Arab American University – Palestine

Faculty of Graduate Studies

Effectiveness of Healthcare Services Provided to Diabetic Patients at Primary Health Care Centers in The West Bank: A Retrospective Review of Patient Records

By

Adam Marawa'a

Supervisor

Dr. Shahenaz Najjar

Co- Supervisor

Dr. Mohammad Asia

This thesis was submitted in partial fulfillment of the requirements for the Master's degree in

Quality Management

February /2020

Effectiveness of Healthcare Services Provided to Diabetic Patients at Primary Health Care Centers in The West Bank: A Retrospective Review of Patient Records

By

Adam Marawa'a

This thesis was defended successfully on February 2020 and approved by:

Committee Member	Signature
1. Supervisor Name: Dr. Shahenaz Najjar	.....
2. Co- Supervisor Name :Dr. Mohammad Asia	.....
3. Internal Examiner Name: Dr. Basma Salameh	.....
4. External Examiner Name: Dr. Jamal Qaddumi	.....

DECLARATION

This thesis was submitted in partial fulfilment of the requirement for the Master's degree in Quality Management.

I declare that the content of this thesis (or any part of the same) has not been submitted for a higher degree to any other university or institution.

Adam Mohammad Ahmad Marawa'a

Sig: 

Date: 13/ 02 /2019

DEDICATION

I would like to dedicate this thesis to:

The sake of Allah, my Creator and my Master;

My great teacher and messenger, Mohammed (May Allah bless and grant him), who taught us the purpose of life;

My homeland Palestine, the warmest womb;

The great martyrs and prisoners, the symbol of sacrifice;

Arab American University, my second magnificent home;

My late Grandfather Mr. Ahmad Marei;

My beloved Father Mr. Mohammad, Mother Ms. Afaf;

My beloved brother Mr. Maher, and sisters Hannen and Niveen and Saher;

My friends and colleagues;

All the people in my life who touch my heart;

I dedicate this research.

ACKNOWLEDGEMENTS

I am grateful to a number of people who worked hard with me from the beginning till the completion of the present research, particularly my supervisor, Dr. Shahenaz Najjar, for her continuous support, guidance, feedback, and offering of encouragement when needed. I'm totally sure that this work would have never become a reality without guidance from the most wonderful leader and my biggest role model, my supervisor Prof. Dr. Mohammad Asia, who has always been generous during all phases of the research.

I also would like to express my wholehearted thanks to my father, Mohammad Marawa'a, and my mother, Afaf Marawa'a; without their endless love and encouragement I would never have been able to complete my graduate studies. I love you both and I appreciate everything that you have done for me.

I would also like to thank Dr. Basma Salameh and Dr. Jamal Qaddumi. The two of them had faith in me and agreed to be committee members. I would forever be grateful to them.

I highly appreciate the efforts expended by Dr. Ahmad Juma Ayed, Dr. Ashraf Almimi, Dr. Ahmad Batran، Dr. Dalia Tuqan, Dr. Najwa Subah, Dr. Raef Amro, Mr. Abed Alra'oof M. Saleem, Dr.Imad abu Khader,Mr. Mohammad Baniode, Ms. Alaa Abu Aisheh, and Mr. Ali Al-Helou.

Finally, we have come a long way. Let us finish well.

Adam Marawa'a

ABSTRACT

Background: Globally there is increasing attention paid to the quality of care as a means to enhance the effectiveness of health care systems concerning the progress and changes linked with follow up visits of diabetic patients to primary healthcare centers (PHCs).

Objectives: The aim of this study was to analyze the present database regarding diabetic patients registered in the primary health care centers in West Bank.

Methods: The study used descriptive research design (retrospective) depending on a review of electronic medical records (EMR) to obtain data about T2DM patients in four targeted governmental primary healthcare centers (Qalqilya, Hebron, Ramallah, and Nablus).

Results: The results revealed that 104156 patients with T2DM attended the target primary health care centers and hospital for treatment and care in 2018. This count was less in 2017 (94126), while in 2016 it was 87676 patients. Fasting blood sugars and HbA1c in 2018 show better rates compared to the previous two years. In addition, HDL and LDL results in the year 2018 showed a slightly increased proportion of normal levels among patients while the proportion of patients with normal creatinine levels in 2018 decreased compared to previous years. There is no significant difference between patients' HDL, LDL, and Creatinine scores with gender of the patient in 2018 but there was a significant difference with HbA1C. The results of the study reported no significant difference between marital status and age with patients' HbA1C, HDL, LDL, and Creatinine.

Conclusions: The current study confirmed that minimum outcomes of diabetes care in terms of HbAC1, HDL, LDL was obtained by diabetic patients over the course of the three-year period from 2016-2018. male diabetics had greater glycemic control than Females.

Key words: Quality Management, Effectiveness, T2DM, Primary health care.

ABBREVIATIONS

AAUP	Arab American University/Palestine
ADA	American Diabetes Association
CDC	The Center for Disease Control and Prevention
DM	Diabetes Mellitus
DQIS	Diabetes Quality Indicator Set
DX	Diagnosis
EMR	Electronic Medical Record
EMR:	Electronic Medical Record
HBA1C	Hemoglobin A1c
HDL	High-Density Lipoprotein
HIS	Health Information System
HIS	Hospital Information System
IDF	International Diabetes Federation
IOM	Institute of Medicine
IRB	Institutional Review Board
LAB	Lab Test
LDL	Low-Density Lipoprotein
MOH	Ministry of Health
NGO	Non-governmental organization
PHC	Primary Health Care Center
PHCUs	Primary Health Care Units
QI:	Quality Improvement
QIIP	Quality Improvement and Innovation Partnership
SHC	Secondary Healthcare Center

SOC	Standard of Care
T2DM	Type Two Diabetes Mellitus
UNRWA	United Nations Relief and Works Agency for Palestinian Refugees in the Near East
WHO	World Health Organization

Contents

DECLARATION II
DEDICATION III
ABSTRACT V
ABBREVIATIONS VI
LIST OF FIGURES XI
LIST OF TABLES XI
CHAPTER (1) 1
INTRODUCTION 1
CHAPTER 1 2
Introduction 2
Quality in health care 2
Dimensions of health care quality 3
Overview of primary health care 3
The Palestinian health care system and primary health care 4
Global report on diabetes 5
Diabetes mellitus complications among Palestinians 5
Indicators of quality and effectiveness for diabetes care 6
1. Haemoglobin A1c (HbA1c) 6
2. Effect on high-density lipoprotein & low-density lipoprotein 6
3. Creatinine 7
Diabetes management in the primary care setting 8
Problem statement 9
Significance of the study 9
Aim of the study 9
Specific objectives 10
Secondary objectives 10
Research questions 10
Conceptual framework 10
CHAPTER TWO 13
Literature Review 13
Introduction 13
Previous studies 13

Summary 17
CHAPTER THREE 19
Methodology 19
Overview 19
Rationale for selecting a quantitative research approach 19
Data collection methods 20
Setting 20
Study population 20
Data cleaning 21
Inclusion criteria 21
Exclusion criteria 21
Data collection tool and measurements 22
Data analysis 24
Ethical considerations 24
Confidentiality and anonymity 24
Reliability and validity 24
Summary 25
CHAPTER FOUR 27
Results 27
Introduction 27
Cleaning data 27
..... 28
Participant characteristics 29
Patient characteristics in the years 2016, 2017 and 2018 31
Effectiveness of health care services for T2DM patients 33
Comparison between the effectiveness of healthcare for diabetic patients in the last three years 35
Differences between the effectiveness of healthcare for diabetic patients and demographic characteristics 35
Comparison of patient demographic characteristics among the three years 39
Summary 40
CHAPTER FIVE 42
Discussion 42
Introduction 42
Overview 42

Evaluation of the effectiveness of diabetes care in T2DM management 43
1. Glycemic control determined by HbA1c 43
2. Lipid control 43
3. Creatinine 44
4. Effectiveness of diabetes care by age 44
5. Effectiveness of diabetes care by gender 45
Conclusion 45
Theoretical contribution to the body of knowledge 46
Limitations for the research 47
Recommendations 47
1. Education and knowledge 47
2. Practice level 48
3. Research level 48
4. Policy making and management level 48
REFERENCES 49

LIST OF FIGURES

Figure 1: Conceptual framework of the study 11
Figure 2: Distribution of raw data for t T2DM in hospitals and primary healthcare centers between 2016 and 2018 27
Figure 3: Raw data for T2DM among primary health care centers between 2016 and 2018 . 28
Figure 4: Raw data for lab tests for T2DM in primary health care centers between 2016 and 2018 28
Figure 5: Distribution of the patients by age (n=11938) 29
Figure 6: Distribution of patients according to PHCs (n=11938) 30
Figure 7: Distribution of the patents according to gender (n=11938) 31

LIST OF TABLES

Table 1: Number of diabetic patients T2DM between 2016 and 2018, raw data 21
Table 2: Number (percentage) of diabetic patients T2DM between 2016 and 2018 after cleaning 22
Table 3: Cut-off points of lab tests based on reference from the MOH laboratories 23
Table 4: Distribution of the patients according to marital status (n=11938) 30
Table 5: Demographic characteristics of T2DM patients who visited PHCs by year 32
Table 6: Effectiveness of health care quality measures for diabetic patients in PHCs (n=11938) 33
Table 7: Descriptive analysis for the effectiveness of healthcare for diabetic patients in PHCs between 2016-2018 (n=11938) 34
Table 8: Differences between diabetic measures scores and gender in the year 2018(n=3032) 35
Table 9: Differences between diabetic measures scores and PHCs in the year 2018 (n=3032) 36
Table 10: Differences between diabetic measures scores and marital status in 2018 (n=3032) 36
Table 11: Differences between diabetic measures scores and age in year 2018 (n=3032) 37
Table 12: Differences between diabetic measures scores and year (n=11938) 38
Table 13: Comparison of patient characteristics and year (n=11938) 39

CHAPTER (1)
INTRODUCTION

CHAPTER 1

Introduction

Quality in health care

Healthcare has received a lot of attention recently, as it is the most rapidly growing service industry in the world. The consideration for patient safety and quality has increased, particularly in terms of allocated budget, health reform, and attention to malpractice (Lee et al., 2013). Evidence has already shown that both health care providers and patients give priority to the availability of health service options offered in an environment that is secure and safe, clean, relaxed, calm and convenient to perform and receive care (Lee, 2015).

Healthcare systems have recently undergone major transformations worldwide, including many quality improvement initiatives that aim at improving the quality of health services for patients and their families. The US Institute of Medicine (IOM) defines the quality of care as the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge (Institute of Medicine, IOM, 2001).

Attempts to quantify this wide definition involve describing main characteristics of quality. According to Tunçalp et al. (2015), quality care is that which is: safe, effective, timely, equitable, efficient, and patient and family-centered. Health system experts also conclude that the provision of high-quality care relies on the correct preparation of the health system or service which, if implemented, should have an effect on the satisfaction of the client from improved health.

Actually, health care quality measures have classically been segmented into three domains: care structure or input, care process or content, and outcomes of care (World Health Organization, 2010). Each domain has advantages and disadvantages: input measures are the required foundation for care, but are not sufficient to describe their content or effects; process measures are directly related to the quality of care but are difficult to collect; and outcome measures determine the final goal of the health system but also represent other factors outside the health system itself (O'Neill et al,. 2013).

Dimensions of health care quality

The IOM, in its report *Crossing the Quality Chasm*, describes the most important aspects of quality improvement by presenting six specific quality objectives (IOM, 2001). The objectives are based around the main aspects of quality healthcare mentioned above:

- **Safe**: Avoiding complications to patient from the care of people providing the healthcare service.
- **Effective**: To provide services based on scientific knowledge to all who could benefit from it, and to refrain from providing services to those who are unlikely to benefit from it.
- **Patient-centered**: Providing care that is respectful and reactive to individual patient interests, needs, values, and maintains that all clinical decisions are guided by patient values.
- **Timely**: Reducing stays and sometimes harmful delays for both the clients and the health care providers.
- **Efficient**: Use of equipment, supplies, ideas, and energy is not wasteful...
- **Equitable**: The quality of care does not differ due to gender, race, geographical location, and socioeconomic status of the patient.

Overview of primary health care

Primary health care centers are the first contact points patients have with the healthcare system. They cover first-contact and out-patient treatment. Primary care services encompass preventative, primitive, curative, and supportive and rehabilitation services (Netshandama et al., 2005). Such services, delivered by professionals from various disciplines, serve to improve the physical, social, emotional and spiritual well-being of people and to resolve factors that affect their health. Services are usually structured to be provided in collaboration with community service providers (Lewis et al., 2004).

Primary health services match the general health of the population. Most of the epidemic problems in low and middle-income countries are handled by primary health care systems. Primary health care is the cornerstone of the health care delivery system in these countries and is approved as the best method for providing basic health care to the populations of these countries (Ehiriet al, 2005).

The Palestinian health care system and primary health care

The Palestinian Ministry of Health (MOH), the United Nations Relief and Works Agency for Palestinian Refugees in the Near East (UNRWA), military health services, charities and non-governmental organizations (NGOs), and the private sector provide primary, secondary, and tertiary health services. In Palestine, there are 743 primary health centers (583 centers in the West Bank and 160 in the Gaza Strip) and 81 hospitals (51 hospitals in the West Bank, including East Jerusalem and 30 in the Gaza Strip) (MOH, 2017). According to MOH statistics from 2017, the number of primary health care centers (PHCs) operated by NGOs is 182 centers which makes up 24.9% of all primary healthcare services available in Palestine, while the number of UNRWA centers are 65 and there are 17 military medical centers.

Despite a number of advances in the healthcare system in Palestine, most PHCs still use paper records. Just nine of all PHCs in the West Bank have electronic health records. Such centers are Ramallah PHC, Nablus PHC, Qalqilya PHC, Hebron PHC, Azzun PHC, Karantina PHC, Tarqumiyah PHC, Huwara PHC, and Bayt Rima PHC.

The prevalence of non-communicable diseases is significant in Palestine. The major causes of death are cardiovascular diseases, cancer, cerebrovascular diseases, perinatal conditions, and diabetes mellitus. Associated risk-factors such as smoking, unhealthy diet and sedentary lifestyle are common (MOH, 2017). Estimates of the prevalence of diabetes have been difficult to obtain given the large population of refugees scattered across neighboring countries and the fragmented nature of the health system. Prevalence rates and projections, though, range from a low of 10% to as much as 20.8% as projected for the current year, 2020 (Abu-Rmeileh et al., 2013).

Primary health care is essential for management and control of non-communicable diseases such as type 2 diabetes mellitus (T2DM). Good preventive and adequate care may lower the incidence and prevent further complications and comorbidities related to T2DM at the primary level. Although monitoring quality of diabetes care is a challenging task for the health care system, it is essential in evaluating the effectiveness of guideline implementation in health care. There is a lack of standard indicators for diabetes care that are used to measure the quality of diabetes care in many countries in Europe and the USA (International Diabetes Federation 2014c).

Global report on diabetes

Globally, the number of people with T2DM is expected to rise from 405.6 million in 2018 to 510.8 million in 2030 (Basu et al., 2019). On this basis, insulin use is estimated to increase from 516.1 million 1000 IU vials per year in 2018 to 633.7 million per year in 2030. If insulin access was to improve over the next ten years and if it were prescribed to accomplish an HbA1c of 7% or less, the rate of T2DM using insulin may raise from approximately 7% to 15%. Furthermore, the Disability-Adjusted Life Years may be prevented if an HbA1c level of 7% or lower is widely achieved, if access to more recent oral drugs increased, and if the HbA1c target level was 8%for older adults (Basu et al., 2019).

Diabetes mellitus complications among Palestinians

Diabetes and its complications are reported to account for nearly 5.7% of all deaths in Palestine(Al-Halaweh,2017), The Union of Palestinian Medical Relief Committee reported that in 2020 approximately 18% of the Palestinian population will have diabetes mellitus. However, this proportion is closer to 30% when taking into account the people with pre-diabetes as well as those who are unaware that they are diabetics. (Palestine Diabetes Institute, 2020)

Prevalence data of diabetes complications is important to understand the level of diabetes control in a population and as a method of monitoring the efforts of health systems to address the prevention and control of diabetes. Unfortunately, these data are lacking in Palestine. (Khader et al., 2014). Diabetes can be managed and controlled by careful medical treatment and persistent follow-up. However, large proportions of Palestinians with diabetes do not have necessary access to affordable treatment and may be at-risk for serious complications such as blindness, kidney failure, and diabetic foot leading to amputation.

In 2006 the MOH developed diabetes management guidelines to enhance the quality of care for patients with diabetes. The MOH guidelines are dedicated to diabetes mellitus management and care based on the World Health Organization (WHO) diabetes care guidelines (WHO, 2006). Then in 2008, together with the WHO and the Austrian Development Cooperation, the MOH guidelines were revised and modified. The MOH adopted the Diabetes Mellitus Management and Care Quick Reference Guide, known as the Quick Guide. However, it is not yet known whether these diabetes management

guidelines have improved diabetes mellitus treatment, follow-up and outcomes. Therefore, the primary aim of this study was to assess whether the follow-up and outcomes of T2DM patients have improved in Palestine from 2016 to 2018.

Indicators of quality and effectiveness for diabetes care

WHO and American Diabetes Association (ADA) developed indicators to evaluate the effectiveness of health services provided to diabetes mellitus patients. These indicators include glycated hemoglobin (HbA1c), High-Density Lipoprotein (HDL), Low-Density Lipoprotein (LDL), and creatinine.

1. Haemoglobin A1c (HbA1c)

Glycated hemoglobin (HbA1c) is average blood glucose level over the previous three months, which is the predicted half-life of red blood cells (RBCs). It is recommended as a standard of care (SOC) for evaluating and monitoring diabetes, specifically the T2DM (Khan & Weinstock, 2011). The ADA actually recommends HbA1c with a cut-point of ≥6.5 % for diagnosing diabetes as an alternative to fasting plasma glucose (FPG ≥7.0 mmol / L) based criteria

2. Effect on high-density lipoprotein & low-density lipoprotein

The increase in triglyceride-rich lipoproteins, in turn, has consequences on other lipoproteins. "Diabetic dyslipidaemia" is typically characterized by elevated serum triglycerides (TGs) and low high-density lipoprotein cholesterol (HDL) concentrations, In patients with T1DM, the degree of glycaemic control appears to be important, as those with poor control typically have dyslipidaemia resembling T2DM, while individuals with good control tend to have normal or even raised HDL (Chait & Goldberg, 2017).

3.1 **High-density lipoprotein**

HDL exerts diverse actions in the vascular system. It primarily mediates the process of reverse cholesterol transport (RCT) by scavenging cholesterol from peripheral cells, including from macrophages in atherosclerotic plaque, returning it to the liver for further metabolism and excretion, and in doing so, protects against atherosclerosis, a pathological hallmark of vascular complications (Ahmed et al., 2016).

3.2 Low-density lipoprotein

Diabetes and associated comorbidities are known to increase patients' risk of developing cardiovascular diseases (CVDs), which are responsible for approximately 70% of diabetes-related deaths. The risk to the development of CVD is higher in people with suboptimal glycaemic, hypertension and low-density lipoprotein-cholesterol (LDL-C) control. A reduction of HbA1c to control targets along with optimal hypertension control and the use of statins to lower LDL-C levels have been shown to improve long-term outcomes including reducing mortality among patients with diabetes (Mwita et al., 2019).

3. Creatinine

Creatinine is the breakdown product of creatinine phosphate is released from skeletal muscle at a steady rate Diabetic nephropathy affects 30% of all diabetics and it is a leading cause of end stage renal disease. Diabetic nephropathy is characterized by macro albuminuria more than 300 mg (proteins specifically albumin) in a 24-hour urine collection or macro albuminuria and abnormal renal function as represented by an abnormality in serum creatinine and serum urea (Bamanikar, S. A 2016).

Measurement of serum urea and creatinine are easily available tests for this purpose which can assist in detection and prevention diabetic kidney disease at an early stage and can limit the progression to end stage renal disease (ESRD). Patients with early onset diabetes mellitus have higher GFR levels thus making them a suitable population for study of progressive loss of renal function.

Diabetes management in the primary care setting

Management of diabetes consists of pharmacological and non-pharmacological treatment. Pharmacological treatment includes timely intake of ordered medications (Santhanakrishnan et al., 2014). Non-pharmacological treatment includes modification of diet, exercise and activity, stopping smoking, foot care and regular follow-up.

Glycemic control requires self-management involving compliance to dietary modifications, medications, regular follow-up, foot care and physical activity. Treatment of diabetes mellitus (DM) is a life-long process and necessitates continuous motivation from the patient and depends upon a regular supply of medication and a specific attitude from health-care providers (Shaw et al., 2010).

Non-compliance causes treatment failure and leads to lack of metabolic control, which plays an important role in the development and acceleration of diabetic complications (Nuesch et al., 2001). Several methods are used to measure compliance such as self-reports and interviews with patients, which are the simplest and most common methods for measuring compliance. Non-adherence in chronic disease has been identified as taking less than 80% of the prescribed treatment. Studies show compliance is about 50% for medications in chronic diseases and much lower for life-style prescriptions. The consequences of medication non-compliance may not only be dangerous for patients' health, but also dramatically increase the financial cost of public health services (Girerdet al., 2001).

The human and economic toll of DM, particularly T2DM is likely to grow globally in the foreseeable future due to rapid cultural changes, aging populations, increasing urbanization, dietary changes, decreased physical activity and other unhealthy lifestyle and behavioral patterns (WHO, 2005).

Diabetes requires comprehensive and continuous management and is a complex challenge for healthcare providers. A number of management guidelines and protocols are recommended by different international federations and associations (American Diabetes Association, 2009). Nevertheless, large numbers of studies both from developed and developing countries have identified major gaps in the quality of care provided to people with diabetes. According to one study from the USA, only 33% of people with diabetes received the recommended HbA1c testing and 58% had their feet checked by a health professional within a one-year period (Wu et al., 2005).

Problem statement

Diabetes mellitus is a burdensome disease that contributes to higher mortality rates and is costly (ADA, 2018). However, it can be managed through medication, diet, exercise and other adapted lifestyle activities that depend on behavioral change in many ways (IDF, 2014).

Diabetes and its related complications are main health problems in Palestine and are recorded as the sixth primary reason for death; causing about 5.7% of all deaths (Palestinian Ministry of Health, 2015.) Until recently, data on the prevalence of diabetes complications have hardly existed. Moreover, no published data exists on the effectiveness of healthcare services provided to T2DM patients. These data are important to understand the diabetes control level in a population and to follow-up on the process of monitoring the health system's efforts to discourse diabetes control and prevention.

Significance of the study

The study will highlight the need for healthcare professionals to play an active role in helping patients manage diabetes effectively. This will help healthcare professionals create appropriate recommendations for diabetes management and encourage adherence to self-care. The study will also emphasize the need to focus on the content of patient interactions with health care providers to enhance patient support. Importantly, the study will recognize the need for professionals to regularly evaluate the knowledge and understanding of diabetes of patients and ensure that relevant resources are available to them. Recognizing the influences that affect health outcomes in the Palestinian community is a crucial step towards achieving health equity for all elderly patients suffering from the disease. The study findings will be intended to assist healthcare providers, community - based programs, and healthcare organizations in the development of health promotion materials and other types of interventions used to prevent and treat diabetes.

Aim of the study

The study aims to evaluate the effectiveness of healthcare services provided to T2DM patients between 2016 and 2018 in the West Bank, Palestine.

Specific objectives

1. Assess the quality of healthcare services provided to the Palestinian T2D patients in the West Bank between 2016 and 2018 in terms of HbA1c, LDL, HDL and Creatinine as treatment outcome indicators.
2. Evaluate the follow-up of T2D patients from HbA1c, LDL, HDL and Creatinine in 2016, 2017, and 2018.
3. Determine the relationships between socio-demographic characteristics of patients and quality of healthcare services in 2018.

Secondary objectives

To raise the awareness of primary healthcare center staff, policy makers and others towards higher quality healthcare and to support development of strategies and recommendations that will help in developing proper practices to improve the quality of healthcare services provided to T2DM patients in primary healthcare centers.

Research questions

1. What was the current level of quality of health care (effectiveness) provided to the Palestinian T2DM patients in the West Bank between 2016 and 2018 using HbA1C, LDL, HDL and Creatinine as treatment outcome indicators?
2. How different were the follow up results of the last three years (2016-2018) for T2DM patient indicators?
3. What is the effect of socio-demographic characteristics of T2D patients on the effectiveness of health services?

Conceptual framework

The conceptual framework of our study is based on the Triad Model of Donabedian, but we take the process and the outcome into consideration; the process analysis focused on the care delivered by the primary health care centers to diabetic patients, and the outcome analysis focused on the effect of health care on the status of the diabetic patients as measured by HbA1C, Creatinine, LDL, and HDL (Donabedian, 1980). as shown in Figure 1.

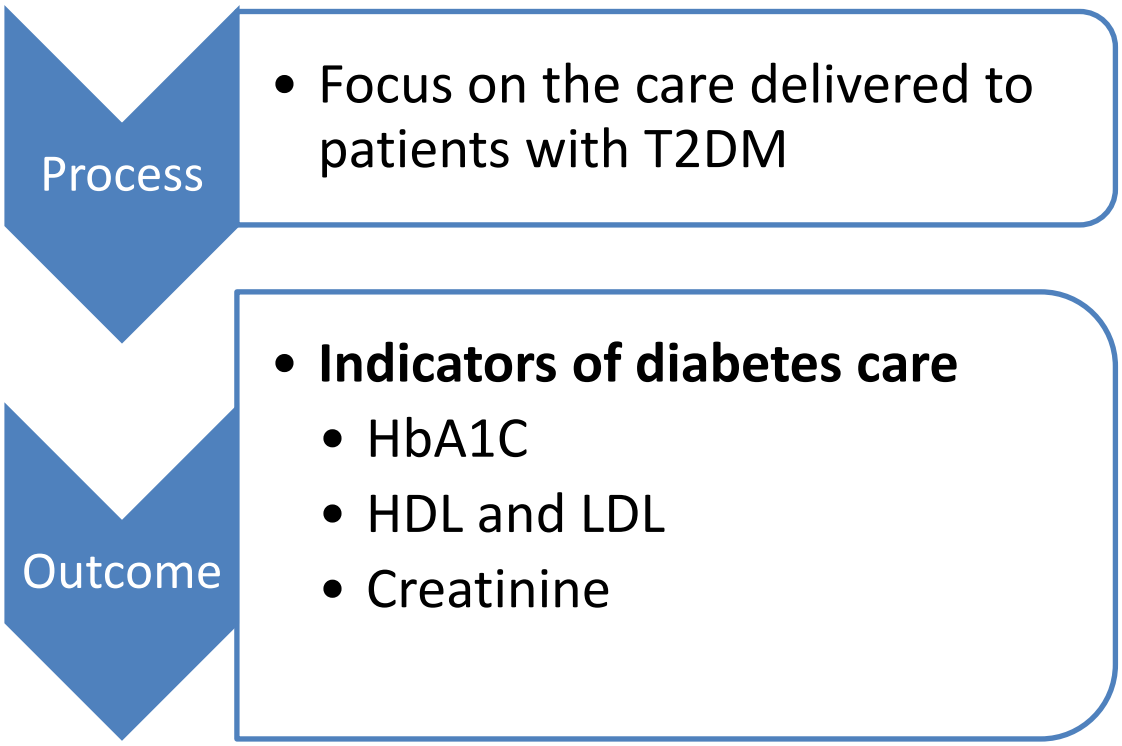


Figure 1: Conceptual framework of the study

Next, we have reviewed the findings in relation to the wider context in which the study is located. In addition, we have reviewed previous research globally and regionally that investigated effectiveness of health care services provided to diabetic patients, effectiveness of health care for these patients as concluded through an analysis of glycated hemoglobin, fasting blood sugar, LDL, HDL, and creatinine.

CHAPTER (2)

LITERATURE REVIEW

CHAPTER TWO

Literature Review

Introduction

The literature review integrates previous and current research in both print and electronic formats covering the constructs and variables that are at the core of the study. The study focused on peer-reviewed electronic journal articles from the Arab American University Library databases, article databases and EBSCO host. The print sources included articles, books, and journals that were available in hard copies. The reference section provides the details of the sources.

Previous studies

A cross-sectional, observational study initiated by Simão et al. (2017) described the quality of care indicators for people with diabetes in southeast Brazil and explored the associations among these indicators. Health care providers completed a questionnaire on the structure and processes of health care at 14 primary health care units (PHCUs). The data were obtained from diabetic patients attending the PHCUs. Study results showed that there was shortage of professionals in 53.8% of the PHCUs. Glycated hemoglobin findings were already available in half of the medical records at the PHCU. Moreover, there was a low rate of adequate glycemic control. The study concluded that, in regards to unsatisfactory diabetes care outcomes, the major defects were found in the PHCUs' structures and processes. No association was found, however, between structure, process, and outcomes.

Another cross-sectional study conducted by Badawi, Saleh, Natafgi, Mourad, & Behbehani (2015) to examine the performance of T2DM care by using a diabetes quality indicator set (DQIS) in primary health care centers in Kuwait. Five key care domains/ measures were used: (1) measurement of blood glucose levels, (2) measurement of cholesterol levels, (3) measurement of blood pressure, (4) testing of kidney function and (5) checking of smoking status. The sample included the four major primary health care centers with the highest caseloads in Kuwait City. (4,241 patients) in 2012 and 3,211 patients in 2010 were included in the study. Findings revealed that many of the primary health care centers attained significant improvements in diabetes care between 2010 and 2012, except for the smoking domain.

In addition, another study conducted in the Netherlands using a cross - sectional study design by Campmans - Kuijpers, Baan, Lemmens, Klomp, Romeijnders, & Rutten, (2015) aimed to explore the association between care group level quality management and aggregate care group performance indicators. –23 Dutch care groups provided aggregate register - based performance indicators of all their practices as well as quality management data assessed with a questionnaire filled out by 1 or 2 of their quality managers. Weighted multivariable linear regression analysis was used to test the combination of overall quality management in 6 areas (care organization, multidisciplinary teamwork, patient centering, performance management, quality improvement policy and management strategies) with 3 process indicators (percentages of patients with at least 1 glycated hemoglobin measurement, Lipid profile and systolic blood pressure) and 3 intermediate outcome indicators (percentages of patients with glycated hemoglobin below 53 mmol / mol (7 percent); low density lipoprotein cholesterol below 2,5 mmol / L; and systolic blood pressure below 140 mm Hg). The findings revealed that the management strategies domain was significantly associated with the percentage of patients with glycated hemoglobin< 53 mmol / mol (β 0.28 (0.09; 0.46) p=0.01). The other areas as well as overall quality management were not associated with aggregate process or outcome indicators.

In a review conducted by Schmittdiel, Gopalan, Lin, Banerjee, Chau, & Adams (2017) the main elements of population care methods of diabetes in the current health care environment were summarized. Results showed that public health care strategies proactively classify patients with diabetes through disease registries and electronic health records, and use multidisciplinary care teams, personalized feedback from providers and decision-making support tools to monitor and care for patients at risk for poor outcomes. The evidence produced by this study shows that these approaches will improve health care quality and possibly reduce race / ethnic disparities in health care. Nonetheless, the authors note that these approaches may be less successful for people who are disassociated from the health care system. The conclusion of this study is that, as population care continues to grow, future strategies will find ways to tailor population care to meet individual patient needs by allowing the use of advanced health information systems and continuity of care to optimally manage and prevent diabetes.

Another cross sectional study conducted by Cooper et al. (2009) assess changes in the quality of care in Norway for patients with T2DM. Two surveys were examined that

identified all patients (n = 1,470 in 1995 and n = 2,699 in 2005) with T2DM attending 33 general practices in 1995 and 2005. Results of the study showed that between 1995 and 2005, there were significant improvements in risk factor control and processes of care. The mean HbA1C declined from 7.74% to 7.15%, systolic blood pressure from 150.0 to 140.4 mmHg, and cholesterol from 6.28 to 5.0 mmol/l ($P < 0.001$, age and sex adjusted). The 10-year risk of coronary heart disease for an average male patient declined from 42% to 29%. The study concluded that there have been substantial improvements in T2DM primary care in Norway that are potentially related to major improvements in health outcomes.

Furthermore, Reichert et al. (2017) conducted a cluster matched-control, retrospective study to evaluate the Quality Improvement and Innovation Partnership (QIIP), an Ontario-wide PHC QI program on access to care, diabetes management and colorectal cancer screening. One physician per QIIP-PHC team (n=34) and control (n=34) were recruited for the audit. Eligible charts were reviewed for pre-specified T2DM clinical process and outcome data at baseline, during intervention (range: 15– 17.5 months) and post intervention. Primary outcome measures were the HbA1c of patients above the study target and the proportion of patients with an annual foot exam. Secondary outcome measures included glycemic, hypertension and lipid outcomes and management, screening for diabetes-related complications, healthcare utilization, and diabetes counseling, education and self-management goal setting. Results showed that more patients in the QIIP group achieved statistically improved lipid testing, eye examinations, peripheral neuropathy exams, and documented body mass index.

In a cross-sectional study conducted by Mata-Cases et al. (2012) performed on secondary data collected between 1993–2007 the evolution of T2DM quality indicators in primary care centers (PCC) was assessed as part of the Group for the Study of Diabetes in Primary Care (GEDAPS) Continuous Quality Improvement (GCQI) program in Catalonia. Process and outcome indicators in random samples of patients from each center were collected. The results of each evaluation were returned to each center to encourage learning and improvement. Sixty-four different educational activities were performed during the study period with the participation of 2,041 professionals. Results showed that clinical records of 23,501 patients were evaluated. A significant improvement was observed in the determination of some annual process indicators: HbA1c (51.7% vs. 88.9%); total cholesterol (75.9% vs. 90.9%); albuminuria

screening (33.9% vs. 59.4%) and foot examination (48.9% vs. 64.2%). The intermediate outcome indicators also showed significant improvements in glycemic control [HbA1c ≤ 7% (< 57 mmol⁄mol); (41.5% vs. 64.2%)]; total cholesterol [≤ 200 mg⁄dl (5.17 mmol⁄l); (25.5% vs. 65.6%)]; and blood pressure [£ 140⁄90 mmHg; (45.4% vs. 66.1%)]. In addition, a significant improvement in some final outcome indicators such as prevalence of foot ulcers (7.6% vs. 2.6%); amputations (1.9% vs. 0.6%) and retinopathy (18.8% vs. 8.6%) was observed.

Comorbidities are strongly associated with the quality of diabetes care. Most diabetic patients have at least one additional chronic illness other than diabetes (Piette & Kerr, 2006). Few studies have taken into account comorbid conditions such as the impact of mental disorders on care of diabetes (Goldberg et al., 2007). A limited number of studies have been done so far to assess the quality of diabetes care associated with comorbidities. However, studies on the impact of comorbidities on diabetes care show controversial results. Some earlier studies have found that diabetic patients with concordant diseases are more likely to achieve recommended HbA1c and LDL control (Magnan et al., 2015a). On the other hand, other studies found that discordant diseases were associated with lower quality diabetes care (Pentakota et al., 2012). However, it has also been observed that comorbidities have no significant association with quality of diabetes care at all (de Bruin et al., 2013).

Non-compliance can be due to factors that are patient-centered, therapy-related, psychological or healthcare system -related. The patient-centered factors can be demographic (age, gender, educational level, and marital status) and psychological (patients' beliefs and motivation towards the therapy, negative attitudes, patient-prescriber relationships, understanding of health issues, and patient's DM is influenced by biological, psychosocial, developmental, socio-cultural, and ecological factors. Not only are the individual influences important in the management of diabetes, but environmental influences also affect preventive and curative behaviors. These dynamic inter-reactions occur in varying proportions throughout life (Abraham et al., 2015). Psychological factors are also linked with regimen adherence. Appropriate health beliefs, such as perceived seriousness of diabetes, vulnerability to complications, and the efficacy of treatment can predict better adherence (Peyrotet al., 2005). Patients adhere well when the treatment regimen makes sense to them, when it seems effective, when they believe the benefits exceed the costs, when they feel they have the ability to

succeed at the regimen, and when their environment supports regimen-related behaviors. As the incidence of diabetes is on the rise, it is important that nurses assess the patient's understanding of the disease and treatment and compliance to it (Spring et al., 2012).

Summary

The introduction and literature review in Chapters 1 and 2 suggest that diabetes care has a big financial impact on patients, families, and the national healthcare system in any country. The contributed cost related to the essential anti-diabetic treatment, significantly increased utilization of healthcare services, and decrease of productivity confirm the need to reduce T2DM complications and make provided care more effective.

Increasing consideration has been paid recently to the quality of care as a means to enhance the effectiveness of health care system frameworks. Diabetes is considered as one of the most widespread chronic diseases in the population. Most diabetic patients, especially T2DM patients, receive their care in primary health care centers. Primary healthcare has gained attention worldwide as an important component for efficient, effective, and integrated healthcare systems that can contribute to improved health and health equity while reducing healthcare costs (Alahmary, 2014).

In the following chapter we will discuss the methodology used to answer our study’s research questions.

CHAPTER (3) METHODOLOGY

CHAPTER THREE

Methodology

Overview

This chapter describes the methodology was used to conduct our research and meet the study's objectives. This chapter is divided into six sections:

Section one: Describes the rationale for selecting a quantitative research approach.
Section two: Describes data collection methods.
Section three: Presents the source from which the data have been collected,
Section four: Describes the method and technique by which the data was analyzed.
Section five: Includes the verification and validation of the results as explained.
Section six: Includes the ethical considerations related to our work.

Rationale for selecting a quantitative research approach

For more convenient and possible analysis, a quantitative research method was used to determine how best to organize the data and to identify scales related to them.

The nature of the data needed for our research was numerical data. These data are routinely collected for diabetic patients and are available in the electronic medical files of the health information system (HIS) in primary health care service. For that reason, we adopted the quantitative study approach to put the variable in an operational to which is easily analysed and can be generalized from larger population variables in order to make generalizations about a larger population. This type of research method includes the utilization of measurable, numerical instruments to infer results.

To quantify the research problem so that it describes the participant characteristics in order to compare our data trend and validate the existing condition, we used a descriptive analysis approach; an approach which provided a prediction for future results allowed us to generalise a concept and investigate causality and relationships.

All diabetic patient data were taken from the health information system (HIS). HIS refers to a system designed to manage healthcare data. This includes systems that collect, store, manage and transmit a patient's electronic medical record (EMR), a hospital's operational management or a system supporting healthcare policy decisions.

Data collection methods

To answer the research questions, diabetic patient data were extracted from the health information system. Data extraction was obtained from two different database sources; one from the laboratories department and the other from the non-communicable diseases department. The two different databases for the same patient were merged together in one file using a unique code (D-identifier). A description of the study setting, study population, and data cleaning and management are described below.

Setting

This work was conducted in the primary health care centers (PHC) of the Palestinian Ministry of Health (MOH). The MOH was established after the Oslo agreement between Israel and Palestine in 1995. The MOH is mandated to provide primary, secondary and tertiary health services.

Many efforts were done to improve Palestinian health status through primary health care centers and hospitals. The settings which were chosen for the purpose of the study were primary health care centers from the North, Middle and South districts of the West Bank. Clinics from the North district were Qalqilya and Nablus, the Middle district was Ramallah and the South district was Hebron. The data extracted for this study covered three years; 2016, 2017 and 2018.

Study population

A population is defined as an entire set of subjects, objects, events, or elements being studied (Davis, 2014). Our target population was all patients with T2DM in governmental primary health care settings. The primary healthcare centers that use electronic medical records were covered in this study; namely Qalqilya, Nablus, Ramallah and Hebron cities in the West Bank of Palestine. The total number of diabetic patients with T2DM between 2016 and 2018 per target location are presented in Table 1.

Table 1: Number of diabetic patients T2DM between 2016 and 2018, raw data

Primary health care center	**2016**	**2017**	**2018**
Ramallah PHC	12119	19046	19241
Nablus PHC	33396	29937	31076
Qalqilya PHC	3202	6316	7121
Hebron PHC	7216	7121	9443
Total	55933	62242	66881

Data were gathered from the MOH by extracting data from electronic medical records about T2DM patients who visited primary healthcare centers in 2016, 2017, and 2018. Obligatory electronic data entry started in 2016 in the MOH.

Data cleaning

Only T2DM patients who received care in the selected primary healthcare centers in the West Bank were included. The inclusion and exclusion criteria for selecting patient records were as follows.

Inclusion criteria

- Patients who received health care through selected primary health care centers between 2016-2018
- All T2DM patients
- All patients with a completed file (Dx, Lab)

Exclusion criteria

- Incomplete records
- Patient received care in 2019
- Duplicated records

The final results for cases per year after data cleaning are shown in Table 2.

Table 2: Number (percentage) of diabetic patients T2DM between 2016 and 2018 after cleaning

Primary health care center	2016	2017	2018
	N (%)	N (%)	N (%)
Ramallah PHC	292 (7.4%)	1055 (24.8%)	766 (20.5%)
Nablus PHC	3322 (84.3%)	2720 (64.0%)	2091 (55.8%)
Qalqilya PHC	34 (0.9%)	116 (2.7%)	168 (4.5%)
Hebron PHC	294 (7.5%)	360 (8.5%)	720 (19.2%)
Total	3942	4251	3745

Data collection tool and measurements

The electronic files of patients with T2DM were reviewed. The effectiveness of healthcare services provided to T2DM patients was measured using specific indicators developed by WHO and the ADA. The indicators used were:

1. **HbA1C level** is an analysis of glycated hemoglobin (HbA1c) in blood. It provides evidence about an individual's average blood glucose levels during the previous two to three months, which is the predicted half-life of red blood cells (RBCs). It's a three-month average because that's typically how long a red blood cell lives. (Sherwani, et al., 2016)

   A hemoglobin A1c (HbA1c) test measures the amount of blood sugar (glucose) attached to hemoglobin. Hemoglobin is the part of red blood cells that carries oxygen from the lungs to the rest of the body. The HbA1c is now recommended as a standard of care (SOC) for testing and monitoring diabetes, specifically T2DM. (Sherwani, Khan, Ekhzaimy, Masood, & Sakharkar, 2016). An HbA1c of 6.5% is recommended as the cut-off point for diagnosing diabetes. A value of less than 6.5% does not exclude diabetes diagnosed using glucose tests. (WHO, 2011)

2. **Low-density lipoprotein (LDL) and high-density lipoprotein (HDL)** are indicators for heart disease and for the complications of diabetes mellitus disease. LDL, sometimes called 'bad cholesterol', makes up most of our body's cholesterol. High levels of LDL cholesterol raise our risk of heart disease and stroke (CDC, 2017). However, HDL, or 'good cholesterol', absorbs cholesterol and carries it back to the liver. The liver then flushes it from the body. High levels of HDL cholesterol can lower one's risk of heart disease and stroke (CDC, 2017).

3. **Creatinine** is known as a waste product derived from muscle creatinine that releases into the blood at a relatively constant rate. It is then excreted by glomerular filtration during the normal renal function. The amount of creatinine per unit of muscle mass is constant; therefore, increased blood creatinine is the best indicator of impaired kidney function. (CDC,2011) Creatinine is an indicator of renal function. It could be affected by long term diabetes mellitus. This indicator was also identified as an important complication associated with T2DM.

To evaluate the effectiveness of T2DM, specific cut-off points were used for each indicator. Table 3 shows the cut-off points used in our study based on reference from the MOH laboratories, according to the kit used there.

Table 3: Cut-off points of lab tests based on reference from the MOH laboratories

	Gender	Min. Limit	Max. Limit	Min. Value	Max. Value
HbA1C	All	0 Year	150 Year	0	6.4%
HDL	Female	0 Year	150 Year	35	80 mg/dl
	Male	0 Year	35 Year	35	65 mg/dl
LDL	All	0 Year	150 Year	0	130 mg/dl
Creatinine	Female	0 Year	120 Year	0.5	0.9 mg/dl
	Male	0 Year	120 Year	0.7	1.2 mg/dl

Data analysis

Analysis of the data was performed by SPSS version 23. The effectiveness of health services provided to T2DM patients was calculated using five indicators (HbA1C, HDL, LDL, and Creatinine). Each indicator was scored based on the lab test values. These values were then converted to high, normal, or low using the evidence-based cut-off points. Frequencies, means and standard deviations were used to measure the level of effectiveness for health services. Independent t-tests and ANOVA were used to compare the effectiveness of health services provided to T2DM across three years; 2016, 2017, 2018. In relation to the participants' characteristics, they were compared across study phases using a chi-square test.

A regression model was carried out to assess the relationship between each outcome and participants' characteristics.

Ethical considerations

Ethical considerations at each step of the study process were ensured. Prior to data collection, approval was obtained from the Arab American University. Moreover, the study was approved by the Palestinian Ministry of Health (MOH) to review electronic files.

Confidentiality and anonymity

Confidentiality and anonymity were assured during all phases of this study. Confidentiality refers to protecting data by not divulging information that is gathered without the individual's permission to do so (Davis, 2014). Anonymity refers to keeping participants nameless and limiting access to information that is gathered about participants (Davis, 2014). In this study, the participants' names were coded and only used by the researcher for the purpose of the study. Data was secured and saved in the researcher's computer; no one except the researcher had access to the data.

Reliability and validity

Since the data is collected from reliable and valid secondary data sources; namely the HIS system, there was no need to do any further tests for checking their reliability and validity.

Summary

A quantitative approach was used in this study. Diabetic patients between the years 2016 and 2018 were involved in the study at MOH primary health care centers in Qalqilya, Nablus, Ramallah and Hebron cities in the West Bank of Palestine. Data was collected from laboratory departments and non-communicable disease departments by using HbA1C level, low-density lipoprotein (LDL), high-density lipoprotein (HDL), and creatinine. Data were analyzed using SPSS version 23.

After data collection, management, and analysis, the following chapter will present our results.

CHAPTER (4)

RESULTS

CHAPTER FOUR

Results

Introduction

This chapter describes demographic characteristics of participants, effectiveness of health care services for diabetic patients over the last three years (2016, 20017 and 2018) and the association between each outcome and participant demographic characteristics.

Cleaning data

The initial database of T2DM showed that approximately 104156 patients with diabetes mellitus were clients of either hospitals or primary health care centers until the end of the year 2018. The number of the patients was less in 2017 at 94126 while in 2016 it was 87676 patients. The initial data was respectively cleaned. All missing and duplicated data were excluded. Only primary health care patients were included in our study population. The distribution of T2DM in hospitals and primary health care centers data before cleaning is shown in Figures 2 & 3.

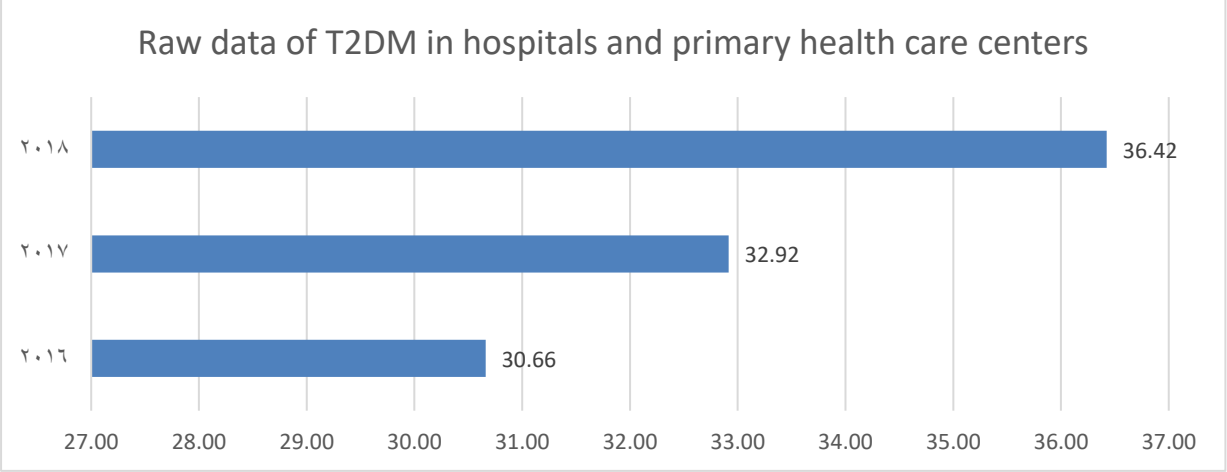


Figure 2: Distribution of raw data (%) for T2DM in hospitals and primary healthcare centres between 2016 and 2018

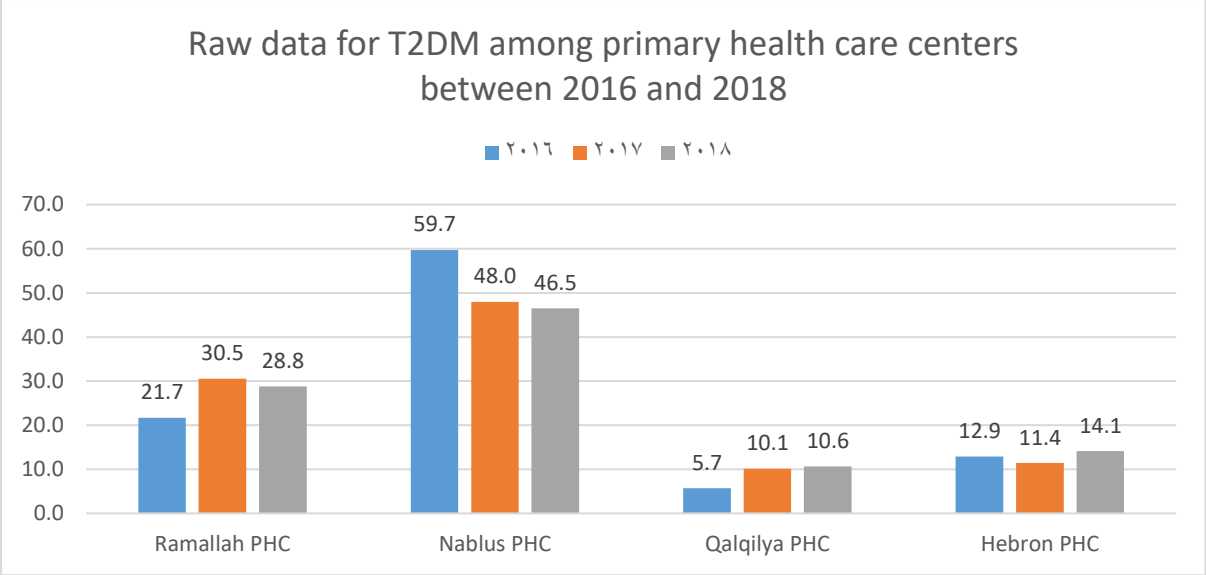


Figure 3: Raw data for T2DM among primary health care centers between 2016 and 2018

Initial (raw) laboratory data which included all T2DM patients in primary health care centers was analyzed using a frequency test, as shown in Figure 4.

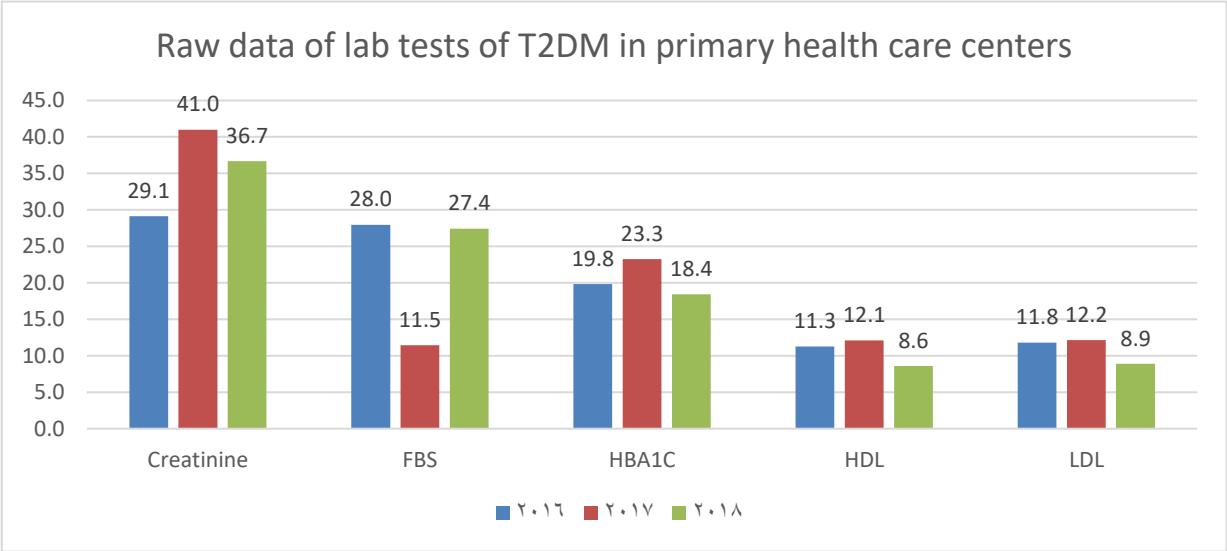


Figure 4: Raw data for lab tests for T2DM in primary health care centers between 2016 and 2018

Participant characteristics

Approximately 11938 patients who were diagnosed with T2DM visited primary health care centers for treatment and care during the last three years: 3942 patients (33.0%) in 2016, 4251 (35.6%) in 2017, and 3745 (31.4%) in 2018. The mean age of the patients was 62.7 years (SD=10.8) and the range was between 20 and 100 years as shown in the histogram (Figure 5).

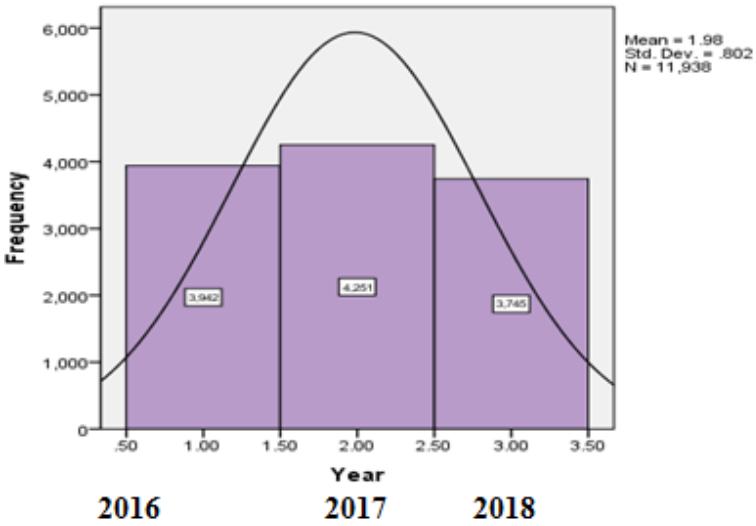


Figure 5: Distribution of the patients by age (n=11938)

The four primary healthcare centers are located in Ramallah, Nablus, Qalqilya, and Hebron cities. The bulk of the participants were from the Nablus Primary Health Care Center 8133 (68.1%) as seen in Figure 6.

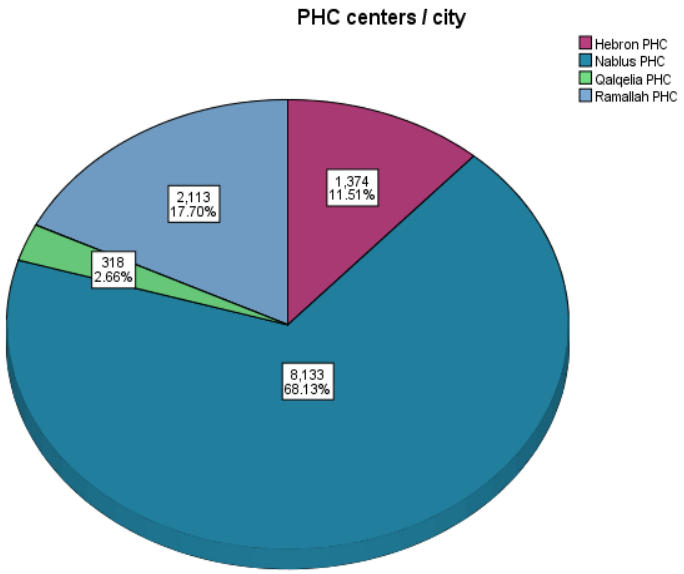


Figure 6: Distribution of patients according to PHCs (n=11938)

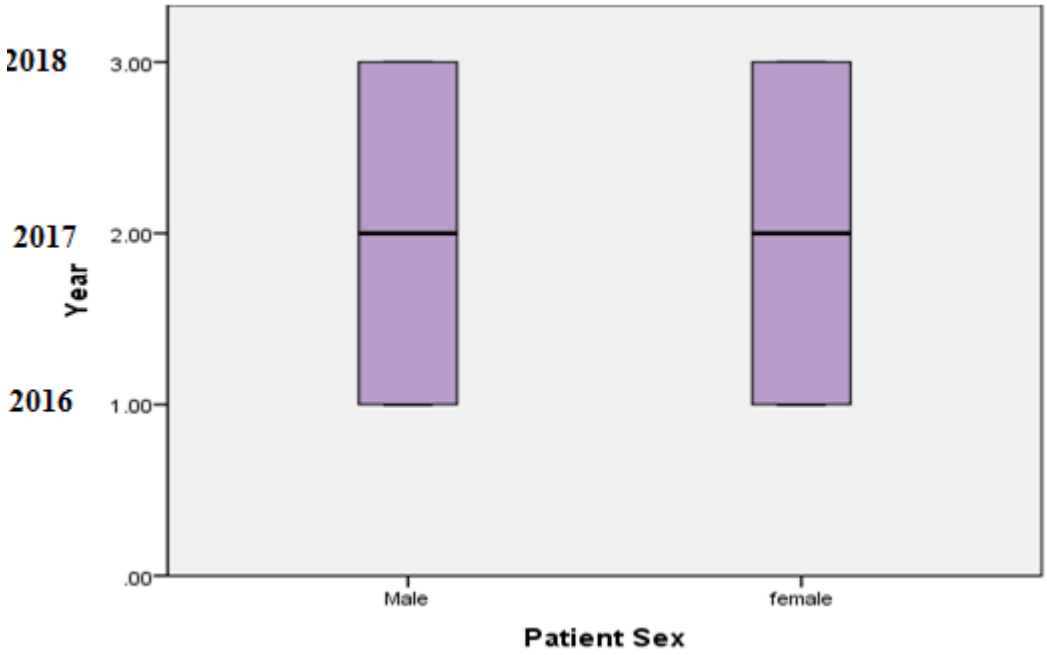
The majority of patients (10287, 86.2%) were married and 1158 (9.7%) were widowed, as shown in Table 4.

Table 4: Distribution of the patients according to marital status (n=11938)

Variable		**N (%)**
Marital status	Single	350 (2.9)
	Married	10287 (86.2)
	Widowed	1158 (9.7)
	Divorced	87 (0.7)
	Polygamous	56 (0.5)

The median of both groups, male and female, were similar to each other with no extreme values as shown in boxplot in Figure 8.

Figure 7: Distribution of the patents according to gender (n=11938)



Patient characteristics in the years 2016, 2017 and 2018

3942 patients with T2DM were treated at the target primary health care centers in 2016. The average age was 63.9 (SD=10.8). A high proportion of patients (2140, 54.3%) was in the 40-65 age group. Most of the patients (3353, 85.1%) were married and more than half (58.8%) were female. The majority of patients (3322, 84.3%) were from the Nablus Primary Health Care Center.

Findings showed that 4251 patients diagnosed with T2DM attended primary health care centers for treatment in 2017. The average age was 62.6 (SD=10.7). A high proportion of patients (2253, 57.9%) were in the 40-65-year age group. Most of the patients (2492, 85.6%) were married and more than half of the patients (2515, 59.2%) were female. The majority of patients (2720, 64.0%) were from Nablus primary health care center.

Also, 3745 patients with T2DM attended primary health care centers for treatment in 2018. The mean age was 61.6 (SD=10.8). The largest proportion of patients (2283, 61.0 %) were in the 40-65 age group. Most of the patients (3266, 87.2%) were married and 2131 (56.9%) were female. The majority of patients (2091, 65.8%) were from Nablus primary health care center; more detail can be found in Table 5.

Table 5: Demographic characteristics of T2DM patients who visited PHCs by year

Dependent		2016	2017	2018
		N (%)	N (%)	N (%)
Age	20-39 years old	59 (1.5)	79 (1.9)	98 (2.6)
	40-65 years old	2140 (54.3)	2492 (58.6)	2283 (61.0)
	More than 65 years old	1743 (44.2)	1680 (39.5)	1364 (36.4)
Primary health care center	Ramallah PHC	292 (7.4)	1055 (24.8)	766 (20.5)
	Nablus PHC	3322 (84.3)	2720 (64.0)	2091 (55.8)
	Qalqilya PHC	34 (0.9)	116 (2.7)	168 (4.5)
	Hebron PHC	294 (7.5)	360 (8.5)	720 (19.2)
Gender	Male	1623 (41.2)	1736 (40.8)	1614 (43.1)
	Female	2319 (58.8)	2515 (59.2)	2131 (56.9)
Marital status	Single	121 (3.1)	127 (3.0)	102 (2.7)
	Married	3353 (85.1)	3668 (86.3)	3266 (87.2)
	Widowed	424 (10.8)	402 (9.5)	332 (8.9)
	Divorced	28 (0.7)	31 (0.7)	28 (0.7)
	Polygamous	16(0.4)	23(0.5)	17(0.5)
		M (SD)	M (SD)	M (SD)
Age		63.9 (10.8)	62.6 (10.7)	61.6 (10.8)

Effectiveness of health care services for T2DM patients

To benchmark our results with international evidence standards, we considered the WHO and ADA standards as cut-off point values to assess the effectiveness of healthcare services provided to T2DM .

During the last three years (2016 – 2018), around 10330 (68.5%) of our patients who had fasting blood sugar tests had an abnormal result, while 9690 (81.2%) had an abnormal result of HbA1C. Also, 2659 (22.3%) were in the abnormal range of HDL and 2012 (16.9%) were in the abnormal range of LDL. More than half of patients had an abnormal creatinine result (6361, 53.3%), as shown in Table 6.

Table 6: Effectiveness of health care quality measures for diabetic patients in PHCs (n=11938)

Dependent	Cut-off point value	N (%)
HbA1C	Normal	2248 (18.8)
	Abnormal	9690 (81.2)
HDL	Normal	9279 (77.7)
	Abnormal	2659 (22.3)
LDL	Normal	9926 (83.1)
	Abnormal	2012 (16.9)
Creatinine	Normal	5577 (46.7)
	Abnormal	6361 (53.3)

When looking at the effectiveness of health care services provided to diabetic patients in 2016, we found 3119 (79.1%) of patients had HbA1C result in the abnormal range, also 849 (21.5%) fell in the abnormal range of HDLs and 627 (15.9%) were in the abnormal range of LDLs. In addition, 2102 (53.3%) had abnormal creatinine levels, as shown in Table 7.

Results in 2017 showed that 3536 (83.2%) had abnormal HbA1C results. while, 1091 (25.7%) patients had results in the abnormal range for HDL and 820 (19.3%) had abnormal levels of LDL. Moreover, half of patients (2162, 50.9%) had normal creatinine levels, as shown in Table 7.

Results in 2018 revealed that most of them were in the abnormal range for HbA1C (3035, 81.0%). Also, 719 (19.2%) had results in the abnormal range for HDL and only 565 (15.1%) had abnormal levels of LDL. Additionally, more than half of the patients (2097, 56.0%) had abnormal creatinine levels as shown in Table 7.

Table 7: Descriptive analysis for the effectiveness of healthcare for diabetic patients in PHCs between 2016-2018 (n=11938)

Dependent		**2016**		**2017**		**2018**	
		N	**(%)**	**N**	**(%)**	**N**	**(%)**
HbA1C	0-6.4	823	20.9	715	16.8	710	19.0
	Above 6.4	3119	79.1	3536	83.2	3035	81.0
HDL	Normal	3093	78.5	3160	74.3	3026	80.8
	Abnormal	849	21.5	1091	25.7	719	19.2
LDL	Normal	3315	84.1	3431	80.7	3180	84.9
	Abnormal	627	15.9	820	19.3	565	15.1
Creatinine	Normal	1840	46.7	2089	49.1	1648	44.0
	Abnormal	2102	53.3	2162	50.9	2097	56.0

Comparison between the effectiveness of healthcare for diabetic patients in the last three years

When comparing the effectiveness of healthcare indicators in PHC centers in the last three years (2016, 2017 and 2018), we found the patients' HbA1C levels in 2018 showed decrease than in 2017. Additionally, HDL and LDL results in the year 2018 showed a slightly increased proportion of normal levels among patients than in 2016 and 2017. The number of patients with normal creatinine levels in 2018 decreased compared to those in 2016 and 2017, as shown in Table 7.

Differences between the effectiveness of healthcare for diabetic patients and demographic characteristics

T-tests were performed to assess the difference between diabetes health care quality indicators in terms of HbA1C, HDL, LDL, and Creatinine scores which is characterized diabetes status risk. The result showed no significant difference between patients' HDL, LDL, and Creatinine scores in relation to gender in 2018 ($p > 0.05$) while there was a significant difference in HbA1C ($p<0.05$).

Table 8: Differences between diabetic measures scores and gender in the year 2018(n=3032)

Variable	Male	Female	**Statistical test**	
	M (SD)	**M (SD)**	**t**	**p-value**
HbA1C	8.0 (1.9)	8.1 (2.0)	2.034	0.042*
HDL	50.0 (12.8)	50.5 (12.9)	1.166	0.244
LDL	95.6 (35.1)	96.1 (35.6)	0.389	0.697
Creatinine	1.3 (1.5)	1.3 (1.5)	1.000	0.317

Note. $*p<0.05$

To assess mean differences between PHC centers and effectiveness of healthcare for diabetic patients (in terms of HbA1C, HDL, LDL, and Creatinine scores) in the year 2018, a one-way ANOVA test was used. The study showed that there was no significant difference between PHC centers in relation to HbA1C and LDL ($p > 0.05$). Conversely, there was a significant difference between PHC centers and patients' HDL and creatinine scores ($p < 0.05$) as shown in Table 10.

Table 9: Differences between diabetic measures scores and PHCs in the year 2018 (n=3032)

Variable	Ramallah PHC	Nablus PHC	Qalqilya PHC	Hebron PHC	Statistical test	
	M (SD)	**M (SD)**	**M (SD)**	**M (SD)**	***F***	**p-value**
HBA1C	8.2 (2.1)	8.1 (1.9)	7.6 (1.8)	8.0 (2.3)	1.430	.232
HDL	48.7 (12.8)	50.7 (13.3)	49.2 (11.9)	47.8 (6.0)	6.207	.001*
LDL	100.0 (36.1)	95.4 (36.7)	90.7 (40.0)	98.3 (7.2)	2.322	.073
Creatinine	1.1 (1.0)	1.3 (1.5)	0.9 (0.4)	1.4 (1.5)	3.321	.019*

Note. $*p<0.05$

Analysis of means for marital status and effectiveness of health care for diabetic patient in relation to HbA1C, HDL, LDL, and Creatinine scores in 2018 showed no relationship between marital status and HbA1C, HDL, LDL, and Creatinine ($p>0.05$) as shown in Table 11.

Table 10: Differences between diabetic measures scores and marital status in 2018 (n=3032)

Variable	Single	Married	Widowed	Divorced	Polygamous	Statistical test	
	M (SD)	**M (SD)**	**M (SD)**	**M (SD)**	**M (SD)**	***F***	**p- value**
HBA1C	8.1 (2.0)	8.1 (2.0)	8.0 (2.0)	7.7 (1.8)	8.2 (1.4)	0.360	0.837
HDL	49.9 (12.5)	50.2 (12.9)	50.8 (12.8)	49.3 (10.4)	55.8 (17.2)	.968	.424
LDL	92.0 (34.2)	96.0 (35.4)	96.2 (35.2)	98.7 (38.3)	95.4 (27.6)	.422	.793
Creatinine	1.2 (1.3)	1.3 (1.5)	1.2 (1.3)	2.0 (2.0)	1.1 (0.9)	1.649	.159

Note. $*p<0.05$

Mean analysis of the difference between age and effectiveness of health care for the diabetic patients (HBA1C, HDL, LDL, and Creatinine scores) in 2018 showed that there were no significant differences between age and effectiveness (HbA1C, HDL, LDL, and Creatinine ($p>0.05$), as shown in Table 12.

Table 11: Differences between diabetic measures scores and age in year 2018 (n=3032)

Variable	20-39 years	40-65 years	More than 65 years	Statistical test	
	M (SD)	M (SD)	M (SD)	*F*	p-value
HbA1C	7.7 (2.0)	8.1 (2.0)	8.0 (1.9)	1.457	.233
HDL	49.6 (11.7)	50.0 (12.7)	50.7 (13.1)	1.427	.240
LDL	94.3 (39.8)	96.3 (35.0)	95.4 (35.6)	.392	.676
Creatinine	1.0 (0.88)	1.3 (1.4)	1.3 (1.6)	.969	.380

Note. $*p<0.05$

The Differences between the effectiveness of healthcare for diabetic patients in 2016, 2017 and 2018

The quality of health care, particularly the effectiveness of healthcare for diabetic patients was assessed for the last three years, from 2016 to 2018 by using the mean of differences between the year and HbA1C, HDL, LDL, and Creatinine scores in 2018. The results showed that there was a significant difference between the year and patient scores of HbA1C, HDL, LDL ($p<0.05$).

The results illustrated that patients' HbA1C mean was slightly decrease in 2016 than 2017 and 2018; and HDL was elevated in 2016 than in 2017 and 2018. Moreover, the LDL mean was lower in 2016 compared to 2017 and 2018.

In respect to patients' creatinine, there was no significant difference between year and creatinine levels ($p>0.05$), illustrating that patients' creatinine was generally the same for the three years, as shown in Table 13.

Table 8: Differences between diabetic measures scores and year (n=11938)

Variable	2016	2017	2018	Statistical test	
	M (SD)	M (SD)	M (SD)	*F*	p-value
HBA1C	8.1 (2.0)	8.3 (2.1)	8.3 (2.9)	17.6	.001*
HDL	50.3 (12.9)	44.5 (12.4)	47.5 (12.8)	215.9	.001*
LDL	95.9 (35.4)	100.8 (37.3)	100.7 (35.4)	24.2	.000*
Creatinine	1.3 (1.5)	1.3 (1.7)	1.3 (1.3)	.197	.821

Note. $*p<0.05$

Comparison of patient demographic characteristics among the three years

A chi-square test was performed to assess if there was a significant difference between the three years 2016, 2017, and 2018 regarding age, gender, primary health care center, and marital status.

The results showed that there were no significant differences between gender and marital status in the three years. However, the results showed a significant difference between age and primary health care centers between the three years, as displayed in Table 14.

Table 9: Comparison of patient characteristics and year (n=11938)

Variable			**Chi square**				
		Total	**2016**	**2017**	**2018**	**test statistic**	***p* - value**
Gender	Male		1623	1736	1614	4.8	0.093
	Female		2319	2515	2131		
Age	20-39 years old	3942	59	2140	1743	57.6	0.001*
	40-65 years old	4251	79	2492	1680		
	>65 years old	3745	98	2283	1364		
Marital status	Single	350	121	127	102	10.237	.249
	Married	10287	3353	3668	3266		
	Widowed	1158	424	402	332		
	Divorced	87	28	31	28		
	Polygamous	56	16	23	17		
Primary Health Center	Ramallah PHC	2113	292	1055	766	997.1	0.001*
	Nablus PHC	8133	3322	2720	2091		
	Qalqilya PHC	318	34	116	168		
	Hebron PHC	1374	294	360	720		

Note. $*p<0.05$

Summary

The study included 11938 patients already diagnosed with T2DM and using primary health care centers for treatment during the last three years; 3942 patients (33.0%) in 2016, 4251 (35.6%) in 2017, and 3745 (31.4%) in 2018.

During the last three years (2016 – 2018), 9690 (81.2%) had abnormal HbA1C. Also, 2659 (22.3%) had abnormal HDL levels and 2012 (16.9%) had abnormal LDL levels. More than half of patients had abnormal creatinine results (6361, 53.3%).

When comparing the effectiveness of healthcare indicators in PHC centers in the last three years (2016, 2017 and 2018), we found the HbA1C mean was slightly decrease in 2016 than 2017 and 2018; and HDL was elevated in 2016 than in 2017 and 2018. Moreover, the LDL mean was lower in 2016 compared to 2017 and 2018.

The results of the study showed that there is no significant difference between gender and patients' HDL, LDL, and Creatinine in 2018 ($p>0.05$). However, there is a significant difference in HbA1C ($p<0.05$).

The study results reported no significant difference between PHC centers and patients' scores of HbA1C and LDL ($p>0.05$). On the other hand, there was a significant difference between PHC centers and patients' HDL and creatinine scores ($p<0.05$). In addition, no significant difference was found between marital status and patients' HbA1C, HDL, LDL, and Creatinine scores ($p>0.05$).

The following chapter will present the discussion of the results, recommendations, and conclusions.

CHAPTER (5)
DISCUSSION

CHAPTER FIVE

Discussion

Introduction

According to the results presented in Chapter 4, the discussion will first include the evaluation of the effectiveness of diabetes care in T2DM management. Secondly, the relationship between demographic characteristics and effectiveness of diabetic care will be analyzed followed by a discussion of indicators that predict the effectiveness of diabetic care.

Overview

The measurement of diabetic care effectiveness has been well developed worldwide (Fleming et al., 2001; O'Connor et al., 2011). The use of performance indicators has been linked with a beneficial effect on patient outcomes when assessing the care process (Campbell et al., 2003). These findings have guided our study's objectives on evaluating the feasibility of assessing these clinical indicators of diabetic care and comparing these results among Palestinian primary health care centers on the national level.

Our results highlighted the importance of using quality indicators prevent complications of diabetes that will be costly on health expenditure and it will alter the quality of life of patients. Moreover, our study supports benchmarking our results with international evidence.

The data were collected from all PHCs in Palestine that utilized electronic medical records. The results of the current study are discussed in the context of the national guidelines for the management of T2DM in Palestine in addition to similar regional and international care management and barriers to diabetes care studies.

Evaluation of the effectiveness of diabetes care in T2DM management

1. Glycemic control determined by HbA1c

Almost 20.9% of the sample proved to have control over their HbA1C in 2016 and it sharply decreased to 16.8% in 2017 to increase another time to 19.0% in 2018. Our study results were consistent with previous studies. A Radwan et al. (2018) study was conducted in the Gaza Strip and the results revealed that 20% of patients had acceptable glycemic control (HbA1c $\leqslant$ 7%).

Another study conducted in Kuwait has shown that approximately 20% of the population studied has good glycemic control (Al Sultan et al., 2005). Also, in Trinidad, 15% of people with diabetes displayed good glycemic control (National Committee for Quality Assurance, 2010). Several studies showed that less than 50% of patients met glycemic control targets (Alhyas et al., 2011; Akbar et al., 2001; Khattab et al., 2010).

On the other hand, this prevalence is lower than the findings of Ali and his colleagues (2012), who reported 87.1% of U.S. adults with self-reported diagnosed diabetes exhibited poor glycemic control during 2007–2010.

The variations could be attributed to lack of comprehensiveness of diabetes management which comprises a set of practices including, but not limited to, continuous glucose monitoring, dietary habits, physical exercise and awareness about DM; it also could be due to the disease process itself, as well as attitudes of physicians and patients.

2. Lipid control

Poor control of cholesterol levels in diabetic patients can lead to a high risk of heart attacks and Cerebrovascular accidents (National Health Institutes, 2010). The World Heart Federation assumes that complications of cardiovascular diseases can be reduced by 20% to 50% by controlling blood lipid levels (Eledrisi et al., 2007).

In 2016, around 84.1% of the study's diabetic population had good LDL lipid control, which declined to 80.7% in 2017, then relatively increased to 84.9% in 2018. The results are better than of previous studies in other countries who reported rates of good lipid control of approximately 30–50% of patients (Alhyas et al., 2011). A study in Dubai revealed that the proportion of people with diabetes who had the desirable level of LDL-cholesterol ranged from 20.8% to 33.6%. In United States 23% of the patients

(Beaton et al., 2004) and 52.8% in Australia achieved ADA targets (Saydah et al., 2004). Moreover, the percentage of people attaining their cholesterol target is only about 40% in the United Kingdom (Diabetes UK, 2012). The increased level of lipid in our study reflects the commitment of diabetics to control their level of blood cholesterol. The variations could be attributed to dietary habits, physical exercise, and awareness about DM complications, and also could be due to adherence to medication. These findings have practical and clinical implications in terms of preventing early microvascular complications associated with T2DM and therefore reducing healthcare-related costs.

Our study reported no gender differences in the control of cholesterol in the current study. Nilsson et al. (2004) confirmed the current study findings. It is possible that all patients, regardless of gender, have equitable healthcare access in Palestine. On the other hand, several previous studies showed that females with diabetes had higher levels of LDL than males (Franzini et al. 2013, Rossi et al. 2013, Yu et al. 2013).

3. Creatinine

A severe life-threating complicated of Diabetes Mellitus is kidney failure. In 2016, only 46.7% of patients in our study had normal levels of creatinine as a measure of kidney function. The number of patients with healthy creatinine levels decreased to 44% in 2018. This emphasizes the urgent need to strengthen routine kidney function screening (at least once a year) as part of the main care processes and the annual review check of patients according to standards of care (Diabetes UK, 2012).

4. Effectiveness of diabetes care by age

In general, there were no age variations in the HbA1c level and cholesterol reported in the current study. Our findings were inconsistent with a Selvin et al. (2006) study showing that HbA1c was higher in diabetic patients over 65 years old. Similar results were also observed in a cross-sectional study (1988-1994 and 1999-2004) that ascertained that poor HbA1C control was noted in older patients with higher comorbidity levels. This study also found that, between the two phases of the survey, the percentage of patients with higher LDL-cholesterol decreased by 30% among older patients (Suh et al., 2008). A possible interpretation of our results is that all patients, regardless of age, have equal healthcare access in Palestine.

5. Effectiveness of diabetes care by gender

According to the HbA1c test, our findings also indicated that male are more likely to attain the target of treatment and have lower mean of HbA1c than female. Previous studies indicated that sex hormones have a high effect on energy metabolism, body composition, vascular function, and inflammatory responses. Thus, psychosocial stress appears to have a higher effect on women compared to men (Kautzky-Willer et al., 2016). Therefore, there is a need for further studies to examine this issue.

However, these findings are not supported by a cross-sectional study among high-risk patients selected from a Pathways study (which is a prospective observational cohort study to determine the prevalence of depression in patients with diabetes and the impact of depression on the outcome of diabetes in the USA). The study found that females were more prone than males to have better chances of glycemic control (Yu et al., 2013). This could be explained in part by the increased use of health services and increased comorbidity among diabetic females compared to males (Shalev et al., 2005). Adherence to insulin and oral anti-glycemic drugs has shown to be higher in diabetic females compared to males (Franzini et al., 2013). Women with certain chronic diseases, such as asthma or mental illness, frequently visit health centers, which could be a factor in improving care (Hoff et al., 1998; Osborne et al., 1998). Participation in diabetes education and the level of self-care and understanding of diabetes are more common among women, which could also be possible explanations for improved diabetes care in women than in men (Gucciardi et al., 2008).

Conclusion

The current study confirmed that better outcomes of diabetes care in terms of HbAC1, HDL, LDL were obtained by diabetic patients over the course of the three years from 2016 to 2018. Our study confirmed that around one-fifth of diabetic patients had good glycemic control. Greater glycemic control was obtained by diabetic male in the cohort. Furthermore, cholesterol achieved the target goal, while the creatinine level was not satisfactory.

Theoretical contribution to the body of knowledge

This thesis contributes to a better understanding of the role of primary health care centres on the effectiveness of T2DM care. The conclusions of the study contributed to understand the quality of healthcare provided to diabetic patients in primary health care centers and to link it with a beneficial effect on patient outcomes when assessing the care process. This research has contributed to improving the effectiveness of healthcare provided to diabetic patients.

The theoretical contribution to the literature:

1. This study contributes to fill the gap in assessing the quality of healthcare provided to diabetic patients within the primary health care centres, where there is no existing literature regarding this subject.
2. The study highlights areas of improvement for health policymakers and quality coordinators.
3. Finally, the thesis contributions can be researched and developed by researchers in the future, to give further knowledge regarding the subject and inspire future research ideas.

Limitations for the research

Despite the fact that our study covers a significantly large national sample size, it has some limitations that have to be mentioned, regarding the setting of the study, sample size and data collected. Some limitations have been encounter and are summarized as follows:

1. Our study was limited to the Ministry of Health clinics, although many services for diabetic patients are provided by other health care agencies, which limits our results.
2. Our study was limited to patients who attended four primary health care centers. The generalizability of our findings to other settings requires further study.
3. This study reflects the outcomes of diabetic patients for three years. Longer follow-up studies are needed to determine whether benefits are found over the life-course of disease. A five-year follow-up study is required to be undertaken in the future.
4. The study was conducted only with some specific indicators of diabetes. Further variables in follow-up studies are needed as an assessment, such as eye and renal diseases as a possible complication of diabetes mellitus.

Recommendations

The study provides important outcomes from which the following recommendations have been proposed:

1. Education and knowledge

- Educational programs and counselling sessions should be regularly held for diabetic patients.
- Improvement programs for health care providers would be helpful to enhance the effectiveness of documentation.

2. Practice level

- Applying evidence-based best practices in health care should be consider as an important aspect for the starting point in the process of improving the quality of diabetes care and improving health outcome.
- A better and highly structured educational program for diabetics is needed.
- Utilization of structured health electronic documentation process that grants full use of all information such as demographic data, investigations, treatments, and follow up in all primary health care canters.

3. Research level

- More qualitative research studies to identify needs based on individualized interviews.
- Repeating this study at different settings and populations and adding another indicator like eye retinopathy.
- It is worth encouraging related research to integrate physical and mental health care indicators for diabetic patients.
- Comprehensive program for follow up study of the effectiveness of health care services of PHCs should be done.

4. Policy making and management level

- Interventions as workshops should be held regularly for both the patients of diabetes mellitus and health care providers to update their knowledge and skills.
- The development of manuals and audio-visual materials will help health providers educate the patients.
- A variety of diabetes knowledge multimedia should be provided for all patients.
- Policies and protocols should be revised and updated over time.
- Construct a medical record system for the diabetic mellitus context.

REFERENCES

Abraham, A., Sudhir, P., Philip, M &Bantwal, G. (2015). Illness perceptions and perceived barriers to self-care in patients with type 2 diabetes mellitus: an exploratory study from India. *Int J Diabetes Dev Countr, 35*:137–44.

Abu-Rmeileh, N., Husseini, A., Capewell, S & O'Flaherty, M. (2013). Preventing type 2 diabetes among Palestinians: comparing five future policy scenarios. *BMJ, 3(12):*1-6

Ahmed, H. M., Miller, M., Nasir, K., McEvoy, J. W., Herrington, D., Blumenthal, R. S., & Blaha, M. J. (2016). Primary low level of high-density lipoprotein cholesterol and risks of coronary heart disease, cardiovascular disease, and death: results from the multi-ethnic study of atherosclerosis. *American journal of epidemiology*, *183*(10), 875-883.

Akbar, D. H. (2001). Low rates of diabetic patients reaching good control targets.

Al Sultan, F. A., & Al Zanki, N. (2005). Clinical epidemiology of type 2 diabetes mellitus in Kuwait. *KMJ-Kuwait Medical Journal,* 37: 98-104.

Alahmary, K. (2014). Quality of primary care from the patient perspective in Saudi Arabia: a multi-level study. International Journal for Quality in Health Care, 17(4):331-46

Al-Halaweh, A. A., Davidovitch, N., Almdal, T. P., Cowan, A., Khatib, S., Nasser-Eddin, L., & Baradia, Z. (2017). Prevalence of type 2 diabetes mellitus complications among Palestinians with T2DM. *Diabetes & Metabolic Syndrome: Clinical Research & Reviews*, *11*, S783-S787.

Alhyas, L., McKay, A., Balasanthiran, A., & Majeed, A. (2011). Quality of type 2 diabetes management in the states of the Co-operation Council for the Arab States of the Gulf: a systematic review. *PloS one, 6*(8), e22186.

Ali, M. K., McKeever Bullard, K., Imperatore, G., Barker, L., & Gregg, E. W. (2012). Characteristics associated with poor glycemic control among adults with self-reported diagnosed diabetes—National Health and Nutrition Examination Survey, United States, 2007–2010. *MMWR Morb Mortal Wkly Rep*, *61*(2), 32-37.

Al Tunaiji, H., Davis, J. C., Mackey, D. C., & Khan, K. M. (2014). Population attributable fraction of type 2 diabetes due to physical inactivity in adults: a systematic review. *BMC Public Health*, *14*(1), 469.

American Diabetes Association. (2009). Standards of medical care in diabetes—2009. *Diabetes care*, *32(Suppl 1)*, S13.

American Diabetes Association. Standards of medical care in diabetes – 2018. Retrieved at: https://professional.diabetes.org/content-page/standards-medical-care-diabetes.

Badawi, D., Saleh, S., Natafgi, N., Mourad, Y., & Behbehani, K. (2015). Quality of type II diabetes care in primary health care centers in Kuwait: employment of a diabetes quality indicator set (DQIS). *PloS one*, *10*(7).

Bamanikar, S. A., Bamanikar, A. A., & Arora, A. (2016). Study of Serum urea and Creatinine in Diabetic and nondiabetic patients in a tertiary teaching hospital. *The Journal of Medical Research*, *2*(1), 12-15.

Basu, S., Yudkin, J. S., Kehlenbrink, S., Davies, J. I., Wild, S. H., Lipska, K. J., ... & Beran, D. (2019). Estimation of global insulin use for type 2 diabetes, 2018–30: a microsimulation analysis. *The Lancet Diabetes & Endocrinology*, *7*(1), 25-33.

Beaton, S. J., Nag, S. S., Gunter, M. J., Gleeson, J. M., Sajjan, S. S., & Alexander, C. M. (2004). Adequacy of glycemic, lipid, and blood pressure management for patients with diabetes in a managed care setting. *Diabetes care*, *27*(3), 694-698.

Campbell, S. M., Braspenning, J. A., Hutchinson, A., & Marshall, M. (2002). Research methods used in developing and applying quality indicators in primary care. *Qual Saf Health Care*, *11*(4), 358-364.

Campmans-Kuijpers, M. J., Baan, C. A., Lemmens, L. C., Klomp, M. L., Romeijnders, A. C., & Rutten, G. E. (2015). Association between quality management and performance indicators in Dutch diabetes care groups: a cross-sectional study. *BMJ open*, *5*(5), e007456.

CDC/National Center for Health Statistics (2015). Retrieved at. https://www.cdc.gov/nchs/data/nhanes/nhanes_11_12/ALB_CR_G_met_creatinine. pdf

CDC/National Center for Health Statistics (2017). Retrieved from https://www.cdc.gov/cholesterol/ldl_hdl.htm.

CDC/National Center for Health Statistics (2017). Retrieved from https://www.cdc.gov/cholesterol/facts.htm.

CDC/National Center for Health Statistics (2011). Retrieved from https://www.cdc.gov/nchs/data/nhanes/nhanes_11_12/ALB_CR_G_met_creatinine.pdf.

Chait, A., & Goldberg, I. (2017). Treatment of dyslipidemia in diabetes: recent advances and remaining questions. Current diabetes reports, 17(11), 112.

Cooper, J. G., Claudi, T., Jenum, A. K., Thue, G., Hausken, M. F., Ingskog, W., & Sandberg, S. (2009). Quality of care for patients with type 2 diabetes in primary care in Norway is improving: results of cross-sectional surveys of 33 general practices in 1995 and 2005. *Diabetes Care*, *32*(1), 81-83.

De Bruin, S. R., Van Oostrom, S. H., Drewes, H. W., de Jong-van Til, J. T., Baan, C. A., & Struijs, J. N. (2013). Quality of diabetes care in Dutch care groups: no differences between diabetes patients with and without co-morbidity. *International Journal of Integrated Care*, *13*.

Diabetes, U. K. (2014). State of the Nation 2012 England. 2012. URL: www. diabetes. org. uk/Documents/Reports/State-of-the-Nation-2012. pdf (accessed 18 May 2015).

Donabedian, A. (1980): *The definition of quality and approaches to its assessment. Health Administration Press*, Chicago, IL. Vol (1).

Donabedian, A. (2005). Evaluating the quality of medical care. *The Milbank Quarterly*, *83*(4), 691-729.

Ehiri, J. E., Oyo-Ita, A. E., Anyanwu, E. C., Meremikwu, M. M., & Ikpeme, M. B. (2005). Quality of child health services in primary health care facilities in south-east Nigeria. *Child: care, health and development*, *31*(2), 181-191.

Eledrisi, M., Alhaj, B., Rehmani, R., Alotaibi, M., Mustafa, M., Akbar, D., & Matboli, S. (2007). Quality of diabetes care in Saudi Arabia. *Diabetes research and clinical practice*, *78*(1), 145-146.

Family and Community Medicine). (2012). Fifteen years of continuous improvement of quality care of type 2 diabetes mellitus in primary care in Catalonia, Spain. *International journal of clinical practice*, *66*(3), 289-298.

Federation, I. D. (2015). IDF Diabetes Atlas International Diabetes Federation *Brussels, Belgium*

Fleming, B. B., Greenfield, S., Engelgau, M. M., Pogach, L. M., Clauser, S. B., & Parrott, M. A. (2001). The Diabetes Quality Improvement Project: moving science into health policy to gain an edge on the diabetes epidemic. *Diabetes care*, *24*(10), 1815-1820.

Franzini, L., Ardigò, D., Cavalot, F., Miccoli, R., Rivellese, A. A., Trovati, M., ... & Vaccaro, O. (2013). Women show worse control of type 2 diabetes and cardiovascular disease risk factors than men: results from the MIND. IT Study Group of the Italian Society of Diabetology. *Nutrition, Metabolism and Cardiovascular Diseases*, *23*(3), 235-241.

Girerd, X., Hanon, O., Anagnostopoulos, K., Ciupek, C., Mourad, J. J., & Consoli, S. (2001). Assessment of antihypertensive compliance using a self-administered questionnaire: development and use in a hypertension clinic. *Presse medicale (Paris, France: 1983)*, *30*(21), 1044-1048.

Goldberg, R. W., Kreyenbuhl, J. A., Medoff, D. R., Dickerson, F. B., Wohlheiter, K., Fang, L. J., ... & Dixon, L. B. (2007). Quality of diabetes care among adults with serious mental illness. *Psychiatric Services*, *58*(4), 536-543.

Gucciardi, E., Wang, S. C. T., DeMelo, M., Amaral, L., & Stewart, D. E. (2008). Characteristics of men and women with diabetes: observations during patients' initial visit to a diabetes education centre. *Canadian Family Physician*, *54*(2), 219-227.

Hilawe, E. H., Yatsuya, H., Kawaguchi, L., & Aoyama, A. (2013). Differences by sex in the prevalence of diabetes mellitus, impaired fasting glycaemia and impaired glucose tolerance in sub-Saharan Africa: a systematic review and meta-analysis. *Bulletin of the World Health Organization*, *91*, 671-682D.

Hoff, R. A., Rosenheck, R. A., Materko, M., & Wilson, N. J. (1998). The quality of VA mental health services. *Administration and Policy in Mental Health and Mental Health Services Research*, *26*(1), 45-56.

Institute of Medicine (US). Committee on the National Quality Report on Health Care Delivery, & United States. Agency for Healthcare Research. (2001). *Envisioning the national health care quality report*. National Academy Press.

Institute of Medicine. (2001): *Crossing the quality chasm: a new health system for the 21st century*. Washington, D.C.: National Academy Press.

International Diabetes Federation (IDF). (2014) Diabetes Atlas. International Diabetes Federation. Brussels, Belgium.

Kautzky-Willer, A., Harreiter, J., & Pacini, G. (2016). Sex and gender differences in risk, pathophysiology and complications of type 2 diabetes mellitus. *Endocrine reviews*, *37*(3), 278-316.

Khader, A., Ballout, G., Shahin, Y., Hababeh, M., Farajallah, L., Zeidan, W., ... & Kapur, A. (2014). Treatment outcomes in a cohort of P alestine refugees with diabetes mellitus followed through use of E-H ealth over 3 years in J ordan. *Tropical Medicine & International Health*, *19*(2), 219-223.

Khan, M & Weinstock, R. (2011): Carbohydrates. In: McPherson RA, Pincus MR, editors. Henry's Clinical Diagnosis and Management by Laboratory Methods. 22nd ed. Philadelphia, PA: *Saunders Elsevier*; Chapter 16. pp. 210–25.

Khattab, M., Khader, Y. S., Al-Khawaldeh, A., & Ajlouni, K. (2010). Factors associated with poor glycemic control among patients with type 2 diabetes. *Journal of Diabetes and its Complications*, *24*(2), 84-89.

Lee, D. (2015). The effect of operational innovation and QM practices on organizational performance in the healthcare sector. *International Journal of Quality Innovation*, *1*(1), 8.

Lee, S. M., Lee, D., & Olson, D. L. (2013). Health-care quality management using the MBHCP excellence model. *Total Quality Management & Business Excellence*, *24*(1-2), 119-137.

Lewis, M., Eskeland, G., & Traa-Valerezo, X. (2004). Primary health care in practice: is it effective?. *Health Policy*, *70*(3), 303-325.

Magnan, E. M., Palta, M., Johnson, H. M., Bartels, C. M., Schumacher, J. R., & Smith, M. A. (2015). The impact of a patient's concordant and discordant chronic conditions on diabetes care quality measures. *Journal of Diabetes and its Complications*, *29*(2), 288-294.

Mata-Cases, M., Roura-Olmeda, P., Berengué-Iglesias, M., Birulés-Pons, M., Mundet-Tuduri, X., Franch-Nadal, J. A., ... & Diabetes Study Group in Primary Health Care (GEDAPS: Grup d'Estudi de la Diabetis a l'Atenció Primària de Salut, Catalonian Society of

Mwita, J. C., Francis, J. M., Omech, B., Botsile, E., Oyewo, A., Mokgwathi, M., ... & Tshikuka, J. G. (2019). Glycaemic, blood pressure and low-density lipoprotein-cholesterol control among patients with diabetes mellitus in a specialised clinic in Botswana: a cross-sectional study. *BMJ open*, *9*(7), e026807.

National Committee for Quality Assurance (2010). Available at: http://www.ncqa.org/portals/0/state%20of%20health%20care/2010/sohc%202010%20-%20full2.pdf.

Netshandama, V. O., Nemathaga, L., & Shai-Mahoko, S. N. (2005). Experiences of primary health care nurses regarding the provision of free health care services in the northern region of the Limpopo Province. *Curationis*, *28*(1), 59-68.

Nilsson, P. M., Theobald, H., Journath, G., & Fritz, T. (2004). Gender differences in risk factor control and treatment profile in diabetes: a study in 229 Swedish primary health care centres. *Scandinavian journal of primary health care*, *22*(1), 27-31.

Nuesch, R., Schroeder, K., Dieterle, T., Martina, B., & Battegay, E. (2001). Relation between insufficient response to antihypertensive treatment and poor compliance with treatment: a prospective case-control study. *Bmj*, *323*(7305), 142-146.

O'Connor, P. J., Bodkin, N. L., Fradkin, J., Glasgow, R. E., Greenfield, S., Gregg, E., ... & Taylor, M. L. (2011). Diabetes performance measures: current status and future directions. *Diabetes care*, *34*(7), 1651-1659.

O'Neill, K., Takane, M., Sheffel, A., Abou-Zahr, C., & Boerma, T. (2013). Monitoring service delivery for universal health coverage: the Service Availability and Readiness Assessment. *Bulletin of the World Health Organization*, *91*, 923-931.

OSBORNE, M. L., Vollmer, W. M., Linton, K. L., & Sonia Buist, A. (1998). Characteristics of patients with asthma within a large HMO: a comparison by age and gender. *American journal of respiratory and critical care medicine*, *157*(1), 123-128.

Palestinian Ministry of Health. (2017). Annual Report. Retrieved from http:// site.moh.ps/ index/ Books/BookType/2/Language/ar .

Palestinian Diabetes Institute.(2020). Palestine. Retrieved from http:// www. pdi.org.ps/en

Piette, J. D., & Kerr, E. A. (2006). The impact of comorbid chronic conditions on diabetes care. *Diabetes care*, *29*(3), 725-731.

Peyrot, M., Rubin, R. R., Lauritzen, T., Skovlund, S. E., Snoek, F. J., Matthews, D. R., ... & Kleinebreil, L. (2005). Resistance to insulin therapy among patients and providers: results of the cross-national Diabetes Attitudes, Wishes, and Needs (DAWN) study. *Diabetes care*, *28*(11), 2673-2679.

Radwan, Mahmoud, Aymen Elsous, Hasnaa Al-Sharif, and Ayman Abu Mustafa. "Glycemic control among primary care patients with type 2 diabetes mellitus in the Gaza Strip, Palestine." *Therapeutic advances in endocrinology and metabolism* 9, no. 1 (2018): 3-14.

Reichert, S. M., Harris, S. B., Tompkins, J. W., Belle-Brown, J., Fournie, M., Green, M., ... & Roberts, S. (2017). Impact of a primary healthcare quality improvement program on diabetes in Canada: evaluation of the Quality Improvement and Innovation Partnership (QIIP). *BMJ Open Diabetes Research and Care*, *5*(1), e000392.

Rossi, M. C., Cristofaro, M. R., Gentile, S., Lucisano, G., Manicardi, V., Mulas, M. F., ... & Giorda, C. (2013). Sex disparities in the quality of diabetes care: biological and cultural factors may play a different role for different outcomes: a cross-sectional observational study from the AMD Annals initiative. *Diabetes care*, *36*(10), 3162-3168.

Santhanakrishnan, I., Lakshminarayanan, S., & Kar, S. S. (2014). Factors affecting compliance to management of diabetes in Urban Health Center of a tertiary care teaching hospital of south India. *Journal of natural science, biology, and medicine*, *5*(2), 365.

Saydah, S. H., Fradkin, J., & Cowie, C. C. (2004). Poor control of risk factors for vascular disease among adults with previously diagnosed diabetes. *Jama*, *291*(3), 335-342.

Schmittdiel, J. A., Gopalan, A., Lin, M. W., Banerjee, S., Chau, C. V., & Adams, A. S. (2017). Population health management for diabetes: health care system-level approaches for improving quality and addressing disparities. *Current diabetes reports*, *17*(5), 31.

Selvin, E., Coresh, J., & Brancati, F. L. (2006). The burden and treatment of diabetes in elderly individuals in the US. *Diabetes care*, *29*(11), 2415-2419.

Shalev, V., Chodick, G., Heymann, A. D., & Kokia, E. (2005). Gender differences in healthcare utilization and medical indicators among patients with diabetes. *Public health*, *119*(1), 45-49.

Shaw, J. E., Sicree, R. A., & Zimmet, P. Z. (2010). Global estimates of the prevalence of diabetes for 2010 and 2030. *Diabetes research and clinical practice*, *87*(1), 4-14.

Sherwani, S. I., Khan, H. A., Ekhzaimy, A., Masood, A., & Sakharkar, M. K. (2016). Significance of HbA1c test in diagnosis and prognosis of diabetic patients. *Biomarker insights*, *11*, BMI-S38440.

Simão, C. C. A. L., Costa, M. B., Colugnati, F. A. B., de Paula, E. A., Vanelli, C. P., & de Paula, R. B. (2017). Quality of care of patients with diabetes in primary health services in Southeast Brazil. *Journal of environmental and public health*, *2017*.

Spring, B., Schneider, K., McFadden, H. G., Vaughn, J., Kozak, A. T., Smith, M., ... & Siddique, J. (2012). Multiple behavior changes in diet and activity: a randomized controlled trial using mobile technology. *Archives of internal medicine*, *172*(10), 789-796.

Suh, D. C., Kim, C. M., Choi, I. S., & Plauschinat, C. A. (2008). Comorbid conditions and glycemic control in elderly patients with type 2 diabetes mellitus, 1988 to 1994 to 1999 to 2004. *Journal of the American Geriatrics Society*, *56*(3), 484-492.

Tunçalp, Ö., Were, W. M., MacLennan, C., Oladapo, O. T., Gülmezoglu, A. M., Bahl, R., ... & Temmerman, M. (2015). Quality of care for pregnant women and newborns—the WHO vision. *BJOG: an international journal of obstetrics & gynaecology*, *122*(8), 1045-1049.

World Health Organization. (2010). *Monitoring the building blocks of health systems: a handbook of indicators and their measurement strategies*. World Health Organization.

World Health Organization. (2011). Use of glycated haemoglobin (HbA1c) in diagnosis of diabetes mellitus: abbreviated report of a WHO consultation. World Health Organization. https:// apps. who.int/iris/handle/10665/70523

World Health Organization.(2005): Report on Medication Adherence. Geneva, World Health Org., 2005 World Health Organization. *What is diabetes?* http://www.who. int/media Centre/factsheets/fs312/en/print.html. Published September 2006. Accessed September 10, 2008.

World Heart Federation. Diabetes. 2013. Available: http://www.world-heart-federation.org/cardiovascular-health/cardiovascular-disease-risk-factors/diabetes/.

Yu, M. K., Lyles, C. R., Bent-Shaw, L. A., & Young, B. A. (2013). Sex disparities in diabetes process of care measures and self-care in high-risk patients. *Journal of diabetes research*, *2013*.

فعالية الخدمات الصحية المقدمة لمرضى السكري في مراكز الرعاية الصحية الأولية في الضفة الغربية

المقدمة: هناك اهتمام عالمي متزايد بجودة الرعاية كوسيلة لتعزيز فعالية أنظمة الرعاية الصحية فيما يتعلق بالتقدم والتغييرات المرتبطة بزيارات متابعة مرضى السكري لمراكز الرعاية الصحية الأولية (PHCs).

الأهداف: الهدف من هذه الدراسة هو تحليل قاعدة البيانات الحالية المتعلقة بمرضى السكري المسجلين في مراكز الرعاية الصحية الأولية في الضفة الغربية مع التوصية بتعديل السياسات والإجراءات المتبعة في رعاية مرضى السكري لزيادة اهتمام صانعي السياسات. علاوة على ذلك، تهدف الدراسة إلى المساهمة في زيادة تطوير إطار تحليلي لقياس الجودة للرعاية.

وسائل البحث: استخدمت الدراسة تصميم البحث الوصفي (بأثر رجعي) اعتمادًا على مراجعة السجلات الطبية الإلكترونية (EMR) للحصول على بيانات حول مرضى السكري من النوع 2 في أربعة مراكز حكومية للرعاية الصحية الأولية المستهدفة (قلقيلية، الخليل ، رام الله ، ونابلس).

النتائج أظهرت النتائج أن (104156) من مرضى السكري راجعو مراكز الرعاية الصحية الأولية المستهدفة للعلاج والرعاية في عام 2018. وكان هذا العدد أقل في عام 2017 (94126)، بينما كان في عام 2016 (87676) مريض. HbA1c في عام 2018 تظهر معدلات أفضل مقارنة بالعامين السابقين. بالإضافة إلى ذلك، أظهرت نتائج HDL و LDL في عام 2018 نسبة زيادة طفيفة في المستويات الطبيعية بين المرضى، بينما انخفضت نسبة المرضى الذين يعانون من مستويات الكرياتينين الطبيعية في عام 2018 مقارنة بالسنوات السابقة. لا يوجد فرق كبير بين درجات المرضى HDL، LDL ، والكرياتينين مع جنس المريض في عام 2018 ولكن كان هناك اختلاف كبير مع HbA1C، ذكرت نتائج الدراسة لا يوجد فرق كبير بين الحالة الاجتماعية والعمر مع مرضى HbA1C، HDL، LDL ، والكرياتينين.

الخلاصة: أكدت الدراسة الحالية أنه تم الحصول على نتائج أفضل لرعاية مرضى السكري من حيث HbAC1، HDL، LDL السكري على مدار السنوات الثلاث من 2016-2018. حيث كان لدى مرضى السكر من الذكور مستوى أكبر من السيطرة على نسبة السكر في الدم من الإناث.