.01$) في جميع أنحاء المناطق التي تمت زيارتها.

التوصيات: كشفت نتائج الدراسة أن الدواء الأكثر استخداماً كان الميتفورمين كعلاج أولي، تليه الجليبيبيريد. كما تم استخدام الدوائين معاً بشكل متواتر. لذا، يمكن اتخاذ خطوات لتعزيز الوصف العقلاني عن طريق دراسة الممارسات الوصفية الحالية.

الكلمات الرئيسية: استعراض استخدام الأدوية، مرض السكري من النوع الثاني، عوامل مخفضة للسكر الفموية، ارتفاع مستوى السكر في الدم.