Deanship of Graduated Studies
Al-Quds University

Determinants of Type 2 Diabetes Complications Management in Jenin and Tubas Districts

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M.Sc. Thesis

Jerusalem- Palestine

1430/2010

Determinants of Type 2 Diabetes Complications Management in Jenin and Tubas districts

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A thesis submitted in Partial Fulfillment of Requirement for the degree of Master of Public Health/School of Public Health.

1430/2010

Al- Quds University

Deanship of Graduate Studies

Thesis Approval

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Master thesis submitted and accepted, Data: 23.5.2010

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Jerusalem – Palestine

1431 / 2010

Dedication

To my dear parents Odeh and Zakia.

To my dear wife Watan and my daughter Sara.

To my dear brothers and sisters.

Iyad Odeh Samara

Declaration

I certify that this thesis submitted for the degree of Master is the result of my own research, except where otherwise acknowledged and that this thesis (or any part of the same) has not been submitted for a higher degree to any other university or institution.

Singed:

Iyad Odeh Samara

Date: 6/03/2010

Acknowledgement

First and foremost I offer my sincerest gratitude to my supervisor, Dr. Nuha El Sharif, who has supported me throughout my thesis with her patience and knowledge. I attribute the level of my Masters degree to her encouragement and effort and without her this thesis, too, would not have been completed or written. One simply could not wish for a better or friendlier supervisor. It is deep pleasure to express many sincere thanks to the faculty of public health, University of Al-Quds and all its staff. And it would not be successful without God who guides me in my everyday life and activities, I thank Him for the good health he has given to me, and for the success of my study.

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My special thanks go to Dr. Ahmad abu Halawa, Dr. Hani Abdin and Dr. Abdel Latif Shawar for there advice on validation of study questionnaire. All the love and gratitude to my friends during Master study at Alquds University, especially Deif Swedat, Ahmad Masri, Samah Khatib, Nardin Abu Asab, Jihan Da'na, Liana Hadweh, Shaima' Seiam.

I am grateful to all primary health care staff at the ministry of health, UNRWA and PMRS for their friendly assistant and help. I would like to thank Dr. Mohammad Abed, Dr. Ma'moun Zyoud, Dr. Naser Abdel Hafez, Dr. Muhannad Khabbas, Dr. Ammar Jarrar, Seham Itewi and A'esha Dusouki from ministry of health; Dr. Mohammad Hwaiti, Dr. Tayseer Sabbah and Dr. Jamal Sa'di from UNRWA; Dr. Jamil al Hamad, Dr. Waddah Jaber, Dr. Samer Khader and Dr. Isam Zghebi from PMRS for their support and under standing during the study.

I would like to thank in particular my good friend Imad Sammoudi for his support and encouragement me to study in Al-Quds university.

My warmest grateful of the deep of my heart goes to my family, thanks you my parents, sisters and brother, you presence in my life gave me all the strength and faith in my work and study.

It is a pleasure to thank my dear nephew Khaled Zayed, for his support and help during the field work to accomplish this research.

Finally, I owe my deepest gratitude to my wife Watan for caring, inspiring and supporting me throughout my study and to our lovely kid Sara.

Abstract

Background: Diabetes complications are multi-factorial. Several of these risk factors can be modified so to improve the health condition of the patient and at the same prevent the occurrence of other complications.

Study aim and objectives: The aim of the study was to identify the determinants of type 2 diabetes complications management in Jenin and Tubas districts. The objectives were to identify the health care system and the patients' own factors role in determining diabetes' complications.

Methodology: A cross sectional study was conducted on 800 patients' medical files with type 2 diabetes that were randomly selected from 16 PHC centers at MOH, UNRWA and PMRS. Also, all physicians dealing with patients type 2 working at the same centers (n= 139) filled in a questionnaire at the fourth quarter of 2009 to ascertain their knowledge, use of diabetes management guidelines and health care system aspects for diabetes management. In addition, information about services provided at these clinics were collected.

Results: Analysis of patients' data showed that the mean age of the patients was 58,8 ± 11,4 (mean ± S.D). A 64% of diabetic patients in this study were males. Half of the patients were not working, and more than third were illiterates. A 65.5% of the study population showed positive family history of diabetes**.**

The data showed that 33,1% of study population tested their fasting blood sugar (FBS) once in the last month and 17,6% did HbA1c test before three months. Also, 81,6% these patients had a lipid profiling once in the last year, 70,5% had kidney function testing, 15% did a microalbumin test in the last year, of study population, 45,6% consulted an ophthalmologist in the last year and 43,6% did an electrocardiogram (ECG) at least once as a baseline. The prevalence of diabetic complications among these patients were as follows: neuropathy 38.4%, retinopathy 26.8%, and nephropathy was 20.5%.

In the univariate analysis for patients' data, a significant difference was found between diabetic retinopathy with age, educational level, diabetes family history and previous coronary artery disease ($P < 0.05$). A significant association was found between nephropathy with age, gender, kidney function tests, urine for microalbumin, diabetes family history, previous hypertension ($P < 0.05$). Neuropathy was significantly associated with age, gender, FBS, HbA1c and ECG, family history of diabetes, hypertension and obesity ($P < 0.05$).

The multiple logistic regression models showed that age, low educational level, lipid profile testing and history of coronary artery disease were shown to be risk factors for Retinopathy. Also, age, gender, FBS, HbA1c, ECG monitoring and history of hypertension and diabetes were shown as risk factors for neuropathy. While, age, gender, KFT, urine for microalbumin monitoring, history of dislepedimia and coronary artery disease determined the occurrence of nephropathy among these diabetic patients.

Comparing the patients' files with the data reported by the physicians, more than two thirds of physicians stated that they recommend HbAlc testing, but only (17.6%) of the patients medical files confirmed this recommendation. More than 86% of providers stated that they recommend eye examinations to these patients. Only 45.6% of patients medical files showed that their physicians ever sent them for eye examinations.
In our study, only 3.6% of physicians reported having an endocrinologist at their clinic, 27.3% have ophthalmologist, 34.5% of these clinics have a nutritionist.

Conclusion: This is the first study in Palestine which identified the determinants of type 2 diabetes management complications. Age, gender, educational level, patients' personal follow up, compliance of physicians with diabetes management guidelines and health care system structure are the major factors that affect type 2 diabetes complications management. This recommended the need for an awareness program. The health care system needs a better modification according to the patients' needs. An advocacy for the national guidelines is an urgent need.

ملخص الرسالة

خلفية الدراسة: تنتج مضاعفات مرض السكري بسبب عدة عوامل . العديد من عوامل الخطورة هذه يمكن التأثير عليها و تعديلها لتحسين الحالة الصحية للمريض وفي نفس الوقت منع حدوث مضاعفات أخرى.

أهداف الدراسة: هدفت هذه الدراسة إلى التعرف على العوامل المؤثرة في ادارة مضاعفات مرض السكري من النوع الثاني في محافظتي جنين وطوباس, بالاضافة الى التعرف على دور نظام الرعاية الصحية و تأثير الخصائص الشخصية للمرضى في تحديد 'مضاعفات مرض السكري.

منهجية الدراسة: أجريت دراسة مقطعية على 800 ملف طبي لمرضى سكري من النوع الثاني التي تم اختيارها عشوائيا من 16 مركزا للرعاية الصحية الأولية في وزارة الصحة ووكالة الغوث لتشغيل اللاجئين والإغاثة الطبية. كذلك ، فإن جميع الأطباءالذين يتعاملون مع مرضى السكري من النوع الثاني و يعملون في المراكز نفسها و القطاع الخاص (عددهم = 139) قاموا بتعبأة استبيان في الربع الرابع من عام 2009, للتأكد من معرفة واستخدام الأطباء لدليل إدارة مرض السكري و لمعرفة خصائص نظام الرعاية الصحية بالنسبة لإدارة مرض السكري. بالإضافة إلى ذلك ، تم جمع معلومات حول الخدمات المقدمة في هذه العيادات.

النتائج الرئيسية: أظهرت نتائج الدراسة أن متوسط عمر المرضى هو 58،8 عاما (انحراف معياري=11.4). و من نتائجنا عن الصورة العامة للمرضى تبين أن نسبة 64 ٪ من مرضى السكري في هذه الدراسة كانوا من الذكور. في حين كان نصف المرضى لا يعملون ، فيما كانت نسبة الاميين أكثر من الثلث, وكانت نسبة 65.5 ٪ من المرضى يملكون تاريخ عائلي ايجابي بالنسبة لمرض السكري.

وأظهرت البيانات أن 33،1 ٪ من الذين شملتهم الدراسة قد أجري لهم فحص السكر في الدم اثناء الصيام مرة واحدة خلال الشهر الماضي. كما تم اجراء اختبار السكر التراكمي خلال الثلاث شهور الماضية ل 17،6 ٪ من المرضى . 81.6 %من المرضى قاموا باجراء فحص الدهون في الدم مرة واحدة في العام الماضي ، فحص وظائف الكلى أجري ل 70،5 ٪ من مجمل المرضى خلال العام الماضي، و 15 ٪ من المرضى قامو باجراء فحص المايكروألبومين في البول في العام الماضي . من مجمل المرضى الذين شملتهم الدراسة ، 6،45 ٪ قاموا بزيارة طبيب عيون في العام الماضي و 43،6 ٪ قاموا بعمل تخطيط قلب على الأقل مرة واحدة من بداية المرض .

نسبة انتشار مضاعفات مرض السكري بين هؤلاء المرضى على النحو التالي : الاعتلال العصبي 38.4 ٪ ، اعتلال الشبكية 26.8 ٪ ، واعتلال الكلى كان 20.5 ٪.

أظهر التحليل وحيد المتغير لبيانات المرضى وجود علاقة ايجابية و ذات دلالة احصائية بين مشاكل العيون مع تقدم العمر ، المستوى التعليمي، التاريخ العائلي لمرض السكري و مرض الشريان التاجي حيث كانت قيمة الدالة الاحصائية أقل من 5%. وقد وجد أيضا ارتباط مهم ذو دلالة احصائية بين اعتلال الكلية مع السن , الجنس ,اختبارات وظائف الكلى ، فحص المايكروألبومين في البول، تاريخ العائلة بمرض السكري وارتفاع ضغط الدم حيث كانت قيمة الدالة الاحصائية أقل من 5%. الاعتلال العصبي يرتبط بشكل كبير مع السن, الجنس, فحص السكر في الدم اثناء الصيام، اختبار السكر التراكمي, تخطيط القلب, التاريخ العائلي لمرض السكري, ارتفاع ضغط الدم والسمنة حيث كانت قيمة الدالة الاحصائية أقل من 5%.

كما أظهرت نماذج الانحدار اللوجيستي المتعدد أن العمر ، المستوى التعليمي المتدني ، فحص الدهون و أمراض الشريان التاجي هي عوامل خطورة لاعتلال الشبكية. بينما، العمر، الجنس، مراقبة فحص السكر في الدم اثناء الصيام, فحص السكر التراكمي, تخطيط القلب ، وتاريخ عائلي لضغط الدم والسكري هي عوامل خطورة بالنسبة للاعتلال العصبي الناتج عن مرض السكري. في حين، العمر، الجنس، فحوصات وظائف الكلى، فحص المايكروألبومين في البول, ارتفاع نسبة الدهون في الدم وأمراض الشريان التاجي هي عوامل الخطورة لأمراض الكلى بين مرضى السكري.

بمقارنة بياناث ملفات المرضى بالمعلومات التي أدلى بها الأطباء، أكثر من ثلثي الأطباء قالوا أنهم يوصوا مرضاهم باجراء فحص السكر التراكمي، ولكن فقط (17.6 ٪) من الملفات الطبية للمرضى أكدت هذه التوصية. أكثر من 86٪ من مقدمي الخدمة ذكروا أنهم يوصوا المرضى بفحص عيونهم عند أخصائي العيون و لكن فقط 45.6 ٪ من ملفات المرضى أظهرت أن أطبائهم قاموا بتحويلهم في أي وقت مضى لاجراء فحوص العيون.

في هذه الدراسة، فقط 3.6 ٪ من مجموع الأطباء أخبروا عن وجود أخصائي غدد صماء في مكان عملهم ، و نسبة 27.3 ٪ من الأطباء قالوا انهم يملكون طبيب عيون في أماكن عملهم، 34.5 ٪ من هذه العيادات يوجد بها أخصائي تغذية.

الاستنتاج: من أهم ميزات هذه الدراسة أنها الأولى من نوعها في فلسطين والتي بينت العوامل المؤثرة في ادارة مضاعفات مرض السكري من النوع الثاني . العمر, الجنس, المستوى التعليمي للمرضى , المتابعة الشخصية من قبل المريض، التزام الأطباء بدليل إدارة مرض السكري و تركيبة نظام الرعاية الصحية ، هي العوامل الرئيسية التي تؤثر في ادارة مضاعفات مرض السكري من النوع الثاني. هذا ونوصي بضرورة وضع برنامج للتوعية بكيفية ادارة مرض السكري. تعديل نظام الرعاية الصحية وفقا لاحتياجات المرضى. هناك حاجة ملحة لوضع قانون لحماية الدليل الوطني لادارة مرض السكري.

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List of Abbreviations

ADA	The American Diabetes Association
ADF	The American Diabetes federation
AHRQ	Agency for Health Research Quality
CAD	Coronary Artery Disease
CDC	Center of Disease Control
CHD	Coronary Heart Disease
CPG	Clinical Practice Guidelines
DCCT	Diabetes Control and Complication Trial
DM	Diabetes Mellitus
DPN	Diabetes Peripheral Neuropathy
DSME	Diabetes Self Management Education
EDIC	Epidemiologic Diabetes Intervention and Control
ESRD	End Stage Renal Disease
FBS	Fasting Blood Sugar
GP	General Practitioner
IDF	International Diabetes Federation
IGT	Impaired Glucose Tolerance
MI	Myocardial Infarction
MOH	Ministry of Health
NGO	Non Governmental Organization
PHC	Primary Health Care
PMRS	Palestinian Medical Relief Society
UKPDS	United Kingdom Prospective Diabetes Study
UNRWA	United Nation Relief Work Agency
US	United States
WHO	World Health Organization

Chapter One. Background and Significance

1.1 Background:

In 1999, WHO defined diabetes mellitus as “a metabolic disorder of multiple etiology, characterized by chronic hyperglycemia with disturbances of carbohydrate, fat and protein metabolism resulting from defects in insulin secretion, insulin action, or both. The effects of diabetes mellitus include long-term damage, dysfunction and failure of various organs” (WHO, 1999). Thus, the metabolic abnormalities of diabetes result from inadequate insulin action on target tissues, due to deficient insulin secretion or insensitivity to insulin action, or a combination of both (International Diabetes Federation, 2003; WHO, 1999).

The classification of diabetes mellitus has evolved considerably over time, taking into account recent advances in the diabetes field. The classification is now primarily based on the etiology (causes) of the disease, rather than its treatment. The revised classification encompasses both clinical stages and etiological types of hyperglycemia and results from improved understanding of the causes of diabetes mellitus (WHO, 1999).

There are two main types of diabetes: type 1 (requiring insulin for survival) and type 2 (may or may not require insulin for metabolic control). Type 2 is the most common form of diabetes and is characterized by disorders of insulin action and insulin secretion, either of which may be the predominant feature. Both are usually present at the time that this form of diabetes is clinically manifest. The specific reasons for the development of these abnormalities are not yet known (Diabetes Care, 2005).

Diabetes type 2 can be prevented but if occurred physician should work with their patients to have a good management whether to prevent the occurrence of any complications, if complications started, to stop its dramatic effect which might lead to death**.** Research studies like DCCT and EDIC are reported that control of blood glucose, blood pressure and blood

lipid levels help prevent complications in people with type 2 diabetes. (DCCT, 1993; EDIC, 2005), AHRQ-funded research has shown that glycemic control can be achieved and complications of diabetes postponed. (Miller et al., 2000)

1.2 Problem statement

Over the past three decades, key social and economic changes have occurred in the majority of the Eastern Mediterranean nations. These include progressive urbanization, decreasing infant mortality and increased life expectancy. Increasingly sedentary lifestyles, the obesity pandemic and the higher life expectancy have led to a dramatic rise in type 2 diabetes in many countries of the Region (WHO, 2006)

Diabetes complications are multi-factorial. Several of these risk factors can be modified so to improve the health condition of the patient and at the same prevent the occurrence of other complications. The major factors that were shown by literature to have a major role are, patients socio-demographic characteristics, follow up at the personal level, compliance of physicians with the diabetes management guidelines and the services provided to these patients (Task force on community preventive services, 2002; Lobo CM et al., 2003). There is now clear evidence that an effective control of blood glucose and blood pressure significantly decreases the risk of complications in both type 1 and type 2 diabetes (Khunti K et al., 2001).

The burden of diabetes is due to its complications, so the most important target for diabetes management to reduce these complications or postpone them. Several factors are playing role in diabetes complications management like, health care system, background of physicians and patients themselves and their follow at personal level.

Quality of care of diabetic patients can be influenced by health care system, practice organization and by patients themselves (Lobo CM et al., 2003; Khunti et al., 1999). Health care system has its impact on how care for patients is organized, funded, how the medicines are reimbursed, how the educational materials are prepared and distributed etc. Practice organization requires adequate practice management, for example, by adequate

organization of medical practice by systematic delegation of health promotion activities to the ancillary staff. Written diabetes protocols and the degree to which the general practitioners and ancillary staff work as a team are also important, as these foster teamwork and provide a sense of direction (Lobo CM et al., 2003). Waiting time, list size, practice type and location, record-keeping are just a few of the practice organization factors important in quality of care. Background characteristics of general practitioners (GPs) and practices associated with diabetes guideline adherence may contribute substantially to variations in healthcare delivery and are associated with adherence to preventive guidelines.

In Palestine, in particularly the West Bank, the reported new cases of diabetes in the governmental primary health care clinics (PHC) diabetic clinics was 2,214 cases in 2007, in Jenin and Tubas districts, in particular, was 306 cases. Nephropathy, retinopathy and neuropathy are the most important complications of diabetes. The distribution of the reported visits to government PHC diabetic clinic fro year 2007, by complications was: 5,277 visits with nephropathy, 14,248 with retinopathy and 21,816 visits with neuropathy. (MOH, 2007). However, there have been few studies that estimated the determinants of type 2 diabetes complications. Abdul Rahim et al., investigated the prevalence of diabetes and associated factors in a cross-sectional survey of an urban Palestinian population of 492 men and women aged 30-65 years. Diabetes was found in 12.0% of the survey population (including 9.4% previously diagnosed), and impaired glucose tolerance in 5.9%. Logistic regression analysis controlling for age and sex revealed body mass index, waist-to-hip ratio and family history of diabetes to be significantly independently associated with diabetes (Abdul Rahim et al., 2001). Ali Shaar in his study conducted in 1996, revealed that, clinical services offered to diabetic patients have no or minimal effect in determining the health status of population. Low quality of educational services was due to lack of trained human resources (Shaar, 1996). Ziad Al-Khdoor in his study revealed the prevalence of diabetic complications among type 1 diabetics as follows: retinopathy 36.4%, neuropathy 26.2 and nephropathy 7.5%. He found a significant association between retinopathy and neuropathy with HbA1c, disease duration and sex ($P< 0.05$) (Al-Khdoor, 2007)

This study is planned to be the first baseline study in two districts; i.e. Jenin and Tubas districts that investigated the role of the health care services, as one of the factors affecting the diabetes complications.

The result of this study will help the policymakers to evaluate the effectiveness of health service institutions, which allows better planning to decrease or postpone the complications of diabetes.

1.3 Study justification

As mentioned earlier in this chapter, diabetes mellitus is a prevalent disease in Palestine. According to the Palestinian Ministry of Health, DM is considered the 9th leading cause of death with a proportion of 4.1% of the total (heart disease 2nd, renal failure 5th). The prevalence rate of diabetes mellitus, by a study conducted in 2000 in cooperation with Al Quds University, was about 9%.

The Palestinian health care system is a mixture of governmental, non-governmental, United Nation Relief and Work Agency (UNRWA) and private (profit and non-profit) services delivery. These health providers are over lapping in services, and none of these sector can provide comprehensive health services.

In Palestine, the system of public health care is responsible for diabetes care, with primary health care bearing main responsibility. The care of people with type 2 diabetes requires natural and flexible opportunities for consultations both within the health care centre in question and within the specialized system of medical care. In principle, prevention of type 2 diabetes is also the responsibility of the primary health care system. However, since the primary health care system is vested with overall responsibility for population in each region, the other forms of basic care (e.g. for infections) for these diabetic groups are generally provided in health care centers. In development of care, the principal rule is to improve co-operation between primary health care and specialized medical care, an appropriate division of labour ("shared care model"), and straightforward consultation opportunities in both directions (DEHKO, 2001-2010). In Palestine, the care of diabetic

patients has been shifted to the primary health care system, but when specialized care is needed the system has flexibility to refer patients to secondary health care institutions.

General Practitioner is an old specialty in Palestine. Care provided by GPs is comprehensive, not limited by gender, age or diagnostic category. GPs are providing health care for diabetes patients in all health care institutions (MOH, NGOs, UNRWA and private sector). In general they provide care without undergo any specific training in diabetes management.

In Jenin and Tubas districts, most patients with type 2 diabetes in receive care from GPs. The diabetes nurse and endocrinologist are not available at the hospitals. The specialized health care is provided by internists.

Clinical practice guidelines (CPG) are systematically developed statements to assist the decisions of the practitioner and patient about appropriate healthcare for specific clinical circumstances (Field MJ et al., 1990). It is expected that clinical practice guidelines improve healthcare quality, reduce inappropriate variations between providers and predispose dissemination of the evidence-based medicine concept in daily practice. Policymakers and payers see guidelines as a tool for making healthcare more consistent and efficient.

The WHO has developed guidelines for the prevention, management and care of diabetes mellitus. Before 2008, there was no protocol or guidelines for management of diabetes in the Palestinian ministry of health. In 2008, in cooperation with World Health Organization (WHO) and Austrian Development Cooperation, Ministry of Health adopted a "quick reference guide for the management and care of Diabetes Mellitus", which totally builds on WHO guidelines (Quick Guide, MOH, 2008).

To improve the quality of the care of diabetic patients, Ministry of Health and UNRWA have developed a guideline for management of type 2 diabetes. The MOH guide, i.e. the "quick reference guide for the management and care of diabetes mellitus", (MOH; 2008) and the UNRWA "technical instructions and management protocols on prevention and control of Noncommunicable diseases" (UNRWA; 2004). Both protocols are, in somehow, are built on the WHO guidelines for year 2006, with some differences between them and some times between them and WHO guidelines. Both protocols of MOH and UNRWA adopted the WHO

recommendations about patient educations and advice on diet and the types of oral antidiabetic agent and combined therapy with insulin.

To have an overview of the management of diabetes type 2 in Jenin district, we carried out several interviews with key persons at the diabetes department in the central governmental primary health care center in Jenin. From these interviews we found that the Ministry of Health is the main health provider for patients with type 2 diabetes, as they have 5224 files for those with type 2 diabetes and who was born after 1970. (diabetes clinic report; 2008). They used for the management of diabetes WHO guidelines in general and some times guidelines from American Diabetes Association, and this depends on the interest of GPs them selves to read and enlarge their knowledge (personal communication, Abdel Hafez, 2009).

The second health care provider at Jenin district is the united nation for relief work agency (UNRWA). There are 1600 patients with type 2 diabetes who are registered at the UNRWA primary health care clinics. According to an interview with Doctor Jamal (personal communication, Jamal Sa'di, 2009) The UNRWA has developed their own guidelines and protocols for the management of diabetic patients. These guidelines was published under the name "technical instructions and management protocols on prevention and control of Noncommunicable diseases" (UNRWA; 2004), which is not specifically for diabetes alone. Also, we had some interviews with physicians working at the private sector. No unified protocol was used for dealing with the diabetic patients. Each physician is using his own protocol according to his own belief is the best to be used.

It is not yet known if diabetes care guidelines are incorporated into the daily practice of primary care. In Palestine, information about general practitioners' attitudes towards guidelines, about their ability to adopt and interpret guidelines as well as about the need for additional support to implement guidelines into everyday general practice is very scanty. There is an increasing interest and belief, both nationally and internationally, that working out clinical practice guidelines has a major impact on quality of care. The patient-,practices and practice management-based barriers may prevent implementation of evidence based practices (Larme AC et al., 2001; Zgibor JC et al., 2001). It has been found that attitudes, rather than

knowledge, may impede primary care provider adherence to standards of care (Kirkman MS et al., 2002).

Therefore as researchers, we suspect that the mismanagement, various health systems for follow up and lack of adherence to the international guidelines of diabetes is leading to serious complications which could be lethal in many cases. So, we planned to perform this baseline study to identify the determinants of diabetes complications management in Jenin and Tubas districts

1.3 Study Aim and objectives

To examine the determinants of management of diabetes mellitus type 2 complications at Jenin and Tubas districts.

General objectives

1- To determine the factors affecting diabetes management at the health care system and its association with diabetes' complications
2- To determine the factors affecting diabetes management at the personal level and its association with diabetes' complications.

Specific Objectives:

1- To examine the association between the physicians compliance to diabetes guidelines and diabetes' complications

2- To evaluate the health care systems arrangements for diabetes management and its association with diabetes' complications

3- To examine the association between diabetic patients personal follow up and his diabetes' complications

4- To examine the association between the personal characteristics and health status and the diabetes' complications

1.4 Study limitations

Some physicians could not be reached for the following reasons:

1- Traveling out of country for continuing study
2- Traveling out of district for working in another city
3- Physicians managers, who are not involved in diabetes treatment
4- We could not take permission from ministry of health to do personal interview with diabetes patients during the working hours.
5- In the medical files we could not found the date of diagnosis for each complication.
6- Absence of filling system at the private sector and private clinics

1.5 Thesis chapters' description

The thesis will consist of 6 chapters. In chapter one, we will discuss the aim, problem statement and study justification, and the objectives. Also, it includes study hypothesis and its limitations. Chapter two presents the literature review of previous studies that are related to research topic. While in chapter three, the theoretical and conceptual frame work for the study will be discussed. In chapter four study methodology, and data collection methods, sample size, piloting and statistical analysis of data are presented. While in chapter five, study results will be presented and demonstrated in form of tables and figures. While in chapter six, the study results and its findings will be discussed and recommendations will be presented.

Chapter two. Literature Review

2.1 Introduction:

The literature review in this chapter will focus on dependent and independent variables that are related to the study and this will include the impact of intensive therapy, self management, adherence to diabetes guidelines, health care system impacts on diabetes complication and the impact of socio-demographic characteristics on development of diabetes complications.

2.2 Previous studies

The previous studies that are related to our study will be divided into:

2.2.1 The impact of intensive therapy on achieving glycemic control and good management

2.2.2 The impact of Self Management on diabetes complications

2.2.3 The impact of Level of adherence to diabetes guidelines on diabetes complications

2.2.4 The impact of health care system on diabetes complications

2.2.5 The impact of socio demographic characteristics on diabetes complications

Worldwide, the prevalence of Type 2 diabetes is 150 million cases worldwide 2002 (WHO Meeting, 2002). The incidence of Type 2 diabetes, i.e. new cases diagnosed per year is 798,000. (CDC, 2004)

It is predicted that between 2000 and 2025, the size of the world's adult population will increase from less than 4 billion to 5.5 billion, mainly on account of a 60% increase in

developing countries. The number of adults with diabetes in the world is predicted to increase from 150 million in 2000 to 300 million in 2025 (IDF, 2003). In industrialized countries, the number of diabetics will increase by about one third between 2000 and 2025, while in developing countries that number will more than double (IDF, 2003)

The prevalence of diabetes for all age-groups worldwide was estimated to be 2.8% in 2000 and 4.4% in 2030. The total number of people with diabetes is projected to rise from 171 million in 2000 to 366 million in 2030. The prevalence of diabetes is higher in men than women, but there are more women with diabetes than men. The urban population in developing countries is projected to double between 2000 and 2030. The most important demographic change to diabetes prevalence across the world appears to be the increase in the proportion of people >65 years of age.

These findings indicate that the "diabetes epidemic" will continue even if levels of obesity remain constant. Given the increasing prevalence of obesity, it is likely that these figures provide an underestimate of future diabetes prevalence (Sarah et al., 2004).

The International Diabetes Federation (IDF) published new data in 2006 indicating the enormity of the diabetes epidemic. The Federation's Diabetes Atlas show that the disease now affects 246 million people worldwide, with 46% of all those affected in the 40-59 age group. Previous figures underestimated the scope of the problem, while even the most pessimistic predictions fell short of the current figure. The new data predict that the total number of people living with diabetes will rise to 380 million within twenty years if nothing is done (IDF, 2003).

2.2.1 The impact of intensive therapy on achieving glycemic control and good management

Substantial evidence points to the admission of glucose level as an independent predictor of early and late mortality after MI in patients with and without diabetes (Capes et al., 2000). The DIGAMI (Diabetes Mellitus, Insulin Glucose Infusion in Acute Myocardial Infarction) study suggests that strict glycemic control for 3 months can significantly improve survival at 1 and 3 years after myocardial infarction (MI) (Nesto et al., 1998; Malmberg et al., 1999).

For patients with newly recognized diabetes, this provides an opportunity for prompt referral to a diabetes management team, in addition to a program of cardiac rehabilitation.

The Diabetes Control and Complications Trial (DCCT) was a major clinical study conducted from 1983 to 1993 and funded by the National Institute of Diabetes and Digestive and Kidney Diseases. The study showed that keeping blood glucose levels as close to normal as possible slows the onset and progression of the eye, kidney, and nerve damage caused by diabetes. In fact, it demonstrated that any sustained lowering of blood glucose, helps, even if the person has a history of poor control.

The DCCT involved 1,441 volunteers, ages 13 to 39, with type 1 diabetes and 29 medical centers in the United States and Canada. Volunteers had to have had diabetes for at least 1 year but no longer than 15 years. They also were required to have no, or only early signs of, diabetic eye disease.

The study compared the effects of standard control of blood glucose versus intensive control on the complications of diabetes. Intensive control meant keeping hemoglobin A1C levels as close as possible to the normal value of 6 percent or less. The A1C blood test reflects a person's average blood glucose over the last 2 to 3 months. Volunteers were randomly assigned to each treatment group.

When the DCCT ended in 1993, researchers continued to study more than 90 percent of participants. The follow-up study, called Epidemiology of Diabetes Interventions and Complications (EDIC), is assessing the incidence and predictors of cardiovascular disease events such as heart attack, stroke, or needed heart surgery, as well as diabetic complications related to the eye, kidney, and nerves. The EDIC study is also examining the impact of intensive control versus standard control on quality of life. Another objective is to look at the cost-effectiveness of intensive control.

DCCT Study finds that, intensive blood glucose control reduces risk of:

- eye disease by 76% reduced risk
- kidney disease by 50% reduced risk

- nerve disease by 60% reduced risk

EDIC Study finds that, intensive blood glucose control reduces risk of:

- any cardiovascular disease event by 42% reduced risk.
- nonfatal heart attack, stroke, or death from cardiovascular causes by 57% reduced risk.

The goal of treatment of diabetes mellitus is to control blood glucose and ultimately prevent long-term complications, as shown by major diabetes studies like the United Kingdom Prospective Diabetes Study group and Diabetes Control and Complications
Trial (UKPDS 38, 1998; UKPDS 33, 1998; DCCT , 1993). Insulin therapy is necessary to control hyperglycemia in type 1 diabetes mellitus.

Provided hyperglycemia is mild in type 2 diabetes, patients may be given at least a one month trial of diet, exercise and weight management in order to control hyperglycemia. If this regimen does not lead to adequate blood glucose control, the physician will need to prescribe oral anti-hyperglycemic agents and/or insulin(DCCT, 1993) .

Results of the DCCT and EDIC studies have important implications for preventing diabetes complications in people with type 2 diabetes because the microvascular disease development process is likely to be similar for both type 1 and type 2 diabetes. One study of people with type 2 diabetes, the United Kingdom Prospective Diabetes Study, demonstrated that controlling blood glucose levels reduced the risk of diabetic eye disease and kidney disease.

Research studies have shown that, the most important factors in preventing diabetes complications are the control of blood glucose, blood pressure, and blood lipid levels which, helps prevent complications in people with type 1 or type 2 diabetes. (DCCT, 1993; EDIC, 2005)

The Atlanta researchers reviewed several earlier studies that focused mostly on patients in primary care settings and found that significant percentages of patients had HbA_{1c} levels above 8 percent (Martin et al 1995; wealtherspoon et al., 1994). When comparing their own study to one of these earlier studies (Harris et al., 1999), the AHRQ-funded Atlanta team

found that patients in their study were more likely than those in the earlier study to be using oral hypoglycemic medications plus insulin (31 percent vs. 3 percent). Also, the Atlanta patients taking insulin were more likely to be injecting three or more times per day (42 percent vs. 4 percent).

The Atlanta researchers stated that "the discrepancies between our data and those of primary care studies (showing less success in achieving glycemic control) may be because of factors other than the type of treating physician (Miller et al., 2000)."

The following factors were mentioned by the researchers:

- The earlier primary care studies date from the early 1990s and may not reflect current practices.
- Patient motivation may have differed.
- A broader array of medications was available at the time of the Atlanta study.
- The ability to do rapid on-site HbA_{1c} measurements was available for the Atlanta physicians.

Conclusion

AHRQ-funded research shows that patients can achieve good diabetic control if providers recommend intensive therapies, use a team approach, furnish appropriate preventive care, and put into practice proven strategies that help patients better manage their care. Few patients have type 2 diabetes without other diagnoses (Glasgow et al., 1999), and others have multiple chronic disease, for both the physician should try to achieve blood glucose control.

2.2.2 The impact of Self Management on diabetes complications

Diabetes is a major growing health care problem. At the present rate of increase in type 2 diabetes, it will be one of the world's commonest diseases and among the most serious problems of public health within a few decades. (Diamond J, 2003). The most important challenge in the care of diabetic patients is to avoid or postpone several complications of the disease. There is now clear evidence that an effective control of blood glucose

and blood pressure significantly decreases the risk of complications in both type 1 and type 2 diabetes .(Khunti et al.,2001)

According to Collaborative management of chronic illness, Self-management is defined as: (1) engaging in activities that protect and promote health; (2) monitoring and managing symptoms and signs of illness; (3) managing the impacts of illness on function, emotions, and interpersonal relationships; and (4) adhering to treatment regimens (Von Korff et al., 1997). patients are more likely to comply with a practitioner's instructions to take medicines as instructed when the patients can observe the impact of their behaviors(Gardiner et al.,2006; DeWalt et al.,2006).

By CDC 2003, Diabetes self-management education (DSME) is also referred to as diabetes self-management training (DSMT). DSME is the process of teaching individuals with diabetes to manage their disease and is an integral component of the treatment plan (CDC, 2003). In order to maintain optimal control of this condition, individuals or caregivers of individuals with diabetes must be directly involved in the day-to-day management of the disease. As such, diabetes is considered a self-managed disease. The national standards for DSME state that DSME is an interactive, collaborative, ongoing process that involves the person with diabetes and the educator (Mensing, 2007). The standards note that the individual with diabetes needs the knowledge and skills to make informed choices, to facilitate self-directed behavior changes and, ultimately, to reduce the risk of complications. Mensing, 2007 conclude the main components of the process of DSME:

- Assessment of the individual's specific education needs
- Identification of the individual's specific diabetes self-management goals
- Education and behavioral intervention directed toward helping the individual achieve identified self-management goals
- Evaluation of the individual's attainment of identified self-management goals (Mensing, 2007)

The American Association of Diabetes Education (AADE) talked about the characteristics of diabetes health educator, who should be a skilled and experienced healthcare professional with recent education in diabetes, educational principles and behavior change strategies (AADE, 1999). The scope of practice for diabetes educators and standards of practice for diabetes educators notes that a diabetes educator is "defined as a healthcare professional who has mastered the core of knowledge and skills in the biological and social sciences, communication, counseling, and education and who has experience in the care of people with diabetes.

The American Diabetes Association recommends: People with diabetes "should receive diabetes self-management education/training according to the National Standards for Diabetes Self-Management Education when their diabetes is diagnosed and as needed thereafter" and DSMT "should be provided by health care providers who are qualified to provide DSME based on their professional training and continuing education. (ADA, 1999). DSMT should also be considered for people at risk for developing diabetes. (DSMT, 2003). DSME is considered "the cornerstone of treatment for all people with diabetes" by the Task Force to Revise the National Standards for Diabetes Self-Management Education Programs,(ADA, 1995) a group representing national public health and diabetes-related organizations.

Several studies have been done with purpose to ascertain the effectiveness of self-management programs on achieving glycemic control. Norris et al. (2001) conducted a systematic review for 72 studies in 84 articles were identified. The studies were heterogeneous with respect to patient population, educational intervention, outcomes assessed, study quality, and generalizability. Studies with short-term (i.e., less than six months) follow-up demonstrated positive effects of self-management training on knowledge, frequency and accuracy of self-monitoring of blood glucose, self-reported dietary habits, and glycemic control. With longer follow-up, interventions that used regular reinforcement throughout follow-up were sometimes effective in improving glycemic control. Educational interventions that involved patient collaboration may be more effective than didactic interventions. The authors concluded that evidence supports the effectiveness of self-management training in type 2 diabetes, particularly in the short-term (Norris et al.,2001).

In 2002 Norris et al. (2002) performed a meta-analysis to ascertain the efficacy of DSME in adults with type 2 diabetes, to provide summary measures of its effect on glycemic control, and to identify predictors of effect. A total of 31 studies were included in the review. It was noted that, on average, the intervention decreased the glycated hemoglobulin (GHb) by 0.76% more than the control group at immediate follow-up; by 0.26% at one to three months' follow-up; and by 0.26% at greater than four months' follow-up. The authors concluded that the meta-analysis provides evidence of the efficacy of DSME for individuals with type 2 diabetes for glycemic control. It was noted that GHb improves with DSME, with an average change of 0.76%, when measured at immediate follow-up. The authors concluded that self-management education improves GHb at immediate follow-up, and increased contact time increased the effect. In addition, they noted that the benefit declines one to three months after the intervention ceases, which suggests that learned behavior changes over time. The authors note that further research is needed to develop interventions effective in maintaining long-term glycemic control(Norris et al.,2002).

Ellis et al. (2004) conducted a meta-analysis of randomized, controlled trials of diabetes patient education published between 1990 and December 2000 to assess and characterize the effect of patient education on GHb. The study included 21 articles, with twenty-eight educational interventions (n=2439). It was noted that the net glycemic change was 0.320% lower in the intervention group than in the control group. Further analysis indicated that interventions which included face-to-face delivery, cognitive reframing teaching method, and exercise content were more likely to improve glycemic control. The authors concluded that current patient education interventions modestly improve glycemic control in adults with diabetes(Ellis et al.,2004).

Deakin et al. (2005) conducted a Cochrane systematic review to assess the effects of group-based, patient-centered training on clinical, lifestyle and psychosocial outcomes in people with type 2 diabetes. The selection criteria included randomized controlled and controlled clinical trials which evaluated group-based education programs for adults with type 2 diabetes compared with routine treatment, waiting list control or no intervention.

The review included only studies that assessed outcome measures six months or more from baseline. Fourteen publications that described 11 studies were included, involving 1532 participants. The results of this meta-analyses that favored group-based diabetes education programs included: reduced GHb at four to six months, 12–14 months and two years; reduced fasting blood glucose levels at 12 months; reduced body weight at 12–14 months; improved diabetes knowledge at 12–14 months; and reduced systolic blood pressure at four to six months. The authors noted that it was not possible to carry out a meta-analysis for several of the main outcome measures (e.g., self-management skills, empowerment/self-efficacy and quality of life) due to significant heterogeneity between studies. It was also noted that educational interventions are complex interventions, and it is difficult to identify the active "ingredient(s)" with any precision. The review also indicated that, although group-based diabetes education programs result in clinical and statistically significant health outcomes, the exact mechanism of action can be discussed but not identified. The authors concluded that group-based training for self-management strategies in people with type 2 diabetes positively impacts health outcomes by improving fasting blood glucose levels, glycated hemoglobulin and diabetes knowledge and reducing systolic blood pressure levels, body weight and the requirement for diabetes medication(Deakin et al.,2005).

Wattana et al. (2007) conducted a randomized, controlled study to determine the effects of a diabetes self-management program on glycemic control, coronary heart disease (CHD) risk, and quality of life. The study involved 147 patients with type 2 diabetes. The patients will randomized into two groups for a period of six months. The experimental group received the diabetes self-management program and the control group received the usual nursing care. Using pretest and age as covariates, the results indicated that the experimental group had statistically significant lower GHb than the control group at 24 weeks ($P<0.05$). The number of patients in the experimental group who reached the GHb level recommended by ADA (GHb<7%) was greater than that in the control group (12% compared to 1.39%, respectively). The experimental group was noted to have a decrease in the CHD risk factors, including total cholesterol, triglycerides, low-density lipoprotein cholesterol, diastolic blood pressure and body mass index (BMI) and a greater increase in HDL cholesterol levels as compared to the

control group. The results indicated that the experimental group demonstrated a significant decrease in the GHb level and CHD risk, with an increase in quality of life as compared to the control group. The authors concluded that the diabetes self-management program was effective for improving metabolic control and quality of life for individuals with diabetes and that further studies should be replicated using larger groups over a longer time frame(Wattana et al.,2007).

Diabetes Control and Complications Trial (DCCT,1993) and the Kumamoto study, (Ohkubo et al., 1995; Wake et al., 2000) which demonstrated that tight glycemic control improves microvascular outcomes in type 1 and type 2 diabetes, respectively. Reductions of caloric and fat intake are associated with weight control and improved glycemic control,(Reaven et al., 1985; Wing et al., 1987; Watts et al., 1990; ADA, 2001) and physical activity is associated with improved glycemic control(ADA,2001). Aspirin use, which offers the same cardiovascular protection for people with and without diabetes, (ADA,2001) is recommended for all people with diabetes aged>30 years in the absence of contraindications (ADA, 2001).Smoking increases morbidity and mortality from microvascular and macrovascular complications of diabetes.(ADA,2001)

the importance of promoting exercise as a vital component of the prevention as well as management of type 2 diabetes must be viewed as a high priority. It must also be recognized that the benefit of exercise in improving the metabolic abnormalities of type 2 diabetes is probably greatest when it is used early in its progression from insulin resistance to impaired glucose tolerance to overt hyperglycemia requiring treatment with oral glucose-lowering agents and finally to insulin.(ADA,2002)

Results of the lunch study for a type 2 diabetic subject indicate that the recovery time of the post-prandial blood glucose level can be adjusted to 4 hours, which is comparable to the typical time interval for non-diabetics: 3 to 4 hours. A moderate lifestyle adjustment of light supper coupled with morning swimming of 20 laps in a 25 m pool for 40 minutes enabled the subject to reduce his A1c level from 6.7 to 6.0 in six months and to maintain this level for the subsequent six months (Hsin-i WuA, 2005).

In a small survey in Michigan in 2005, 67% of patients with diabetes reported receiving two HBA1c tests, 68% one dilated eye exam, and 67% one foot exam, during a one year period. These three exams are standard care, but only 34% reported receiving all three services. The good news is that patients who received DSMT were 2.1 times more likely to report receiving all three preventive care services as compared to adults with diabetes who had never received DSMT, even after adjusting for the effects of age, sex, race, and education, marital and smoking status (Michigan et al., 2005).

Self-management is significantly less costly to medical care insurance providers (Fitzmaurice et al.,2005). Scientific evidence shows that DSMT, because it correlates with a decrease in $HbA1_C$ levels, is also associated with reductions in health care costs. A study published in The Journal of the American Medical Association indicated that a sustained reduction in A1c among adults with diabetes was associated with a cost reduction of $685 to $950 less per person per year within one to two years of improved glycemic control. (Wagner et al. 2001). Managed care patients with type 2 diabetes, who improved or achieved glycemic control, saved $369 per patient per year in total diabetes related costs as compared to those with higher A1c levels. (Shetty, S. 2005)

2.2.3 The impact of Level of adherence to diabetes guidelines on diabetes complications

Disease management programs help health care organizations address many of the issues patients and physicians face when dealing with a chronic disease like diabetes.(National Pharmaceutical Council , 2004) Those health care organizations that use disease management programs appear to have lower medical costs over the long term while improving results (A1c testing, A1c levels, eye exams, LDL levels, nephropathy screening, and hypertension) (Snyder et al., 2003; Lynne et al.,2004). Patients with diabetes in disease management programs also appear to have lower hospitalization rates, make fewer emergency room visits, and comply more often with recommended office visits.(Lynne et al., 2004; Villagra et al., 2004). Adherence to guidelines was associated with significantly reduced rates of hospitalization. (Frank A, et al., 2004)

For vision-related complications to be treated promptly, the American Diabetes Association recommends that, physician should advise diabetic patients to have comprehensive periodic dilated eye and vision examinations by an ophthalmologist or optometrist (ADA, 2001). Nearly all of the benefits would come from the early detection and prompt treatment of macular edema in patients whose type 2 diabetes began before age 45.

The level of compliance with diabetes management guidelines is vary among physicians in different countries:

Patrick et al reported in his study conducted in United states that, screening of diabetes based on family or personal history was reported for 83% of the patients and on cardiovascular risk factors for 69%. Counseling for dietary changes was reported for 91% of diabetic patients and for 79% for physical activity, but only for 66%
and respectively 60% of pre-diabetic patients. Among diabetic patients, regular HbA1c control was reported for 65%, yearly fundoscopy for 62%, yearly feet examination for 65%, yearly microalbuminuria control for 49%, regular blood pressure control for 96%, and yearly lipid profile for 89%. Regular screening of microangiopathic complications was reported for only 33% of diabetic patients. (Patrick et al.,2007)

Carolyn Rutledge revealed in his study in 2002 that, overall 54.5% of patients received care according to the ADA guidelines. During the year of the study, 93.5% had a cardiovascular exam, 87.0% were tested for creatinin clearance, 76.6% had foot exam, 71.4% had home glucose monitoring, 67.5% of patients were tested for (HbA1c) level, 62.3% had dilated eye exam and 50.6% had lipid profile.(Carolyn Rutledge ,et al.,2002)

Most Medicare beneficiaries diagnosed with type 2 diabetes had at least one physician visit per year, but rates of screening (eye examinations and HbA1c, lipid, Microalbumin and urine tests) fell far short of recommendations. Correlations among use rates for various types of screening were positive but far less than one, suggesting that failure to screen reflects a complex set of underlying factors. Increased rates of adherence were observed for HbA1c and lipid testing over the observation period. Higher use was associated with lower rates of

hospitalization for complications of diabetes (vascular (p=0.007), renal ((p=0.002), and other complication (p=0.005)).

In Jordan, the compliance of physicians with diabetic protocol in year 2004 was as follows:

Medical history	35%
Clinical examination	0%
Counseling	35%
Laboratory tests	0%
Referral	35%
Average	26%

Source: Quality Assurance in the Jordan Primary Health Care System - BEST PRACTICES, February 2004

Adherence to ECG and foot assessment parameters was poor among SOC cases, while poor adherence to weight and foot assessment parameters was seen in the polyclinics. There was poorer adherence to blood pressure and ECG parameters in the SOCs, but better adherence was seen for weight assessment. Among the SOC cases, Cluster A fared better than Cluster B in ECG monitoring. In the polyclinics, better adherence was seen in Cluster A for urinary protein, serum creatinin, lipids, ECG, retinal and foot assessment parameters.(Keng Boon, 2006)

Overall 52% of the doctors' consultations were not optimal. Some important aspects for a positive consultation environment were fulfilled in only about half of the doctors' consultations: ensuring privacy of consultation (49%), eye contact (49%), good attention (52%), encouraging asking questions (47%), and emphasizing on the patients' understanding of the provided information (52%). The doctors enquired about adverse effects of anti-diabetes drugs in less than 10% of consultations. The quality of the nurses' consultations was sub-optimal in about 75% of 85 consultations regarding aspects of consultation environment, care and information.(Nadia Abdulhadi,et al., 2006)

AHRQ-funded study suggests strategies oriented toward assisting the provider can help patients receive needed care. An AHRQ-funded study showed that one way in which providers increased their ability to follow protocols was through completing questionnaires that served as a self-survey about the appropriateness of glycemic goals and whether their patients were well controlled (El-Kebbi et al., 1999). Both physicians and nurses were asked to fill out one-page multiple-choice questionnaires after each office visit over a 3-month period. In this study, conducted at a diabetes clinic treating African-American patients, adherence to protocols calling for intensification of therapy when indicated (e.g., putting patients previously treated by diet alone on medication or adding sulfonylurea medication to insulin) increased from 55 percent to 63 percent when providers completed a questionnaire after every patient visit.

2.2.4. The impact of health care system on diabetes complications:

The development of diabetes complications has a huge impact on the health service provider and the individual's quality of life. Investment in clinical systems to improve diabetes care may benefit both providers and patients. Intensive education in diabetes self-management, use of intensive insulin regimens, and adoption of the empowerment approach to diabetes management have been cited as preventative solutions to the development of complications. (WHO and ADA, 2004). Because of the chronic nature of diabetes, the severity of its complications, and the methods required to control them, diabetes is a disease with substantial human costs for the affected individual and his or her family; these costs affect people everywhere. Intangible costs of diabetes and secondary complications such as pain, anxiety and inconvenience have an impact which is large but also difficult to quantify (Wilson and Cleary, 1995; Jacobson et al, 1994).

Improved blood glucose control to prevent diabetes complications has been highlighted since the release of results from the Diabetes Control and Complications Trial (DCCT, 1993). These results represented the largest randomized longitudinal study of the effects of glycemic control ever conducted. Two groups of participants were involved in the study, with one group using 'conventional' methods (one or two insulin injections per day and one or two blood glucose tests) and the other using 'intensive' methods (frequent blood glucose monitoring and daily

adjustment of food and insulin to regulate blood glucose to as near normal as possible). Nearly half the intensively treated group used continuous subcutaneous insulin infusion (insulin pump therapy) to achieve levels of control that are optimum.

The DCCT Research Group (1993) clearly demonstrated that those individuals achieving improved blood glucose control (a 2% lower HbA1c value on average) had a tremendous decrease in their risk of long-term complications of diabetes, and an increased quality and length of life. Risk of diabetic eye disease decreased by 76%, with reductions to the risk of kidney and nerve damage being 60% and 56% respectively. These results were so significant that the DCCT Research Group was compelled to end the study I year early. This gave the conventionally treated patients the opportunity to have the benefits of intensive diabetes management.

With the evidence that high blood glucose levels increase the risk of developing complications of diabetes, tight blood glucose control has become the benchmark for successful diabetes management (Diabetes UK, 2000; DCCT, 1993).

Research has highlighted that more intensive diabetes care and thorough patient education can result in improved glycemic control, leading to fewer microvascular complications in people with type 1 and type 2 diabetes (Dose Adjustment For Normal Eating (DAFNE) Study Group, 2001; Gray et al, 2000; Gilmer et al, 1997). If the health care system invests in the diabetes control and this investment may include intensive therapies, closer monitoring and increased patient education; however, they are outweighed by reduced incidence of complications and an improved quality of life for the individual (Skyler, 2000; Jacobson et al, 1994). Other studies have also indicated that the health care system investments in diabetes care can improve glycemic control (Skyler, 2000; O'Connor et al, 1996; Eckman et al, 1995).

For most countries, the largest single factor in diabetes expenditure is hospital admission for the treatment of long-term complications such as heart disease and stroke, kidney failure and foot problems (WHO, 2002; O'Connor et al, 1996; Eckman et al, 1997). Many of these are potentially preventable if the health system provide a comprehensive care, given effective patient and professional education and comprehensive long-term care (Diabetes UK, 2000).

World health organization (WHO) recommend referral of diabetes patients to different kinds of specialists for follow up, WHO emphasize on multi disciplinary team for care about diabetics. Health care system should include, diabetes educator, to evaluate patient's ability to perform self-monitoring of blood glucose and his/her ability to interpret the data, dietician, foot-care specialist, ophthalmologist for annual retinal screening, or more often as indicated, nephrologists, neurologist, and cardiologist, if needed. The use of multidisciplinary mini clinics for diabetes care has the potential to improve clinical outcome. These provide team care by a physician, nurse, dietician, chiropodist and health educator that will improve treatment and help establish a referral system for diabetic complications. (WHO, 2006)

Combination of intensive therapy and team approach promotes good outcomes. Even though the treatment of diabetes is complex and major barriers to achieving good outcomes exist, Agency for Health Care Research and Quality (AHRQ-funded research), has shown that glycemic control can be achieved and complications of diabetes postponed through a combination of intensive drug therapy and a team approach.

A retrospective study, academic endocrinologists in Atlanta examined the clinical records of 151 diabetes patients (121 with type 2 diabetes and 30 with type 1) in their own practice (Miller et al., 2000). Most of these patients had complications as a result of their diabetes, including peripheral neuropathy (78 percent), retinopathy (22 percent), hypertension (80 percent), hyperlipidemia (64 percent), coronary heart disease (27 percent), and peripheral vascular disease (14 percent)—not unusual for patients who had had diabetes, on average, for 12 years.

Investigators found that half the patients made at least four visits during the study year. Patients alternated between visits that included both a physician and a nurse practitioner and visits with a nurse practitioner alone. Nurse practitioners, who were also directly available at other times for phone contact, were able to facilitate more frequent adjustment of therapy when necessary. The average HbA_{1c} of patients with type 2 diabetes was 6.9 percent; 87 percent achieved good control of blood sugar (8 percent or less HbA_{1c}) by the use of complex treatment regimens, 78 percent were managed with more than diet alone or a single oral agent, and many patients received either two oral hypoglycemic or one oral hypoglycemic plus

insulin injections. The average HbA_{1c} of patients with type 1 diabetes was 7.1 percent; 80 percent achieved good control of blood sugar with an average of 3.4 injections of insulin per day . In addition, screenings were performed at recommended intervals for major complications, including eye and foot problems, high lipid levels, and hypertension.

Miller et al., recommend team approach for diabetes care:

- 4 or more visits per year for many patients.
- Visits with both physicians and nurse practitioners alternating with visits with a nurse practitioner.
- Direct telephone availability of nurse practitioners.
- Dietitian visits with patients.
- Screening for complications.
- Self-monitoring.

" The AADE (1997) notes that "Multidisciplinary instructional staff who are collectively qualified to teach the required content areas shall include as least: 1) a registered dietician and 2) either a registered nurse or other health professional who is a certified diabetes educator (CDE)."

In Australia, a one-time, advanced diabetes education program teaching intensive insulin self-management with an empowerment style can lead to sustained improvement inpatient outcomes and reduce use of hospital services for people with Type 2 diabetes on insulin (Lowe et al., 2009). In United states, only by teamwork between primary care physician and ophthalmologist can blindness from diabetic retinopathy be reduced (Sinclair et al., 2004). A multifaceted approach to improving diabetes management has led to improved performance in clinical measures related to diabetes care that have been shown to reduce the risk of patients with diabetes developing diabetes- related complications.

Diabetes self-management education (DSME), the process of teaching people to manage their diabetes,(ADA,1995). has been considered an important part of management of diabetes since the1930s and the work of Joslin.(Bartlett et al.,1986). The American Diabetes Association (ADA) recommends assessing self-management skills and knowledge of diabetes at least annually and providing or encouraging continuing education (ADA,2001).

The researchers emphasized that "good glycemic outcomes are attributable to a commitment to achieving normal metabolic status that is reinforced through multiple contacts, including not only physician appointments but also nurse practitioner visits, dietitian visits, and telephone calls. (Miller et al., 2000)

Diabetes management strongly recommended. Disease management of diabetes- as prescribed in Task Force on Community Preventive Services (2002) - in the clinical setting is an organized, proactive, multicomponent approach to healthcare delivery for all members of a population with diabetes or for a subpopulation with specific health risk factors. It embraces all aspects of the delivery system. Care is focused on, and integrated across, the entire spectrum of the disease and its complications as well as the prevention of co morbid conditions. The goal is to improve short- and long-term health or economic outcomes, or both, in the entire population with diabetes. The essential components of disease management are (1) identification of individuals or populations with diabetes (or a subset with certain risk factors); (2) use of guidelines or performance standards to manage those identified; (3) information systems to track and monitor interventions and patient-,practice-, or population-based outcomes; and (4) measurement and management of patient and population outcomes. Other interventions may be incorporated into disease management interventions, and these interventions can be focused on (1) the healthcare system (e.g., practice redesign, electronic information systems, changes in models of care), (2) the provider (e.g., reminders, education, feedback, decision support), or (3) the patient or population (e.g., patient-centered care strategies, DSME, reminders, feedback, telephone call outreach).

Disease management is strongly recommended by the Task Force based on strong evidence of its effectiveness in improving glycemic control, provider monitoring of glycated hemoglobin (GHb), and screening for diabetic retinopathy. Sufficient evidence is also available of its

effectiveness in improving provider screening of the lower extremities for neuropathy and vascular changes, urine screening for protein, and monitoring of lipid concentrations. This recommendation is applicable to adults with diabetes in the settings of managed care organizations and community clinics in the United States and Europe. Although a number of other important health outcomes were examined, including blood pressure and lipid concentrations, data were insufficient to make recommendations based on these outcomes.

Forum three, conducted in USA in 1996, which discussed the Changes in the U.S. Health Care System That Would Facilitate Improved Care for Non-Insulin-dependent Diabetes Mellitus, emphasized on several recommendations to improve the health care delivery for diabetic patients that will help in preventing the complications.

The forum recommended that the U.S. health care delivery system be amended so that the important secondary preventive care that diabetic patients need through most of their illness be available to them regardless of employment status, insurance coverage, and other factors that, if not addressed, would result in the uneven availability of preventive services. The concepts of secondary and tertiary prevention in diabetes, however, are supported by existing data from several previous studies, the most recent and impressive of which is the Diabetes Control and Complications Trial (DCCT)

Forum members recognized that 90% to 95% of diabetes care in the United States is directed by the primary care physician, with the remaining fraction directed by physicians with special interest and training in diabetes and other metabolic disorders. With the current emphasis on primary care in the U.S. health care delivery system, it is unlikely that this ratio will change in the foreseeable future. However, most patients with diabetes would be well served during their illness if they had access to specialists as complications develop. In addition to specialty care for complications, a system of "shared care" between primary care physicians and diabetes specialists has been proposed (Fisher et al.,1994). The specialist and specialty team would review the overall status of the progress of diabetes care at periodic intervals, reset goals and directions as appropriate, and make recommendations to the primary care physician on how to carry out this plan. Making decisions about starting insulin therapy, identifying and

recommending strategies for managing cardiovascular disease risk factors, and periodically screening for diabetes complications (for example, detection of microalbuminuria) are examples of how diabetes specialists could interact with primary care physicians and share responsibility for patients' management. A common data system for everyone offering care to a given patient would integrate this care into a seamless system and would also enhance reporting procedures and facilitate clinical research.

The forum also recommended that the continuing education modalities serving primary care physicians assume the responsibility for updating this large physician population on intensive management for NIDDM. These modalities include the medical literature, review articles in the medical literature, local and national continuing medical education programs, hospital-based medical staff continuing education activities (grand rounds, clinical conferences, and so forth), and protocol development within managed care systems.

The U.K. Prospective Diabetes Study (UKPDS) documented that optimal glycemic control can also benefit most individuals with type 2 diabetes. To achieve optimal glucose control, the person with diabetes must be able to access health care providers who have expertise in the field of diabetes. Treatment plans must include self-management training, regular and timely laboratory evaluations, medical nutrition therapy, appropriately prescribed medication(s), and regular self-monitoring of blood glucose (SMBG) levels. The American Diabetes Association position statement "Standards of Medical Care for Patients with Diabetes Mellitus" outlines appropriate medical care for people with diabetes (ADA, 2001).

To achieve higher quality in taking care of patients with chronic diseases, clinical practice guidelines (CPG) are often developed and used as guidance. CPGs integrate generic recommendations for specific medical circumstances. They have been defined as systematically developed statements to assist practitioner and patient decisions about appropriate health care for specific medical circumstances. They are designed to compile the best medical knowledge in order to provide physicians with a practical decisional aid. Clinical practice guidelines aim to eliminate clinician errors and promote best medical practice. (Ivika Oja; 2005)

Canadian Diabetes Association Clinical Practice Guidelines suggest that care of the person with Diabetes be organized using a team approach and the Guidelines give us a structured care approach to prevention and treatment. It has been repeatedly demonstrated that a structured care approach improves outcomes. The conclusion is that structured care saves lives and reduces morbidity. (CDA, 2003)

2.2.5 Socio demographic characteristics and diabetes complications:

Several socio demographic factors can effect development of diabetes microvascular complications. Several studies have shown age as a risk factor for having retinopathy among diabetic patients. In Oman was higher in age groups 50-59 and 60-69 (R. Khandekar et al., 2003). In Iran the prevalence of retinopathy was higher 37% (Ali Javadi et al., 2009). The strong positive association with duration is frequently reported (Goldberg, 1972; H.A. Kahn, 1975), prevalence of retinopathy rose with age (Draper, 1968).

Education is also a powerful and unique predictor of health outcomes. Lower levels of education are associated with poor health, and higher levels of education are associated with better health (Al-khdoor, 2007). In China, no significant association between retinopathy and educational level was seen (Chen MS et al., 1992). In the UnitedStates of America, retinopathy was weakly associated with lower education level (Moniques, 2000). In Sweden, a study showed that the group in poor metabolic control was characterized by a lower education level (Dick larsson, 1999).

In Egypt multivariate logistic regression analysis revealed that diabetic patients over 49 years of age, were more likely to develop chronic diabetic complications (M.El-Shazly et al., 2009). Poor glycemic control, hypertriglyceridemia, and longer duration of diabetes were independently associated with prevalent microalbuminuria and macroalbuminuria (BessieA.Young et al., 2005). Male gender has been associated with the development of nephropathy in diabetes in many studies. Gall et al., in a prospective observational study involving 176 patients with type-2 diabetes, found that males had a 2.6 times greater risk of developing incipient or overt nephropathy. In Mexico, female gender associated significantly

with reduced nephropathy (Dante Amato, 2005). Male sex (OR 2.6 (95% CI 1.2-5.4); P<0.02) (Mari-Anne gall, 1997). In Canada, female sex appears to be protective (Amrit et al., 2007).

In UK, a cross-sectional multicentre study was performed to establish the prevalence of peripheral neuropathy in Type 2 (non-insulin-dependent) diabetic patients it was 32.1 % . It increases with both age and duration of diabetes, until it is present in more than 50% of Type 2 diabetic patients aged over 60 years. (Young et al., 1992)

The prevalence of diabetic neuropathy across Europe was 28 %.Significant correlations were observed between the presence of diabetic peripheral neuropathy with age ($p < 0.05$), duration of diabetes (P< 0.001). (Tesfaye et al., 1996). Age significantly

independent predictors for first foot ulceration (P 0.01). (Caroline et al., 1998)

In Iran statistically significant relationships were found between neuropathy and age, gender, quality of diabetes control and duration of disease (P values in the order: 0.04, 0.04, < 0.001 and 0.005). More attention must be paid to elderly male diabetic patients with poor diabetes control (Fargol Booya et al., 2005). The presence of clinical neuropathy correlated with greater age, longer duration of IDDM, and male gender. The somatic and autonomic test results confirm the relationship between age, diabetes duration, and male gender and diabetic neuropathy. These results support an effect of age and gender on the development of diabetic complications (DCCT, 1988). In New York this study demonstrates that the males in the study population developed neuropathy earlier than did the females (Aaberg, 2008).

2.3 Summary:

A critical point of care is patients' adherence to it. Adherence to glucose monitoring and medication regime varies between 60-80% in different studies. (WHO, 2003) Adherence to diet varies more, between 30-70%. Quality of care of diabetic patients can be influenced by health care system, practice organization and by patients themselves .(Lobo et al., 2003; Khunti , 1999) Health care system has its impact on how care for patients is organized, funded, how the medicines are reimbursed, how the educational materials are prepared and distributed etc. Practice organization requires adequate practice management, for example, by adequate organization of medical practice by systematic delegation of health promotion activities to the ancillary staff. Written diabetes protocols and the degree to which the general practitioners and ancillary staff work as a team are also important, as these foster teamwork and provide a sense of direction. (Lobo et al., 2003) Waiting time, list size, practice type and location, record-keeping are just a few of the practice organization factors important in quality of care. Background characteristics of general practitioners (GPs) and practices associated with diabetes guideline adherence may contribute substantially to variations in healthcare delivery and are associated with adherence to preventive guidelines. Quality improvement initiatives will be more efficient when we know which GPs or practices are most, or least, likely to comply with clinical prevention. (Lobo et al., 2003)

Chapter three: Theoretical and conceptual framework

3.1 Introduction

In this chapter we will discuss issues related to diabetes mellitus management definition. In addition, an overview of the study conceptual model used will also be presented.

3.2 Diabetes mellitus complications

According to WHO, the diabetes complications divided into tow groups; Acute and Chronic complications.

1- Acute complications of diabetes Mellitus:

a. Hypoglycemia

Hypoglycemia in patients with diabetes mellitus is an abnormally low concentration of glucose in the blood caused by insufficient food intake, excessive exercise, or over dosage with oral hypoglycemic agents or insulin (WHO, 2006)

b. Hyperglycemic crisis

It is rare for people with type 2 diabetes mellitus to develop ketoacidosis. It is much more known for them to develop the hyperglycemic hyperosmolar state in the face of severe infection or other major undercurrent illness. They usually present with dehydration,

circulatory compromise and a change in mental state. Acidosis is uncommon, except when related to lactic acidosis due to hypo perfusion (WHO, 2006).

c. Infections

People with poorly controlled diabetes are more prone to develop bacterial (in particular anaerobic), mycobacterium and fungal infections. Diabetics are more prone to urinary tract infections after bladder instrumentation than non-diabetic individuals. Urinary tract infections may also result from obstruction or neutrogena bladder. Pyelitis and pyelonephritis aggravate diabetic nephropathy. Chronic painless infection may destroy a neuropathic and/or ischemic foot (WHO, 2006).

2- Chronic complications of diabetes

a. Atherosclerosis

Atherosclerosis is the most common macro vascular complication of diabetes mellitus (WHO, 2001; Ramachandran et al., 1999). It accounts for 75% of diabetes-related deaths, a figure two to three times higher than that in people without diabetes. In the Eastern Mediterranean Region, some studies have indicated that the occurrence of clinical events related to coronary artery disease is four times higher in patients with diabetes (Shera et al., 1995; Haider et al., 1981). Coronary and cerebrovascular diseases are also two to three times more known and post-infarction mortality higher (WHO; 2006).

These increase in atherosclerosis in diabetic individuals are seen in all populations, whether the general incidence of atherosclerosis is high or low. In developing and rural societies, changes in lifestyle to a pattern similar to that of more industrialized and urban societies are often associated with a general increase in atherosclerosis. Although the largest numbers of diabetic ischemic events occur in people with type 2 diabetes mellitus, the risk of atherosclerosis is also high in type 1 and may be manifested at a young age. One feature

unique to women with diabetes is the loss of protection from atherosclerosis prior to menopause. (WHO; 2006)

Patients with diabetes have an approximately threefold risk for all cardiovascular diseases (Garcia et al., 1974; Stamler et al., 1993), and their relative risk of death from all causes is increased by 75% (Panzram, 1987; Walter et al. 1994).

The morbidity and mortality associated with macro vascular events far outweigh the risks of micro vascular complications in older people with diabetes. In the United Kingdom Prospective Diabetes Study (UKPDS), 9% of type 2 diabetic patients developed micro vascular disease after 9 years of follow-up, compared to rates of 20% for macro vascular complications (Turner et al., 1996). In the United States, where diabetes is the fourth most common cause of death, atherosclerotic macro vascular disease accounts for as much as 75% of all mortality in type 2 diabetes (Geiss et al., 1995).

A recent prospective study indicated that patients with type 2 diabetes without a history of prior heart attack have equal, if not greater, risks of myocardial infarction (MI) compared to those without diabetes who have had prior heart attacks (20.2% vs. 18.8% incidence of MI, respectively, over 7 years) (Haffner et al, 1998), These data suggest that older diabetic patients should be treated as aggressively for diabetes and cardiovascular risk factors as the secondary prevention efforts currently aimed at people with known cardiovascular disease.

Recently, a published UKPDS data showed no negative effects of intensive therapy with sulfonylurea or insulin on macro vascular events (UKPDS 33, 1998). To the contrary, MI rates were lower with improved glycemic control (HbA_{1c} 7.9% vs. 7.0%).The Diabetes Control and Complications Trial (DCCT) in type 1 diabetic patients also found lower macro vascular complications with improved glycemic control (HbA_{1c} 9.0% vs. 7.0%) (DCCT, 1993). These trials clearly show a lack of adverse effects and suggest a benefit of improved glycemic control with sulfonylurea or insulin on macro vascular outcomes.

Of note, metformin, an agent related to less weight gain and fewer hypoglycemic attacks, did demonstrate statistically significant reductions in MI rates with improved glycemic control (HbA_{1c} 8.0% vs. 7.4%) among overweight diabetic patients after 10 years of treatment (RR

0.61, 95% CI 0.41–0.89, P = 0.01) (UKPDS 34, 1998). It is possible that macrovascular benefits of improved glycemic control with sulfonylurea or insulin are partially offset by adverse effects of weight gain on lipids and blood pressure,

Spread of hypertension in type 2 diabetic patients rises from 40% at age 45 to 60% by age 75, a factor that contributes significantly to both macro- and micro vascular disease complications (Vijan et al.; UKPDS 38, 1998). Therefore, screening for and aggressive treatment of hypertension are critical components of diabetes care. In most cases, therapy should be instituted if blood pressure (BP) exceeds 140/90 mmHg, and expert opinion suggests a treatment goal of BP <130/85 for patients with type 2 diabetes (JNCDETHBP, fifth Report, 1993).

Despite the association between hyperlipidemia and cardiovascular events declines with age, a significant association has been shown to continue into the eighth decade of life (Corti et al., 1997). Further, primary prevention trials with older adults up to age 73 years and secondary prevention trials involving adults up to age 75 years clearly manifested that lowering cholesterol levels can significantly reduce cardiovascular event rates in older adults with and without diabetes (Downs et al., 1998; Sacks et al., 1996; Pyorala et al., 1997).

Significantly elevated blood glucose following a meal is a very common problem in people with diabetes. A recent study showed that over 84% of people with type 2 diabetes experience significantly elevated post-meal blood glucose (Bonora et al., 2001). This is a major concern because of the link between elevated post-meal glucose and diabetes complications, particularly cardiovascular disease (Ceriello et al., 2005) – the leading cause of death in people with diabetes (Niskanen et al., 1998).

Many studies have demonstrated that lowering HbA1c levels reduces the development or progression of diabetes complications (DCCT, 1995; UKPDS 33, 1998). However, studies have also shown that elevated post-meal glucose is an independent risk factor for cardiovascular disease even when HbA1c is within the normal, non-diabetes range (Ceriello et al., 2005).

Among 14 multicenter heart failure treatment trials or data registries that indicated diabetes as a co morbidity of the study population, diabetes was present in 7974 of 32 649 patients, representing an overall spread of 24%. The spread of diabetes ranged from 14% to 28% in these studies. It is worth mentioning that many of the heart failure multicenter trials published in the last 5 years did not indicate the spread of diabetes.

Only a few trials have indicated the outcome of patients with diabetes relative to the non diabetic population (Shindler et al., 1996; Gustafsson et al., 1999; MERIT-HF Study Group, 1999; Jimenez-Navarro et al., 1999). Even fewer report the results of the medical intervention separately in the patients with diabetes. The available data do uniformly demonstrate that persons with diabetes and heart failure represent a very-high-risk group with a substantially worse prognosis than those without diabetes. Data from the Survival and Ventricular Enlargement trial (Jimenez-Navarro et al., 1999) also demonstrate a significant increase in mortality in insulin-dependent patients compared with non–insulin-dependent patients (41% versus 26%, $P<0.001$).

In summary, diabetes is a main risk factor for the development of heart failure, both systolic and diastolic. Moreover, for patients with heart failure, diabetes represents a major risk factor for cardiac complications and death. Intensive management of diabetes to reach a glycemic control (HbA1c within normal range) is very important to prevent or postpone diabetes cardiac complications.

b. Acute Myocardial Infarction

In-hospital and long-term mortality rates after acute myocardial infarction (AMI) are twice as high among individuals with diabetes as among those without diabetes (Jacoby et al., 1992; Arnoson et al., 1997). Approximately 30% of hospitalized patients with AMI will have diabetes, compared with a diabetes prevalence of 6% to 8% in the general population. Diabetes is also a major risk factor for adverse outcomes in patients with unstable angina.

Persons with diabetes, particularly in the setting of autonomic neuropathy, have impaired angina recognition and may not consider shortness of breath, nausea, vomiting, unexplained fatigue or diaphoresis, or disturbances of glycemic control as symptoms of cardiac ischemia

(Nesto et al., 1988). Atypical symptoms could also prevent recognition of AMI by caregivers and be a cause of treatment delay. Too often, AMI is the first clinical expression of cardiac heart disease (CHD) in the patient with diabetes, who may have experienced prior, unheeded symptoms of cardiac ischemia. Furthermore, one should not assume that the absence of angina in the post–myocardial infarction (MI) patient is a reliable index of CHD stability. Surveillance with noninvasive testing may be of benefit in some persons with diabetes (Nesto et al., 1999).

Factors specific to diabetes may not only increase the risk of MI (Silva et al., 1998) but also adversely affect its outcome. Autonomic nervous system (ANS) dysfunction results in sympatho-vagal imbalance and may lower the threshold for life-threatening arrhythmia and increase the risk of hemodynamic instability. Up to 50% of individuals with type 2 diabetes (with disease duration >10 years) have ANS dysfunction manifested as impaired heart rate variability. Fibrinogen levels may be elevated in patients with diabetes, particularly in the setting of proteinuria or poor glycemic control. Elevated levels of plasminogen activator inhibitor-1 indicate impaired fibrinolysis, and diabetic platelets are more agreeable than no diabetic platelets. Such diabetes-related alterations may increase the risk of thrombosis at the site of plaque disruption and possibly increase the risk of reinfarction after thrombolytic therapy. The diabetic ventricle is more prone to maladaptive remodeling, which increases the risk of heart failure and cardiogenic shock. The status of the noninfarct zone, an important determinant of the remodeling process, may be affected by silent infarction, ANS-related diastolic or systolic dysfunction, diabetic or hypertensive cardiomyopathy, impaired micro vascular perfusion, and more extensive epicedial CHD (Nesto et al., 2001).

c. Retinopathy

Diabetic retinopathy is the leading cause of blindness and visual impairment in adults in many societies. Almost, everyone with younger-onset type 1 diabetes will develop diabetic retinopathy after 20 years of the disease. At some time, during their lives, 75% will develop the most severe stage, proliferate diabetic retinopathy. In older-onset type 2 diabetes mellitus, almost 60% will develop diabetic retinopathy and at some time during their lives about 10% will develop proliferate retinopathy and about 2% become blind. (WHO; 2006)

The increase of diabetic retinopathy and nephropathy mainly occurs when the fasting glucose is 7.8 mmol/L or greater (Jarret , Keen, 1976; CDAEC, 1997). However, fasting glucose levels of greater than 6.0 mmol/ L are related to a higher incidence of cardiovascular disease (Jarret , Keen, 1976; Pettitt et al., 1980). This information led the Canadian and American Diabetes Associations to develop new, lower criteria for the diagnosis of diabetes (CDAEC, 1997; ECDCDM, 1997).

It is concluded based on studies that diabetes is the most frequent cause of blindness and renal failure in the United States, and the micro vascular complications of diabetes rise with increasing duration of disease and worsening glycemic control (Klein et al., 1996; Vijan et al., 1997). Although improving glycemic control clearly reduces micro vascular complications, it is important to recognize that the incidence of severe or end-stage micro vascular complications is much lower for type 2 diabetic patients than for type 1 patients, presumably because of their older age of onset and increased competing risks for death (Vijan et al., 1997).

As previously outlined, the absolute benefits of developed glycemic control on micro vascular complications appear to be greatest when moving from poor control (HbA_{1c} >11%) to moderate-to-good glycemic control (HbA_{1c} 8–9%) (Vijan et al., 1997).So, as demonstrated in the UKPDS trials, further reductions in HbA_{1c} below 8% clearly further reduce micro vascular complications, but because of the lower overall complication rates at these levels of HbA_{1c}, the marginal number of events prevented is smaller (UKPDS 33, 1998; UKPDS 34, 1998). Thus, although the UKPDS trial achieved a 25% risk reduction in aggregate micro vascular endpoints (much of which was due to a reduction in the need for retinal photocoagulation) in association with glycemic control of HbA_{1c} of 7.9 versus 7.0%, the absolute risk reduction was 2.8 events per 1,000 patient-years (number needed to treat = 35 patients for 10 years to prevent one micro vascular event) (UKPDS 33, 1998).

d. Diabetic nephropathy

Diabetic nephropathy (kidney disease) is the most common reason of renal failure in many Eastern Mediterranean Region countries (Al-Khader, 2001; Al-Zaid et al., 1994) and a major reason of premature death in diabetic patients. Diabetic patients are 17 times as prone to kidney disease as non-diabetic people. It is a multistage condition that requires several years to become clinically overt. (WHO; 2006)

While the cumulative risk of diabetic nephropathy in type 1 diabetes mellitus is about 30%–40% after 25–30 years, it varies considerably in type 2 diabetes mellitus depending on ethnic origin, and can be as low as 15% in some groups of European origin after 25 years of disease. (WHO; 2006)

In the United States, diabetes is the leading reason of end-stage renal disease (ESRD), which includes the need for kidney dialysis or transplantation. Unfortunately, the 5-year survival rate of ESRD patients with diabetes is only 20%, largely because of a very high incidence of cardiovascular disease (CVD) (Patsan et al., 1998; Levey et al., 1998). The causes for this excess CVD are inadequately explored, but hypertension, dyslipidemia, and anemia probably play important roles. A major goal, therefore, should be early recognition of kidney damage so that measures can be undertaken to prevent progressive loss of renal function.

The clinical course of nephropathy in both type 1 and type 2 diabetes is similar, consisting of an initial period of supranormal glomerular filtration rate lasting 10 or more years followed by 5 years with microalbuminuriaand then macroalbuminuria and loss of glomerular filtration rate (Parving et al., 2000; Nelson et al., 1996; Myers et al., 1991). Microalbuminuria is found in both types of diabetes and identifies the patients destined to develop progressive kidney damage. For screening, yearly testing for albuminuria is required (at the onset of type 2 diabetes and after 7 years of type 1 diabetes). Regular evaluations of glucose control and monitoring of the rate of loss of renal function are indicated for each patient (ADA, 1992). For the older patient with type 2 diabetes, the possibility of coexisting kidney diseases should be evaluated. Numerous reports emphasize the prominent position microalbuminuria holds as an identifier of incipient renal insufficiency. It also predicts CVD. To reach the largest number of persons with diabetes (especially in the setting of primary care), the simple spot, early-

morning-urine sample for determining the microalbumin-to-creatinine ratio should be encouraged as the first-line test.

In addition to serving as an identifying marker for the presence of kidney disease, it is possible that proteinuria plays a role in the pathogenesis of kidney damage. This is controversial, because the degree of proteinuria may simply reflect the severity of kidney damage. Regardless, successful treatment of hypertension reduces the degree of proteinuria and generally results in reduced kidney damage (Ruggennti et al., 1998; Lewis et al., 1993).

It is common that hypertension is known in patients with diabetic nephropathy. Angiotensin-converting enzyme inhibitors (ACEIs) are widely recommended for controlling blood pressure in any hypertensive patient with kidney disease because proteinuria responds well to ACEIs even though blood pressure is not always controlled (Bakris et al., 2000; Lewis et al., 1993). In the Heart Outcomes Prevention Evaluation study, ACEIs also was found to have significant beneficial effects on CVD and the progression of kidney damage in patients with diabetes despite producing only a modest decrease in blood pressure (HOPE study and MICRO-HOPE sub study, 2000; Yusuf et al., 2000). The therapeutic goal should be to achieve a blood pressure <130/85 mm Hg and to reduce proteinuria by restricting dietary salt and adding ACEIs or other blood-pressure lowering drugs (Bakri et al., 2000).

These considerations lead to guidelines for the therapy of patients with diabetic nephropathy. First, treatment should include strict control of blood glucose to HbA1c <7.0%, as recommended after successful trials in controlling the progression of nephropathy in patients with both types of diabetes (ADA, 1999).Patients who have progressive renal insufficiency despite these measures or who develop increasing macroalbuminuria should be referred to a nephrologist. Blood pressure should be strictly controlled (Bakris et al., 2000). In addition to dietary salt restriction, initial therapy should include an ACEI (whether differences in the efficacy of ACEIs on tissue angiotensin converting enzyme are critical is unsettled). Dietary protein should be limited in patients who have progressive renal insufficiency to reduce the accumulation of nitrogen-containing waste products and to take advantage of the antiproteinuric effects of dietary protein restriction and its beneficial influence on progression of renal insufficiency.

e. Diabetic neuropathy

Diabetic neuropathy can be defined as a nerve disorder that may be clinically evident or sub-clinical, and which occurs in diabetes mellitus in the absence of other evident etiology. Manifestations may occur in both the peripheral and the autonomic nervous systems (Morgan et al., 2000).

Diabetic neuropathy affects over 50% of patients who have had type 2 diabetes for more than 15 years, and, as with other microvascular complications, improved glycemic control appears to reduce the incidence of neuropathy (Klein et al., 1996; UKPDS 33, 1998; Vijan et al., 1997). Similar risk reductions in micro vascular risks were observed with intensive glycemic control efforts (HbA_{1c} 8.0 vs. 7.4%) (UKPDS 34, 1998).

f. Neuropathic foot

It has become familiar that more and more hospital beds are occupied by diabetic patients with foot problems than by those with all other consequences of diabetes. The problem of limb amputation in people with diabetes is of such a serious and global nature that a special section giving guidelines for prevention was felt to be warranted in this publication (WHO, 1994; Chobanian et al., 2003)

Diabetes is associated with increased frequency of lower-limb amputations, many of which are potentially preventable. Epidemiological data suggest that >50% of the 120000 non-traumatic lower-limb amputations in the United States of America are associated with diabetes and that the overall risk of amputation in people with diabetes is 15 times that in people without diabetes (WHO, 2006).

Evidence based on analytical studies confirmed that improved glucose control delays the onset of complications in type 2 diabetes. In a cohort study of 114 patients followed for 5 years, the incidence of progression of retinopathy increased linearly as a function of the HbA1C level: 2% in those with HbA1C less than 0.070 and 62% in those with HbA1C greater than 0.090 (Morisaki et al.,1994). In a randomized secondary prevention intervention trial of diabetic

patients (majority type 2 diabetes) who had suffered an myocardial infarction (MI), those who had intensive insulin treatment had an absolute reduction of mortality of 11% (44% vs 33%) compared to the regular therapy group after 3.4 years of follow-up (Malmberg et al., 1997). In a randomized trial of 110 patients with type 2 diabetes, those who received multiple insulin injections had an absolute reduction in the progression of retinopathy of 24%, and of nephropathy of 20%, after 6 years of follow-up, when compared with a conventional therapy group (Okhubo et al., 1995). Preliminary results of a large prospective randomized trial, that is examining the relationship of glucose control to complications of diabetes in type 2 diabetics, show an improvement in HbA1C levels in patients who received treatment, whether with sulfonylurea, metformin or insulin (UKPDS, 1998).

Recent findings from the UKPDS trials have demonstrated the effectiveness of tight glucose control on slowing the progression of microvascular and macrovascular complications in newly diagnosed type 2 diabetic patients (UKPDS 33, 1998).

In Palestine, in the West Bank, the reported new cases in the governmental primary health care clinics (PHC) diabetic clinics in the West Bank was 2,214 cases in 2007, in Jenin district, in particular, was 306 cases. The same report showed the following distribution of the reported visits to government PHC diabetic clinic, by complications:

Table 3.1: Distribution of reported visits of diabetes patients to government PHC centers

Nephropathy-	5,277
Retinopathy-	14,248
Neuropathy-	21,816
Cerebro-vascular diseases-	2,817
Cardio-vascular disease-	17,910
Diabetic foot-	4,655
Other-	8,898

Number of visits of type 2 diabetic patients to diabetes clinic in Jenin district for the year 2008 as the following, by type of management: (Jenin, 2008)

Table 3.2: Distribution of diabetes patients by management regime.

Diet only	171
Tablets	17573
Combined therapy	562
Insulin only	3814

3.2 Management of diabetes mellitus definition

Based on literature, “Disease Management” according to diabetes in the guide for case managers was "a strategy that is usually used by managed care organization or integrated delivered systems to address chronic illness such as **diabetes mellitus**, heart failure, asthma, and many others" (Diane L. Huber; 2005). Accordingly, disease management programs were shown to have various forms with certain core components that are invariably present in any of these programs. These components start with a mechanism to identify people with the disease in question from a database of the health care system. After identifying the patients, clinical care guidelines were specified to deal with those patients. The professionals and patients agree on the intervention methodology and those patients are monitored to have certain expected outcomes as result of such program. (Diane L. Huber; 2005)

Diabetes management was also defined by Couch (Couch, 1998). He observed that it is “Knowledge-based process intended to improve continuously the value of health care delivery from the perspectives of those who receive, purchase, provide, supply and evaluate it (Couch, 1998). Couch (1998) outlined the following seven components of a model of Disease management:

1- knowledge-base creation (medical and stakeholder requirements)
2- Goal setting / Disease management team development
3- Risk stratification and intervention planning (design and development)
4- Communication of intervention

5- Behavior modification
6- Clinical process / environment redesign
7- Outcomes measurement and management

The Disease Management Association of America (DMAA) has defined Diabetes Management, as follows: "A System of coordinated health Care interventions and communications for populations with conditions in which patient self-care efforts are significant. (DMAA, 2004)
…. "Supports the physician or practitioner / patient relationship and plan of care, confirms prevention of exacerbation and complications utilizing evidence-based practice guidelines and patient empowerment strategies, and evaluates clinical, humanistic and economic outcomes on an ongoing basis with the goal of improving overall health" (DMAA, 2004)

The Team methodology in managing diabetes is a crucial aspect. The disease should be managed by the patient, the physician, the nurse, the health care system and the socio-cultural environment as a whole. Defects in any of these components would lead to less than optimal results in the fight against diabetes. (Diane L. Huber; 2005)

Diabetes mellitus should not be managed based on symptoms alone. Glycemic goals are based on evidence of what glucose levels constitute a risk for developing complications. It is, however, inappropriate to aggressively approach target glucose levels when it may adversely affect the patient. Treatment goals must, therefore, be individualized. (WHO; 2006)

Disease management of diabetes- as prescribed in Task Force on Community Preventive Services (2002) - in the clinical setting is an organized, proactive, multi-component approach to healthcare delivery for all members of a population with diabetes or for a subpopulation with specific health risk factors. It embraces all aspects of the delivery system. Care is focused on, and integrated across, the entire spectrum of the disease and its complications as well as the prevention of co morbid conditions. The goal is to improve short- and long-term health or economic outcomes, or both, in the entire population with diabetes. The essential components of disease management are (1) identification of individuals or populations with diabetes (or a

subset with certain risk factors); (2) use of guidelines or performance standards to manage those identified; (3) information systems to track and monitor interventions and patient-, practice-, or population-based outcomes; and (4) measurement and management of patient and population outcomes. Other interventions may be incorporated into disease management interventions, and these interventions can be focused on (1) the healthcare system (e.g., practice redesign, electronic information systems, changes in models of care), (2) the provider (e.g., reminders, education, feedback, decision support), or (3) the patient or population (e.g., patient-centered care strategies, DSME, reminders, feedback, telephone call outreach). (Task Force on Community Preventive Services, 2002)

Disease management is strongly recommended by the Task Force based on strong evidence of its effectiveness in improving glycemic control, provider monitoring of glycated hemoglobin (GHb), and screening for diabetic retinopathy. Sufficient evidence is also available of its effectiveness in improving provider screening of the lower extremities for neuropathy and vascular changes, urine screening for protein, and monitoring of lipid concentrations. This recommendation is applicable to adults with diabetes in the settings of managed care organizations and community clinics in the United States and Europe. Although a number of other important health outcomes were examined, including blood pressure and lipid concentrations, data were in-sufficient to make recommendations based on these outcomes. (Task Force on Community Preventive Services, 2002)

After this revision of literature about the definition of Diabetes Management, we can conclude our understanding to that term as, the good management of diabetes will lead to glycemic control to avoid or delay the complications of diabetes. We can achieve a good management by integration of several factors: good self management, physicians' compliance with diabetes guideline, personal characteristics, patient compliance with the management plan and good health care system for diabetes.

3.4 Guidelines for diabetes management used in Palestine

The protocols description and difference between the MOH and UNRWA used protocols:

The MOH guide, i.e. the "quick guide for the management and care of diabetes mellitus", (MOH; 2008) and the UNRWA "technical instructions and management protocols on prevention and control of Noncommunicable diseases" (UNRWA; 2004). The following issues are summarized. Both protocols are, in somehow, are built on the WHO guidelines for year 2006, with some differences between them and some times between them and WHO guidelines. Both protocols of MOH and UNRWA adopted the WHO recommendations about patient educations and advice on diet and the types of oral antidiabetic agent and combined therapy with insulin.
The WHO adopted the following diagnostic values for diabetes mellitus:

Diabetes mellitus: fasting ≥126 mg/dl; 2-hour post-75 g ≥200

IGT (Impaired Glucose Tolerance): Fasting (if measured) and <126**;** 2-hour post-75 g glucose load ≥140 and <200

IFG (Impaired Fasting Glucose): fasting and (if measured) ≥100 and <126**;** 2-hour post-75 g glucose load <140

Both protocols, the MOH and the UNRWA use the WHO definitions and classifications for diabetes and diabetes types. UNRWA and MOH agree with these values, except IFG, UNRWA considered it between 110 and 126 mg/dl.

A- The screening program

Screening of asymptomatic adults for type 2 diabetes mellitus by WHO should be done on the following groups:

- individuals aged ≥35 years;
- overweight (body mass index ≥ 25 kg/m2);
- first-degree relative with type 2 diabetes;
- women with previous history of gestational diabetes mellitus or who delivered a baby weighing > 4 kg;
- individuals diagnosed previously with IFG or IGT;
- hypertensive individuals with blood pressure >140/90 mmHg;
- HDL cholesterol level ≤0.9 mmol/L (35 mg/dL) and/or triglyceride level >2.82 mmol/L (250 mg/dL);
- other medical conditions associated with insulin resistance like polycystic ovarian syndrome or acanthosis nigricans;
- History of vascular disease.

MOH adopted all these risk groups but regarding the individual age, they consider it over 40 years old. However, the UNRWA does not consider the age as an important factor, so they did not mention it, they emphasize on smoking and sedentary life style in addition to the weight, family history and other vascular diseases.

B- Therapy

Both MOH and UNRWA adopted the WHO objectives of therapy:

- To eliminate symptoms of hyperglycemia.
- To achieve optimum control.
- To reduce or eliminate microvascular and macrovascular complications of diabetes mellitus.
- To treat associated disorders.
- To allow the patient to achieve as normal a lifestyle as possible.

MOH quick guide adopted the WHO marker for diabetes mellitus control are blood glucose and HbA1c, by WHO, the patient must repeat it quarterly but by quick guide every sex months. However, the UNRWA adopted just blood glucose as a marker for diabetes control.

C) Components of the clinic visit

World health organization (WHO), recommend for diabetes health care providers a lot of services which the patient should receive when attending diabetes clinic. Physicians should ask diabetes patients about their medical history (symptoms, home blood glucose monitoring,… etc), visit must include a patients' physical examination (weight, BP, fundoscopy, … etc), and follow up diagnostic studies should be performed (FBA, RBS, HbA1c,….etc) (see annex 6).

Quick guide of MOH just mention the medical history and full physical examination without details, but according to the laboratory test it provides us with which test should the patient perform in diabetic clinic:

- Fasting plasma glucose.
- HbA1c Q 3-6 months.
- Fasting lipid profile (14 hours).
- Ophthalmologic examination.
- Serum Creatinin in adults; and in children if proteinuria is present.
- Urinalysis: glucose, ketones, protein, sediment.
- Test for microalbuminuria (quantitative).
- Urine culture if sediment is abnormal or symptoms are present.
- Thyroid-stimulating hormone (TSH) in all diabetes type 1 patients.
- Electrocardiogram (ECG) in adults.

Technical instructions of UNRWA adopted the questions which the physician should ask the patient and adopted all elements of physical examination and added for them, the sexual maturity staging, thyroid palpation, hand/nail appearance and skin examination.

MOH protocol adopted the recommendation of WHO regarding repeat all lab tests in each visit, but UNRWA in this issue has own system.

In initial assessment, the patients do the following lab tests: FBG and after 2 hours blood glucose, total cholesterol, HDL, LDL, Triglyceride and Creatinin.

In annual assessment the patients repeat, Creatinin, total cholesterol, FBG. The routine follow-up visit (quarterly) include, blood sugar after 2 hours of eating, body mass index, blood pressure measurement, foot examination, and fundus examination.

Follow up criteria at the MOH at the UNRWA, and the private sector:

According to interviews with key persons at the MOH, there are certain procedures that are applied at the MOH-PHC for diabetic patients. There is no screening program for insured patients to check for their blood sugar. Most newly discovered cases happened accidentally, or when the patient starts complaining about symptoms related to diabetes. Each newly discovered case is referred to the central governmental clinic. At this clinic, the GP takes the full medical history of the patient, and carried out a full physical examination. Each patient has to perform certain tests to establish the diagnosis, determine the degree of glycemic control and define associated complications and risk factors. After the completion of this stage, patients are referred to a nutritionist to have a consultation for their diet. For follow up, according to the MOH policy, patients should come after 6 months for reassessment of their diabetic conditions, unless any sign of diabetes complications appear. Therefore, patients visit the PHC monthly only to get their regular medications and can see their GP (personal interview, 2009), (Abdel Hafez, 2009).

At the UNRWA, according to personal interviews with general practitioners and reviewing the technical instruction, the follow up system includes a screening program for risk group clients. The new discovered cases in and out UNRWA clinics undergo the lab tests which include FBS, kidney function and lipid profile to establish the diagnosis and to determine other disorders. Based on the lab results the GP determine the treatment plan for the patient. After

one month the patient attend the clinic for RBS, if RBS over 180 mg/dl (uncontrolled), the doctor correct the treatment and require from him to return back to clinic after one month for another RBS. If RBS below 180 mg/dl, the GP should give the patient medications enough for three months.

Follow up for the diabetic patients in private sector is performing without systems and regulations, from the interviews conducted with some internist specialists and GPs working in own private clinics and working in private hospitals and private medical centers, we found that, each physician exams the diabetic patients who visit his clinic and order for them laboratory analysis based on his own knowledge which he get from various resources, from university, reading new article or from workshop, but not based on any protocol or guidelines. Patients attend private clinics just when they get sick tired from diabetes symptoms or complications. Almost of these diabetic patients who attend private clinics at the same time they attend the governmental clinics and/or UNRWA clinics for medications and for free lab tests. Private physicians do not have in their clinics files for their patients, but they give the patients visit card, where the write the diagnosis and results of lab tests. The patients do not visit the private clinics for follow, because they must to pay for this service. The specialist in the private sector can change the medication regime for the patients and refer him from tablet to insulin therapy, by writing these changes in prescription sheet, and the patient go with this sheet to MOH or UNRWA clinics and they adopt this sheet and add it to his file and start to give the patients medicines according the specialist prescription.

The following table, table 3.3, summarizes the similarities and differences between the used guidelines.

Table 3.3: similarities and differences in the used protocols

WHO	MOH Quick Guide	UNRWA Technical instructions
Medical history -Symptoms of hyperglycemia or hypoglycemia -Results of prior HbA1c and -home blood glucose records -Meal patterns including frequency and content, and any change in weight -Lifestyle and psychosocial elements -Any acute complications such as infection, hypoglycemia or ketoacidosis -Any chronic complications related to vision, kidney, nerve, or the cardiovascular system -Any associated cardiovascular risk factors such as a positive family history, hypertension, dyslipidaemia -Review of all medications; ask if the patient is taking aspirin	Take a medical history (without details)	Frequency, causes and severity of hypoglycemia or hyperglycemia Problems in compliance with treatment regimens Life style changes Symptoms suggesting development of complications of diabetes Other medical illnesses Current medications
Physical examinations -Height and weight -Vital signs, including blood pressure supine and sitting -Fundoscopic examination, looking for any signs of retinopathy -Oral examination, including gums -Cardiovascular including evaluation for pulses and bruits -Abdominal exam, assess liver size -Foot examination, for deformities -Neurological examination: light, touch, vibration sense, reflexes, motor strength.	Full physical examination	WHO and the sexual maturity staging, thyroid palpation, hand/nail appearance and skin examination.

Table 3 continues

WHO	MOH Quick Guide	UNRWA Technical instructions
Diagnostic Criteria **Diabetes mellitus** fasting ⩾126 2-hour post-75 g ⩾200 **IGT (Impaired Glucose Tolerance)** Fasting (if measured) and <126 2-hour post-75 g glucose load ⩾140 and <200 **IFG (Impaired Fasting Glucose)** fasting and (if measured) ⩾100 and <126 2-hour post-75 g glucose load <140	WHO	WHO, except IFG, considered it between 110 and 126
Repeating laboratory testing each visit -Fasting and 2-hour postprandial glucose, if feasible -Quarterly HbA1c -Yearly chemistry panel, fasting lipid profile, urine analysis (including microscopy and urine Microalbumin screening) -Thyroid stimulating hormone for type 1 and for type 2, as indicated -ECG in adults at baseline, and then as clinically indicated	provide us with tests, which should be done in initial visit: -Fasting plasma glucose. -HbA1c Q 3-6 months. -Fasting lipid profile (14 hours). -Ophthalmologic examination. -Serum Creatinin in adults; and in children if proteinuria is present. -Urinalysis: glucose, ketones, protein, sediment. -Test for microalbuminuria (quantitative). -Urine culture if sediment is abnormal or symptoms are present. -Thyroid-stimulating hormone (TSH) in all type 1 patients. -Electrocardiogram (ECG) in adults.	in initial assessment: FPG and after 2 hours blood glucose, total cholesterol, HDL, LDL, Triglyceride and Creatinin In annual assessment the patients repeat, Creatinin, total cholesterol, FBG. The routine follow-up visit (quarterly) include, blood sugar after 2 hours of eating, body mass index, blood pressure measurement, foot examination, and fundus examination.

Table 3 continues

WHO	MOH Quick Guide	UNRWA Technical instructions
Marker for diabetes mellitus control Blood Glucose HbA1c Quarterly	Blood Glucose HbA1c every six months	Blood Glucose level
Objective of therapy -to eliminate symptoms of hyperglycemia; -to achieve optimum control; -to reduce or eliminate microvascular and macrovascular complications of diabetes mellitus; -to treat associated disorders; -to allow the patient to achieve as normal a lifestyle as possible.	WHO	WHO
Referral to specialists -diabetes educator, to evaluate patient's ability to perform self-monitoring of blood glucose and his/her ability to interpret the data − dietician − foot-care specialist −ophthalmologist for annual retinal screening, or more often as indicated −nephrologists, neurologist, and cardiologist, if needed.	Referral criteria of patients with diabetes to central diabetic clinic -Uncertain classification of diabetes e.g. diabetes associated with endocrinopathy such as acromegaly, Cushing's syndrome or genetic defect of beta-cell function. - Type 1 diabetes patients. -Patients with frequent hypoglycemia, hyperglycemia or HbA1c greater than glycemic control after a good trial of control according to the guidelines.. - Plan of pregnancy (diabetic women) and gestational diabetes. -Multiple severe complication of diabetes. -Patients incompliance. - Frequent emergency room or hospital admissions. - Family problems or psychiatric problems interfering with treatment	In specific situation: -Diabetic women planning to have a child -Diabetic mothers during pregnancy for obstetric advice -Early ocular, cardiovascular or renal complications -Recurrent episodes of hyper-or hypoglycemia

Table 3 continues

WHO	**MOH** **Quick Guide**	**UNRWA** **Technical instructions**
Multidisciplinary team: - physician - Nurse - Dietician - Chiropodist - Health educator	WHO, except Chiropodist	GP and nurse
Control criteria: Plasma values: Pre-meal glucose, mg/dL 90–130 Bedtime glucose,mg/dL110–150 HbA1c <7.0	WHO plus: Post-prandial plasma glucose 140-180 mg/dl Lipids≥ 40 mg/dl (Men) HD≥50 mg/ dl (women) LDL < 100 mg/dl Triglycerides < 150 mg/dl Blood pressure<130/80 mmHg	Post-prandial plasma glucose ≤180 Fasting plasma glucose ≤126 Total serum cholesterol < 250 Blood pressure < 140/90
Pharmacological therapy: Oral hypoglycemic agents groups: -Insulin secretagogues Sulfonylurea -Insulin sensitizers -Alpha-Glycosidase Inhibitors	WHO	WHO, except Alpha-Glucosidase

3.5 Study conceptual framework

According to the literature review and study objectives, we developed this study conceptual framework. The above definitions, review for guidelines, factors affecting diabetes complications at the personal and system level has been discussed. Each group will be discussed later on whom it will of great importance in managing and controlling diabetes complication initiation and progress.

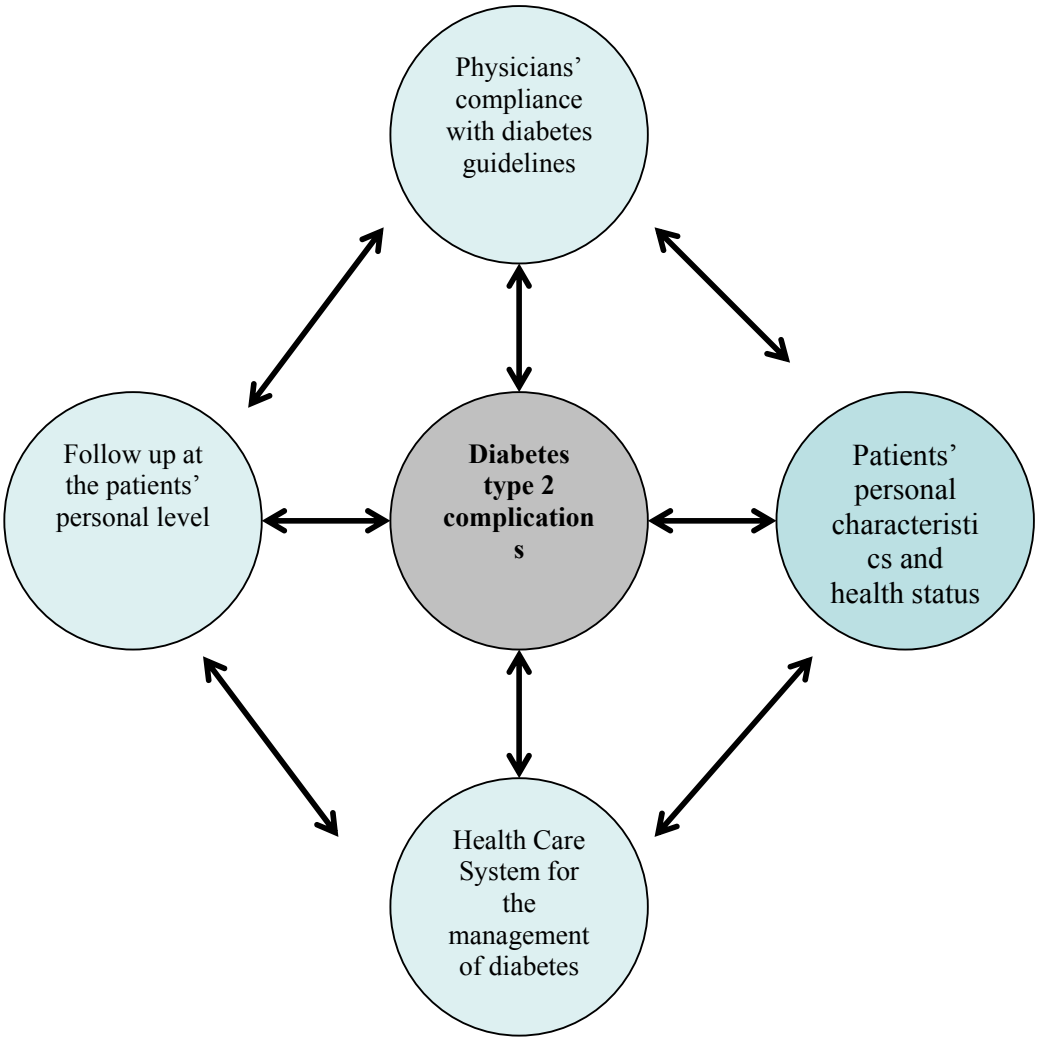

Figure 3.1: Study conceptual Frame Work

3.6 Summary:

Disease Management is a strategy that is usually used by management care organization or integrated delivered systems to address chronic illness such as diabetes mellitus. Accordingly, disease management programs were shown to have various forms with certain core components that are invariably present in any of these programs.

So, disease management is strongly recommended by several health care associations based on strong evidence of its effectiveness in improving glycemic control, provider monitoring of glycated hemoglobin (GHb), and screening for diabetic retinopathy. Sufficient evidence is also available of its effectiveness in improving provider screening of the lower extremities for neuropathy and vascular changes, urine screening for protein, and monitoring of lipid concentrations.

In Palestine, to improve the quality of the care of diabetic patients, Ministry of Health and UNRWA has developed a guideline for management of type 2 diabetes. The MOH guide, i.e. the "quick guide for the management and care of diabetes mellitus", (MOH; 2008) and the UNRWA "technical instructions and management protocols on prevention and control of Noncommunicable diseases" (UNRWA; 2004). Both protocols are, in somehow, are built on the WHO guidelines for year 2006, with some differences between them and some times between them and WHO guidelines. So, our conceptual framework includes socio demographic characteristics, follow up at the patients' personal level, health care system follow up and physicians compliance with guidelines, which effect the diabetes' complications.

Chapter four: Study methodology

4.1 Introduction

This study focuses on management of type 2 diabetic patients in Jenin and Toubas districts. In this chapter the research methodology will be presented. The study area, study population, study design, study tools, and the sampling method are described.

4.2 Socio-demographic and geographic area description

Jenin governorate lies in the northern part of the West Bank, in the central part of Palestine (Jenin map, see annex (7)). It is a regional center due to its proximity to the Israeli, Jordanian, Lebanese and Syrian borders. It is also a well-known stop-over for pilgrims to Nazareth and Jerusalem. The area of the Jenin governorate measures 1,059,752 dunums, 13 municipalities, 68 local councils and 3 project committees.(Ministry of Interior, 2008)

Demographic trends in Jenin district, as is the case of other districts in the west bank, have been closely related to the political situation. According to the population statistics estimated by the Palestinian Center Bureau of Statistics (PCBS), the end total population of 2007 was around 256,619 individuals, which includes one refugee camp population. Approximately 4% (10176) lives in Jenin camp. Sex ratio (male per 100 female) was 103.2. Jenin district has a very young population with 40.0% of the population id (100,701) under 14 years of age. (PCBS, 2007). The Jenin governorate is an agricultural area with over 580,000 dunums of fertile, high quality soil that produce considerable harvests. The agricultural sector of the Jenin Governorate contributes 30% of the Palestinian National Income, and supplies work for 25% of the Palestinian population as farmers. (Ministry of Interior, 2008).

Toubas governorate is a small Palestinian city in the northeastern West Bank, located 21 kilometers northeast of Nablus, a few kilometers west of the Jordan River (Tubas map, see annex (8)). Its urban area consists of 2,271 dunums. As of 2005, its total land area consists of 295,123 dunams , of which 2,271 is classified as built-up, roughly 150,000 used for agricultural purposes and about 180,000 confiscated by Israel for military bases and buffer zone. (Wikipedia, 2009). Demographic trends in Tubas district, as is the case of

other districts in the west bank, have been closely related to the political situation. According to the population statistics estimated by the Palestinian Center Bureau of Statistics (PCBS), the end total population of 2007 was around 50,261 individuals. Sex ratio (male per 100 female) was 103.3. Tubas district has a very young population with 40.5% (19,505) under 14 years. (PCBS, 2007)

4.3 Health services in Jenin and Tubas districts

The Palestinian health care system is a mixture of governmental, non-governmental, United Nation Relief and Work Agency (UNRWA) and private (profit and non-profit) services delivery. These health providers are over lapping in services, and none of these sector can provide comprehensive health services.

a- Primary Health Care Services

The main health care providers for diabetic patient in Jenin district are: Jenin Health Department at Ministry of Health, UNRWA, NGOs and the primary health care clinics at private sector. Jenin Health Department is considered the major provider of primary health care services as it operates 43 PHC facilities out of 76 representing 63.4% of total PHC facilities, where as local NGO's operates 28.4%, followed by UNRWA that operates 4 clinics (Jenin, 2008).

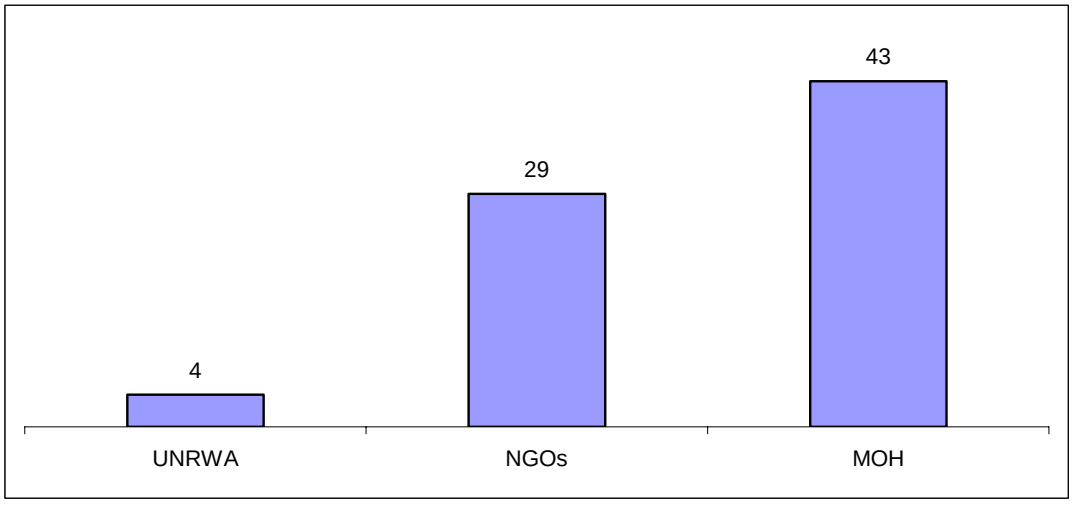

Figure 4.1: distribution of primary health care provider in Jenin district.

There are approximately 10 primary health care clinics (PHC) in Tubas district, 7 are sponsored by the ministry of health (MOH), one PHC clinic is operating by UNRWA, and non-governmental organizations runs 2 PHC centers and mobile clinic which provide health care services for 10 remote areas. (Personal communications, Bani Odeh, 2009)

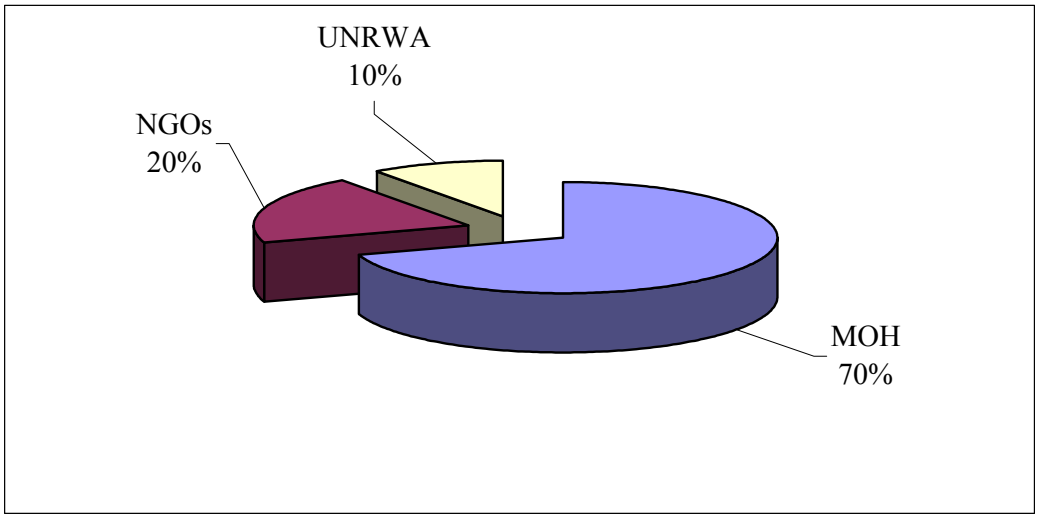

Figure 4.2: distribution of primary health care provider in Tubas district.

Primary health care cervices in both districts, provide various kinds of health services, medicines, heath education and lab tests, for details see annex 1.

b-Secondary health care services

Four hospitals provide the secondary health care services to the residents of Jenin district. The main hospital is the governmental Jenin hospital, which is always crowded and patients must wait several weeks for appointment. Another three hospitals are operated by NGOs and private sector.

In Tubas district there is no hospitals. People who needed hospital care get it either in Jenin or Nablus districts.

c- Health services for diabetics

Three main health care providers provide health care for diabetes type 2 patients; MOH, UNRWA and PMRS primary health care centers in Jenin district and Tubas districts.

The governmental health sector is providing special health services to diabetes patients through clinics present in seven locations in Jenin district and two PHC centers in Tubas, UNRWA is operating four clinics in Jenin district, while PMRS provide health services through three primary health care centers.

MOH developed special diabetes clinics for diabetic patients where the diabetic patients get their consultation by the GPs. At the UNRWA and PMRS the same GP provide health services for all clients with various health problems. Laboratory diagnostic tests at MOH include CBC (in four centers), FBS, RBS, HbA1c (some times and not in all centers), KFT, liver function tests, lipid profile, and urine analysis for free. PMRS offers the same lab tests, but not for free. UNRWA adopted the same MOH package except HBA1c, and also here patients do not pay for these services. Urine for microalbumin test is not available in all health providers. Nutritionist is available at the MOH central clinic. This service is not available at UNRWA and PMRS. Health educator specialist is not available at PMRS primary health care centers, MOH has one in central clinic and UNRWA provides this service in one center. Chronic diseases program at MOH is operating by internist, UNRWA and PMRS operate this service by GP. MOH has no ophthalmologist, but they refer diabetics for follow up to private sector with special form by which patient can get some exemption. In UNRWA also this service is not available, but UNRWA buy this service from Sant John hospital in Toulkarem and Jerusalem. PMRS refer to private sector. Nephrologist is not available in all health providers, mainly GP who manage kidney diseases. In Jenin and Tubas districts endocrinologist not available. For more details about diabetes services (see annex 5).

4.4 Study population

a. Medical files

To achieve the objectives of our study we have two study samples. The first one is medical files for type two diabetes patients in PHC centers which are operating by various providers such as MOH, UNRWA and PMRS, we select those providers because only these providers in Jenin and Tubas have filling system for diabetics.

The original sample consists of all files of type two diabetes patients of both males and females in the different age groups. The total number of files in 16 PHC centers is 7361 files. We choose 50 files randomly from each PHC center. Information about these patients was extracted from these files.

	MOH		**UNRWA**		**PMRS**	
	No. of centers	No. of Patients	No. of centers	No. of Patients	No. of centers	No. of Patients
Jenin	7	350	4	200	3	150
Tubas	2	100	0	0	0	0
Total	9	450	4	200	3	150

Our sample extracted from 800 medical files distributed by 16 PHC centers.

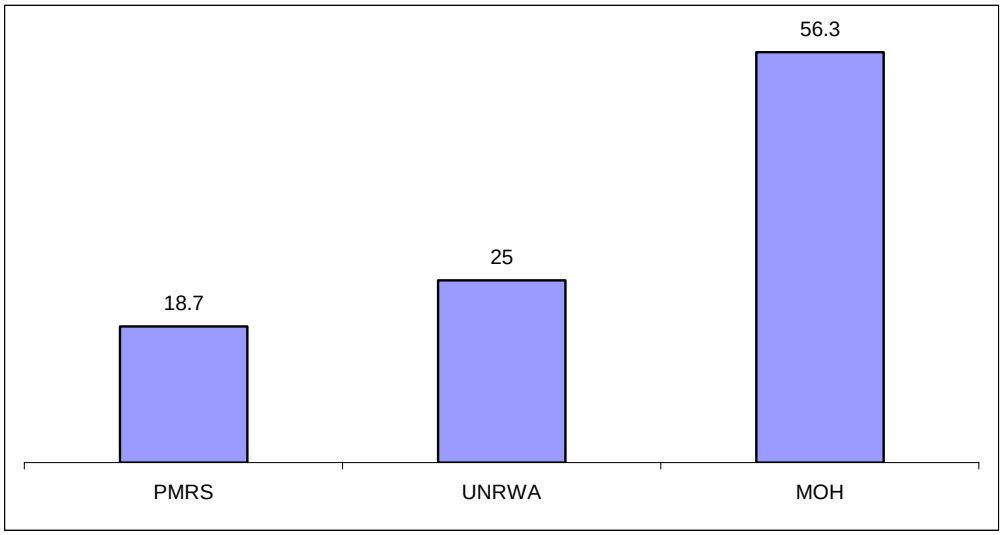

Figure 4.3: Distribution of patients' medical files by health provider.

b- Physicians

The second targeted population was physicians working in the study centers. The original sample consists of all physicians who deal with type two diabetes patients. We get a list of all physicians in Jenin and Tubas districts who registered in the medical association, and then we chose those physicians just who deal with diabetes patients(GPs, internists, endocrinologists, diabeticians, gynecologists, nephrologists, neurologists).

The total number of physicians in both districts who are registered in the medical association is 230 physicians with different kinds of specialties. From those 230 physicians just 156 physicians are GPs, internists, Endocrinologists, diabeticians, gynecologists, nephrologists and neurologists. Four physicians from 156 are not working as physicians (managers, teacher assistants), two physicians have no patients in their clinics, and eight physicians were out of country at the time of research.

Total No. of registered physicians	**Candidates physicians**	**Not candidates physicians**	**Respondents physicians**	**Not respondents physicians**
230	142	14	139 (97,8%)	3 (2,2 %)

4.5 Study design

The study design was a cross-sectional. This design was chosen to meet the objective of the study, namely to identify the determinants of type 2 diabetes complications management in Jenin and Tubas districts. The information on diabetes complications management was collected from diabetic patients' medical files, and by interviewing all physicians dealing with type 2 diabetes in both districts.

4.6 Study tools and equipments

4.6.1 The interview questionnaire

A pre-designed questionnaire was used by the researcher. Previously validated study questionnaires were used by the researcher as references for developing the study questionnaire. The questionnaires was selected from different previous studies such as “the Patient and physician perspectives regarding treatment of diabetes: compliance with practice guidelines**”** (Frank H. Lawler; 1997) and “Guidelines for type 2 diabetes: knowledge, attitudes and self-reported behavior among general practitioners” (Ivika Oja, 2005). Questionnaire was developed for the study with the aim to cover the most important areas of interest regarding the physicians' compliance with diabetes management guidelines and health care system structure for diabetes care.

4.6.2 Diabetes patients' medical files

Data about the patients regarding demographic information, complications, and follow up criteria for the past year will be extracted from their medical files at health care provider institution.

4.6.3 Validation and Piloting the study tool

After developing the questionnaire, the questionnaire was sent to 3 experts of the field of diabetes and diabetes local guidelines in Al-Quds university, Al-Makased and Al-Muttala' hospitals for validation. The questionnaire was piloted before using in the field. Ten doctors from Jenin and tubas districts were asked to fill in the questionnaire to examine the clarity and suitability of the study questionnaire. Physicians were selected from MOH, UNRWA, PMRS and private sector. Interviews were held at their work places after the physician was explained about the aim of the study.

For piloting the patients' questionnaire, 10 medical files were selected randomly from each health provider organization to insure the suitability of the information recoded in these files. .

The physicians questionnaires:

The questionnaire had a cover letter that explains the study purpose and the objective.

It included the following parts:

Part 1: questions that covers the demographic characteristics of the respondents

Part 2: questions related to the various aspects of health care system for the management of diabetes.

Part 3: questions that covers physician's compliance with diabetes guidelines

4.7 Data collection

Patients' file data:

The researcher randomly chose 50 files for type 2 diabetes patients from each PHC center. Data about patients' demographic characteristics, complications, follow up at patients' level and history of diabetes and previous chronic diseases have been extracted.

Physicians filled the questionnaires themselves.

4.8 Ethical considerations

Before beginning the study letters were sent from Al-Quds University to MOH, UNRWA and PMRS headquarters, in which the study was explained and an official permission has been asked for the researcher to visit the clinics and to work on type 2 diabetes patients' medical files. The clinics were visited before beginning of the study in order to get to know the place, to introduce the researcher, and to explain the staff about the research and to ask them about the working hours.

Before giving questionnaire to the physician, a briefly explanation about the purpose of the study and what the results will be used for were provided. An informed consent was given to each physician to sign before filling in the questionnaire (see annex 4).

4.9 Data analysis

The collected data was entered and analyzed by using the statistical package for the social science (SPSS version 15.0). The analysis process divided into different stages.

Frequencies and p values ($p < 0.05$ was used to describe the study variables. A univariate analysis was done to study the associations between the various diabetes microvascular complications (neuropathy, retinopathy and nephropathy) with all other variables (demographic, previous history of other diseases and follow up tests) using person chi-square test of significance at 5% significance level. For physicians we compare self reported familiarity with diabetes management guidelines and all other variables

(demographic, patients' follow up, work place characteristics, clinical exam and adherence to the guidelines), using person chi-square test of significance at 5% significance level.

In the multivariate analysis, three logistic regression models for the various major complication; i.e. retinopathy, neuropathy and nephropathy were developed. for microvascular diabetes complications (neuropathy, retinopathy and nephropathy). Variables that showed a significant difference with each complication were included at each model.

4.10 Operational definition of variables

Age: The age of patient (in completed years at the time of registration at health provider)

Age category: composed of four categories

A- 20 – 39 years

B- 40 – 59 years

C- 60 – 79 years

D- 80 – 99 years

Gender: Male or female of the participant

Marital status: In the term of legal status at the time of registration at health provider, divided into four scales single, married, widow and divorced.

Place of residence: Place in which participant live (City, Village and Camp).

Educational level: finished stage of education, divided into six categories (Alliterative, Elementary, Secondary, high school, Diploma and University).

Occupation: composed of two categories (worker and not worker)

Type 2 diabetes: Non insulin dependant diabetes mellitus diagnosed usually in old age people.

Type 2 diabetes reported complications:

A- Retinopathy: Diabetes affect patients' eye, extracted from patients' medical file.

B- Nephropathy: Diabetes affect patients' kidney, extracted from patients' medical file.

C- Neuropathy: Diabetes affect patients' nerves, extracted from patients' medical file.

4.11 Summary

This study is a cross-sectional study of determinants of type 2 diabetes complications management in Jenin and Tubas districts, it is comprised of two samples (type 2 diabetes patients' medical files at MOH, UNRWA and PMRS and physicians who manage type 2 diabetes). All diabetes microvascular complications were extracted from medical files.

The survey instrument consisted of 46-items to assess physicians' background characteristics and to assess the compliance of physicians with guidelines and health care system arrangements for diabetic patients.

Patients' data regarding demographic information, complications and follow up criteria with past year were extracted from their medical files. However, physicians had a self-administered questionnaire.

Univariate analysis for diabetes microvascular complications (neuropathy, retinopathy and nephropathy) with all other variables (demographic, previous history of other diseases and follow up tests) using person chi-square test of significance at 5% significance level were done. Also, multivariate analysis for microvascular diabetes complications (neuropathy, retinopathy and nephropathy) with those variables which significantly associated with the complication, using logistic regression.

The above analysis will be discussed on chapter 6. Study conclusion and recommendations will also be presented.

Chapter Five. The Results

5.1 Introduction

The study aim was to examine the determinants of management of diabetes mellitus type 2 complications at Jenin and Toubas districts.

The data analysis will be done in two parts: part 1 analysis for patients determinants for their complications for data which was extracted from their personal file, and part 2 for data collected at the interviews with physicians. In part 1 the analysis will be presented in two sections. Section 1 presents the descriptive data for the patients' files; section 2 presents univariate analysis for patients' files

5.2 Part 1 results: Patients' file records data

5.2.1 Descriptive analysis

5.2.1.1: Study population Socio-demographic characteristics

The number of type 2 diabetes patients medical files was 800 files, i.e. 50 files from each # centers. In the study, more than half of diabetic patients were found to be registered at the MOH clinics (see Figure 5.1).

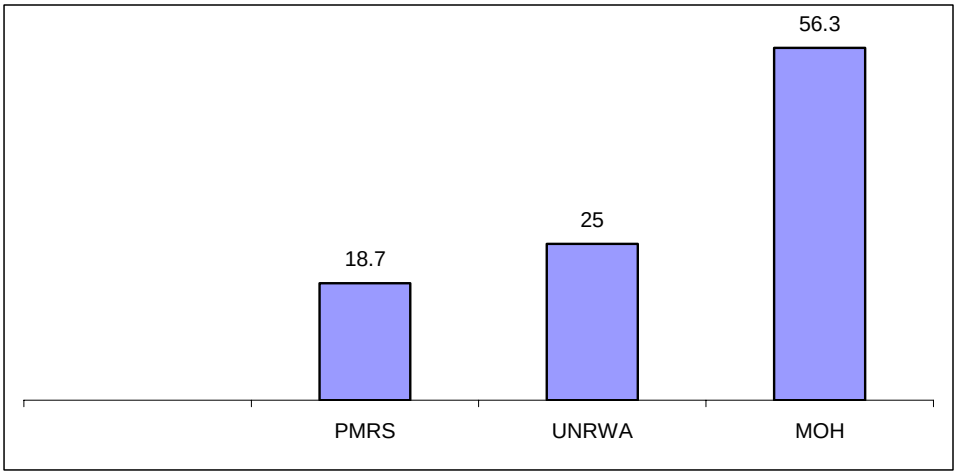

Figure 5.1: Distribution of study population by health provider

The mean age of the group was 58,8 ± 11,4 (mean ± S.D) (see figure 5.2), the mean duration of disease was 10.46 ± 7.43. Of the study population, 81.9% were married (see figure 5.3). A 64% of diabetic patients in this study were males (see figure 5.4). A 93,8 % of patients live in villages (see figure 5.5). Half of the patients (48,5%) were not workers (see figure 5.6). More than third of study population are illiterate (see figure 5.7).

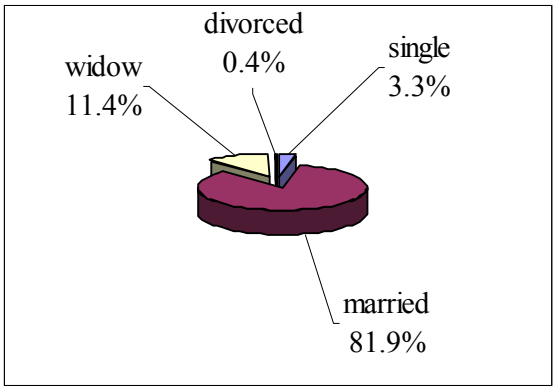

Figure 5.3: Distribution of study population by marital status

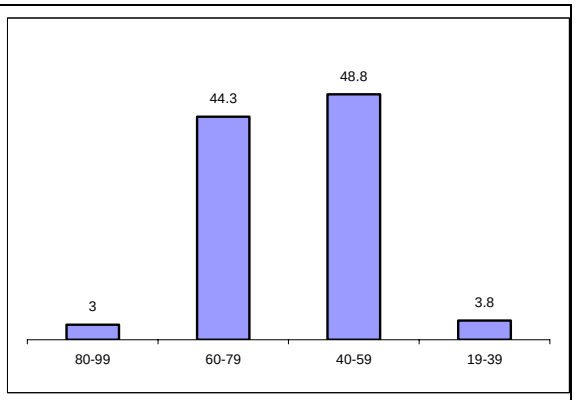

Figure 5.2: Distribution of study population by age group

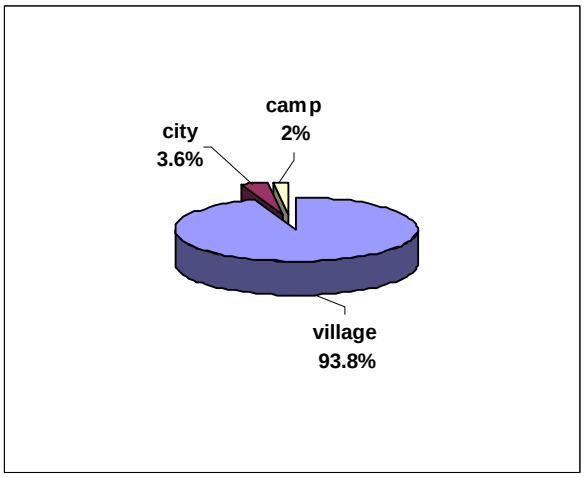

Figure 5.5: Distribution of study population by place of residency

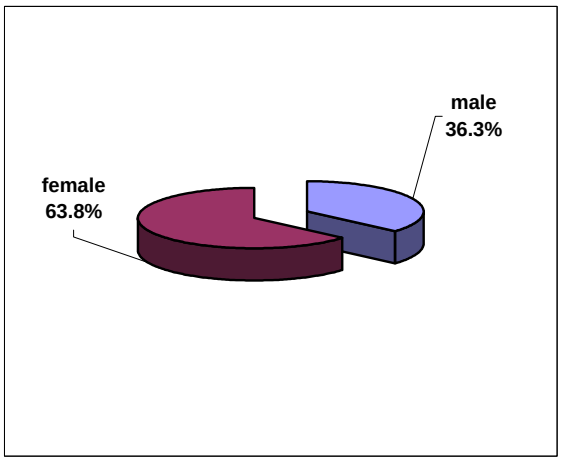

Figure 5.4: Distribution of study population by gender

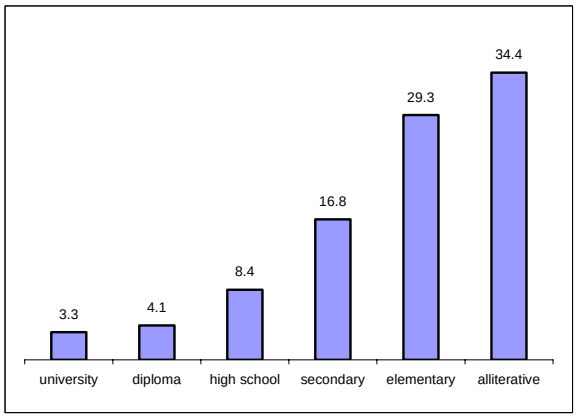

Figure 5.7: Distribution of study population Educational level

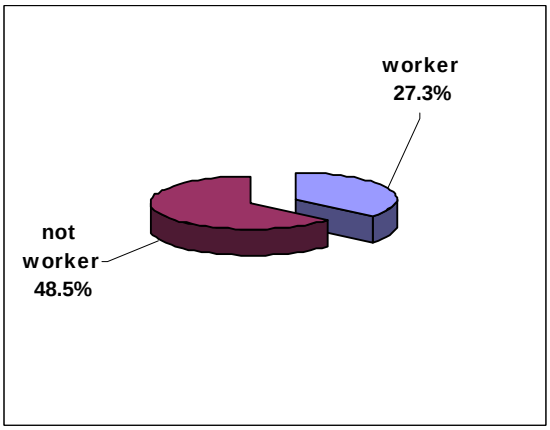

Figure 5.6: Distribution of study population by Job

5.2.1.2 Study population health condition

Interestingly, 65.5% of the study population showed positive family history of diabetes (see figure 5.8)

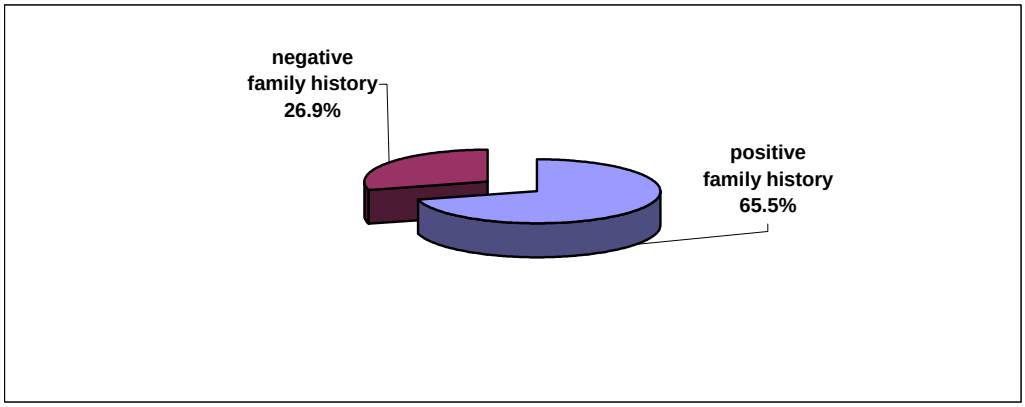

Figure 5.8: Distribution of study population by family history

In the study, 43,1% of the study population had hypertension, 39,3% were obese, 28,1% were suffering from dislepedimia and 11,3% had coronary artery diseases (see figure 5.9)

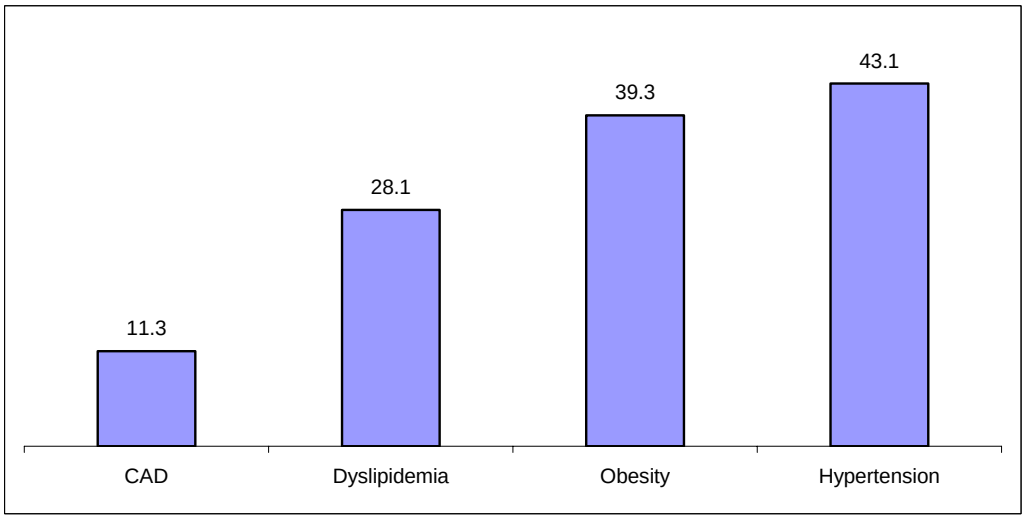

Figure 5.9: Distribution of study population by presence of diabetes risk factors

5.2.1.3 Follow up at personal level

The data extracted from patients medical files showed that 33,1% of study population had their fasting blood sugar test once in the last month, 17,6% did HbA1c test before three months, 81,6% of study population tested their lipid profile (cholesterol and triglyceride) once in the last year, kidney function test was done for 70,5% of study population, urine for Microalbumin was repeated for just 15,6% for the last year of study population, ophthalmologist's report was found in the 45,6% of files of study population for the last year and electrocardiogram (ECG) was done for 43,6% of study population at least once as base line (see figure 5.10)

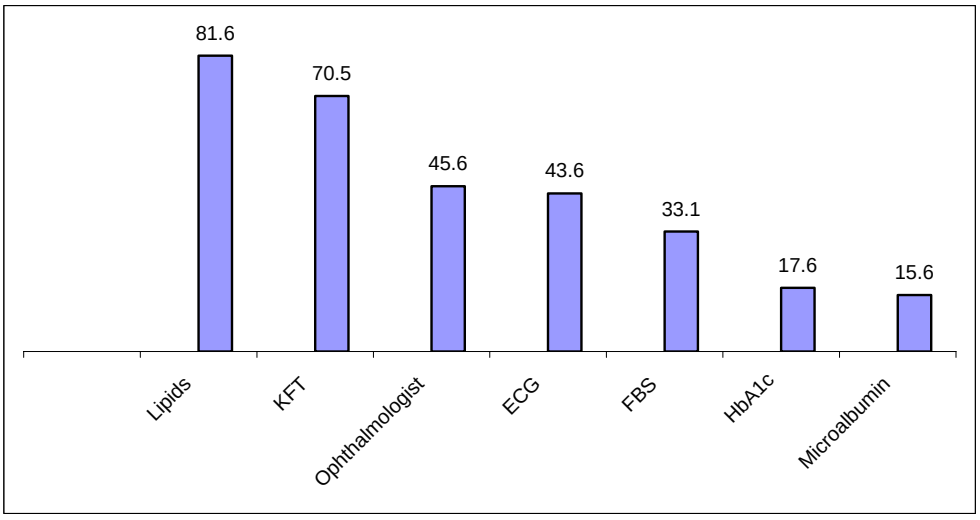

Figure 5.10: Distribution of study population by follow up criteria

5.2.1.4 Home monitoring

Of the study population, 38,8% have their own glucometer for follow up their blood sugar at home conditions (see figure 5.11)

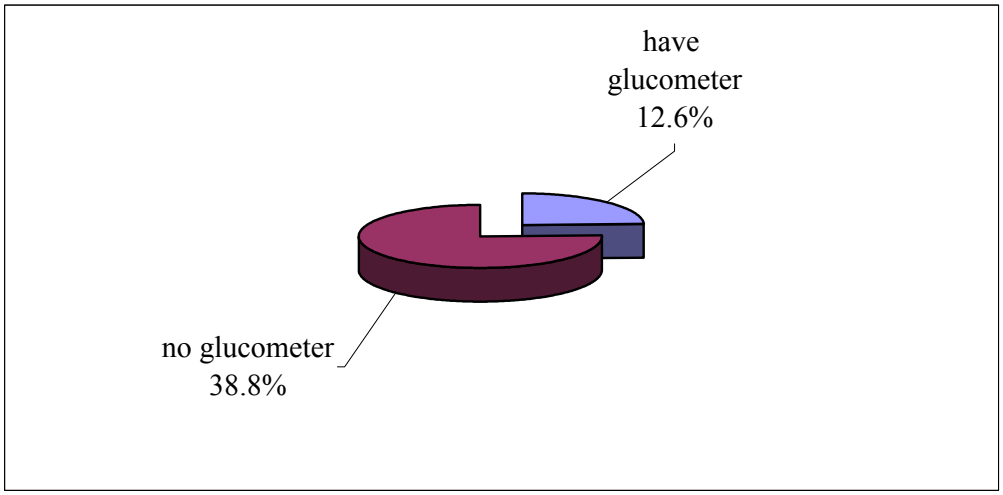

Figure 5.11: Distribution of study population by glucometer ownership

5.2.1.5 Medical regime

Two third of study population (61,4%) were treated by tablet, and just 3,3% by diet only (see figure 5.12)

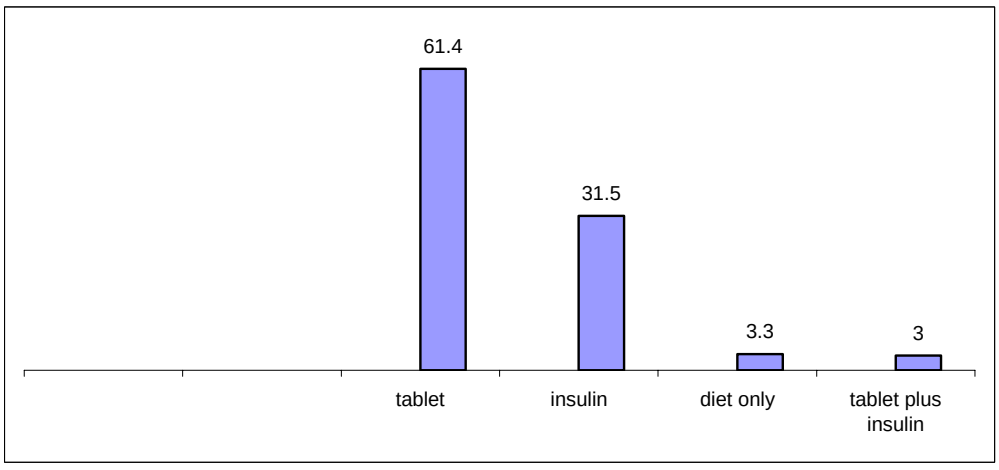

Figure 5.12: Distribution of study population by medical regime type

5.2.1.6 Presence of diabetes complications among study population

Of our study, more than the third of study population (38,4%) suffering from Neuropathy, retinopathy came in the second place with 26,8% of study population, erectile dysfunction was recorded for 0.1% only (see figure 5.13)

In our study we selected three complications (neuropathy, retinopathy and nephropathy) as indicators because of their high prevalence among study population.

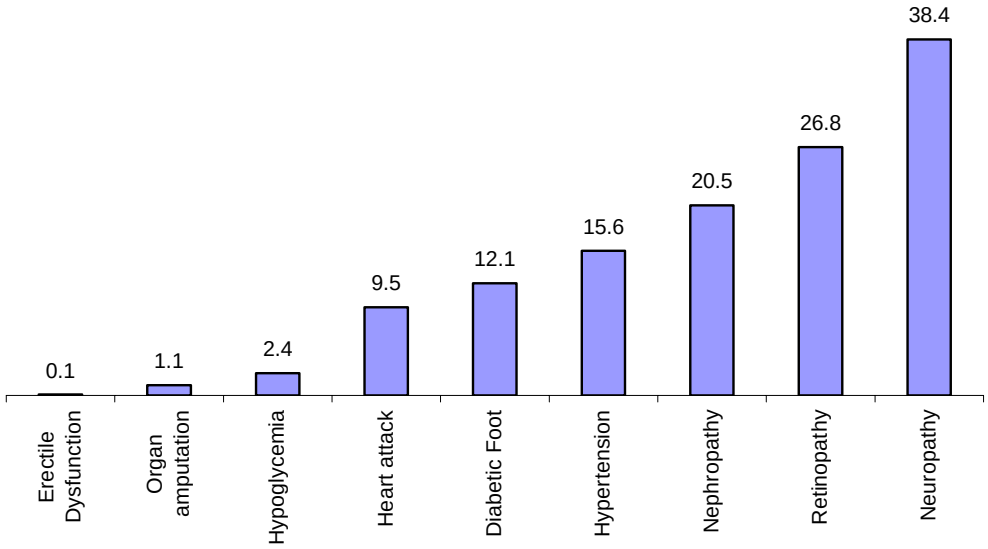

Figure 5.13: Distribution of study population by presence of complications

Of our study population 5.8% was registered in the medical center because of another chronic disease and during follow up of that disease the patient developed diabetes.

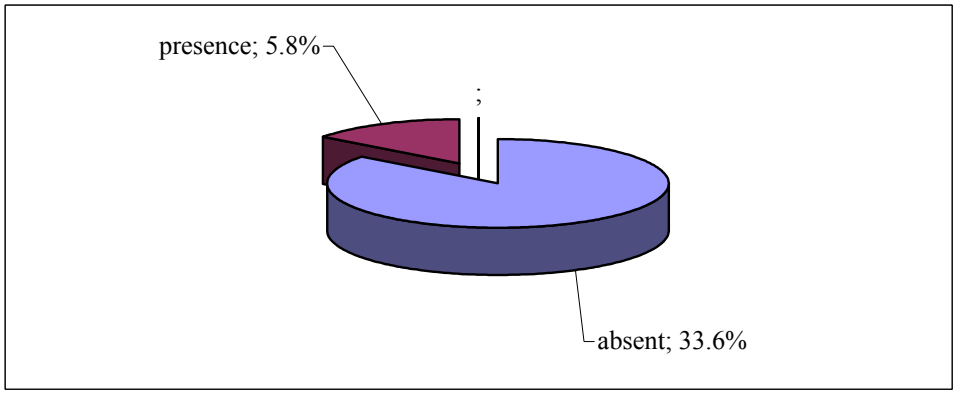

Figure 5.14: Distribution of study population by presence of previous chronic diseases

Section two:

5.2.2 Univariate analysis for patients' file data: Complications determinants

Of our study, more than the third of study population (38,4%) suffering from Neuropathy, retinopathy came in the second place with 26,8% of study population, erectile dysfunction was recorded for 0.1% only (see figure 5.13)

In our study we selected three complications (neuropathy (38.4%, retinopathy (26.8%) and nephropathy (20.5%)) as indicators because of their high prevalence among study population. The other complications like erectile dysfunction (0.01%), diabetic foot (12.5%), hypoglycemia (2.4%), heart attack (9.5%) and organ amputation with 1.1% prevalence.

5.2.2.1 Retinopathy as recorded in patients' file

A- Retinopathy and demographic factors

A significant difference was found between the frequency of retinopathy with the health provider institution, age category and educational level ($P < 0.05$, see table 5.1). No association was found between the presence of retinopathy with the job category (worker or not worker), gender, marital status and place of residency ($P > 0.05$, see table 5.1).

Table 5.1: The distribution of reported retinopathy with various demographic variables for 800 medical files in Jenin and Tubas district

Variable	Retinopathy No: 214 (26.8%)	No-retinopathy No:586 (73.3)	Total No: 800 (100%)	P value
Health provider				
MOH	168 (78.5%)	282 (48.1%)	450 (56.3%)	
UNRWA	29 (13.6%)	171 (29.2%)	200 (25.0%)	0.000
PMRS	17 (7.9%)	133 (22.7%)	150 (16.7%)	
Age				
20-39 years	4 (1.9%)	26 (4.5%)	30 (3.8%)	
40-59 years	70 (32.7%)	320 (54.8%)	390 (48.9%)	0.000
60-79 years	130 (60.7%)	224 (38.4%)	354 (44.4%)	
80-99 years	10 (4.7%)	14 (2.4%)	24 (3.0%)	
Job				
Worker	66 (34.9%)	152 (36.5%)	218 (36.0%)	0.7
Not worker	123 (65.1%)	265 (63.5%)	388 (64.0%)	
Gender				
Male	88 (41.1%)	202 (34.5%)	290 (36.3%)	0.083
Female	126 (58.9%)	384 (65.5%)	510 (63.8%)	
Marital status				
Single	5 (2.4%)	21 (3.7%)	26 (3.4%)	
Married	173 (82.0%)	482 (85.5%)	655 (84.5%)	0.26
Widow	32 (15.5%)	59 (10.5%)	91 (11.7%)	
Divorced	1 (0.5%)	2 (0.4%)	3 (0.4%)	
Educational level				
Alliterative	90 (42.7%)	185 (33.2%)	275 (35.8%)	
Elementary	69 (32.7%)	165 (29.6%)	234 (30.4%)	
Secondary	31 (14.7%)	103 (18.5%)	134 (17.4)	0.013
High School	12 (5.7%)	55 (9.9%)	67 (8.7%)	
Diploma	7 (3.3%)	26 (4.7%)	33 (4.3%)	
University	2 (0.9%)	24 (4.3%)	26 (3.4%)	
Residency				
Village	201 (93.9%)	549 (94.5%)	750 (94.3%)	
City	8 (3.7%)	21 (3.6%)	29 (3.6%)	0.921
Camp	5 (2.3%)	11 (1.9%)	16 (2.0%)	

B- Retinopathy and various follow up criteria

A significant difference was found between the frequency of retinopathy with lipid profile test (P <0.05, see table 5.2). No association was found between the presence of retinopathy with FBS, HbA1c, and ophthalmologist visit (P >0.05, see table 5.2)

Table 5.2: The distribution of reported retinopathy with various follow up criteria for 800 medical files in Tubas and Jenin districts

Variable	Retinopathy No: 214 (26.8%)	No-retinopathy No:586 (73.3)	Total No: 800 (100%)	P value
FBS				
Yes	65 (31.6%)	200 (34.7%)	265 (33.8%)	0.418
No	141 (68.4%)	377 (65.3%)	518 (66.2%)	
HbA1c				
Yes	37 (17.5%)	104 (17.8%)	141 (17.8%)	0.921
No	174 (82.5%)	479 (82.2%)	653 (82.2%)	
Lipid profile				
Yes	164 (77.4%)	489 (83.4%)	653 (81.8%)	0.049
No	48 (22.6%)	97 (16.6%)	145 (18.2%)	
Ophthalmologist				
Yes	109 (51.4%)	256 (43.9%)	365 (45.9%)	0.06
No	103 (48.6%)	327 (56.1%)	430 (54.1%)	

C- Retinopathy and diabetes family history and history of previous chronic diseases

Retinopathy was significantly associated with diabetes family history and previous coronary artery disease (P <0.05, see table 5.3). No significant association was found between retinopathy and previous dislepedimia, hypertension and obesity (P >0.05, see table 5.3)

Table 5.3: The distribution of reported retinopathy with diabetes family history and other diabetes risk factors for 800 medical files in Jenin and Tubas districts

Variable	Retinopathy No: 214 (26.8%)	No-retinopathy No:586 (73.3)	Total No: 800 (100%)	P value
Family history Positive Negative	157 (78.5%) 43 (21.5%)	367 (68.1%) 172 (31.9%)	524 (70.9%) 215 (29.1%)	0.006
Hypertension Yes No	86 (40.2%) 128 (59.8%)	259 (44.2%) 327 (55.8%)	345 (43.1%) 455 (56.9%)	0.311
Dislepedimia Yes No	54 (25.2%) 160 (74.8%)	171 (29.2%) 415 (70.8%)	225 (28.1%) 575 (71.9%)	0.272
CAD Yes No	38 (17.8%) 176 (82.2%)	52 (8.9%) 534 (91.1%)	90 (11.3%) 710 (88.8%)	0.000
Obesity Yes No	75 (35.0%) 139 (65.0%)	239 (40.8%) 347 (59.2%)	314 (39.3%) 486 (60.8%)	0.141

5.2.2.2. Nephropathy as recorded in patients' file

A- Nephropathy and demographic factors

A significant difference was found between nephropathy with the health provider institution, age category and gender (P <0.05, see table 5.4), but no association was found between the presence of nephropathy with the job category (worker or not worker), educational level, marital status and place of residency (P >0.05, see table 5.4).

Table 5.4: The distribution of reported nephropathy with various demographic factors

Variable	Nephropathy No: 164 (20.5%)	No-Nephropathy No:636 (79.5%)	Total No: 800 (100%)	P value
Health provider				
MOH	147 (89.6%)	303 (47.6%)	450 (56.3%)	
UNRWA	16 (9.8%)	184 (28.9%)	200 (25.0%)	
PMRS	1 (0.6%)	149 (23.4%)	150 (16.7%)	0.000
Age				
20-39 years	1 (0.6%)	29 (4.6%)	30 (3.8%)	
40-59 years	63 (38.4%)	327 (51.6%)	390 (48.9%)	0.000
60-79 years	97 (59.1%)	257 (40.5%)	354 (44.4%)	
80-99 years	3 (1.8%)	21 (3.3%)	24 (3.0%)	
Job				
Worker	58 (39.7%)	160 (34.8%)	218 (36.0%)	0.278
Not worker	88 (60.3%)	300 (65.2%)	388 (64.0%0	
Gender				
Male	77 (47.0%)	213 (33.5%)	290 (36.3%)	0.001
Female	87 (53.0%)	423 (66.5%)	510 (63.8%)	
Marital status				
Single	5 (3.1%)	21 (3.4%)	26 (3.4%)	
Married	136 (83.4%)	519 (84.8%)	655 (84.5%)	0.901
Widow	21 (12.9%0	70 (11.4%)	91 (11.7%)	
Divorced	1 (0.6%)	2 (0.3%)	3 (0.4%)	
Educational level				
Alliterative	54 (33.3%)	221 (36.4%0	275 (35.8%)	
Elementary	63 (38.9%)	171 (28.2%)	234 (30.4%)	
Secondary	26 (16.0%)	108 (17.8%)	134 (17.4%)	0.053
High School	11 (6.8%)	56 (9.2%)	67 (8.7%)	
Diploma	7 (4.3%)	26 (4.3%)	33 (4.3%)	
University	1 (0.6%)	25 (4.1%)	26 (3.4%)	
Residency				
Village	159 (97.5%)	591 (93.5%)	750 (94.3%)	
City	2 (1.2%)	27 (4.3%)	29 (3.6%)	0.126
Camp	2 (1.2%)	14 (2.2%)	16 (2.0%)	

B- Nephropathy and various follow up criteria

Table 5.5 present the association between nephropathy with various follow up criteria, a significant association was found with kidney function tests and urine for microalbumin test ($P < 0.05$).

Table 5.5: The distribution of reported nephropathy with various follow up criteria for 800 medical files in Jenin and Tubas district

Variable	Nephropathy No: 164 (20.5%)	No-Nephropathy No:636 (79.5%)	Total No: 800 (100%)	P value
FBS Yes No	49 (31.0%) 109 (69.0%)	216 (34.6%) 409 (65.4%)	265 (33.8%) 518 (66.2%)	0.400
HbA1c Yes No	32 (19.9%) 129 (80.1%)	109 (17.2%) 524 (82.8%)	141 (17.8%) 653 (82.2%)	0.431
Lipid profile Yes No	133 (81.6%) 30 (18.4%)	520 (81.9%) 115 (18.1%)	653 (81.8%) 145 (18.2%)	0.931
Kidney function Yes No	136 (83.4%) 27 (16.6%)	428 (67.4%) 207 (32.6%)	564 (70.7%) 234 (29.3%)	0.000
Microalbumin Yes No	42 (26.1%) 119 (73.9%)	83 (13.2%) 548 (86.8%)	125 (15.8%) 667 (84.2%)	0.000

C- Nephropathy and diabetes family history and history of previous chronic diseases

Table 5.6 provide us with significant association between nephropathy and family history of diabetes and previous hypertension (P <0.05)

Table 5.6: The distribution of reported nephropathy with diabetes family history and other diabetes risk factors for 800 medical files in Jenin and Tubas districts

Variable	Nephropathy No: 164 (20.5%)	No-Nephropathy No:636 (79.5%)	Total No: 800 (100%)	P value
Family history Positive Negative	224 (75.4%) 73 (24.6%)	300 (67.9%) 142 (32.1%)	524 (70.9%) 215 (29.1%)	0.124
Hypertension Yes No	110 (35.8%) 197 (64.2%)	235 (47.7%) 258 (52.3%)	345 (43.1%) 455 (56.9%)	0.123
Dislepedimia Yes No	77 (25.1%) 230 (74.9%)	148 (30.0%) 345 (70.0%)	225 (28.1%) 575 (71.9%)	0.049
CAD Yes No	42 (13.7%) 265 (86.3%)	48 (9.7%) 445 (90.3%)	90 (11.3%) 710 (88.8%)	0.008
Obesity Yes No	98 (31.9%) 209 (68.1%)	216 (43.8%) 277 (56.2%)	314 (39.3%) 486 (60.8%)	0.133

5.2.2.3 Neuropathy as recorded in patients' file

A-Neuropathy and demographic factors

Table 5.7 presents the association between neuropathy with various demographic variables, however, a significant association was found with health provider institution, age category and gender (P <0.05).

Table 5.7: The distribution of reported neuropathy with various demographic variables or 800 medical files in Jenin and Tubas districts

Variable	Neuropathy No: 307 (38.4%)	No-Neuropathy No:493 (61.6%)	Total No: 800 (100%)	P value
Health provider MOH UNRWA PMRS	269 (87.6%) 30 (9.8%) 8 (2.6%)	181 (36.7%) 170 (34.5%) 142 (28.8%)	450 (56.3%) 200 (25.0%) 150 (18.7%)	0.000
Age 20-39 years 40-59 years 60-79 years 80-99 years	5 (1.6%) 129 (42.0%) 167 (54.4%) 6 (2.0%)	5 (1.6%) 129 (42.0%) 167 (54.4%) 6 (2.0%)	30 (3.8%) 390 (48.9%) 354 (44.4%) 24 (3.0%)	0.000
Job Worker Not worker	108 (38.7%) 171 (61.3%)	110 (33.6%) 217 (66.4%)	218 (36.0%) 388 (64.0%)	0.195
Gender Male Female	126 (41.0%) 181 (59.0%)	126 (41.0%) 181 (59.0%)	290 (36.3%) 510 (63.8%)	0.026
Marital status Single Married Widow Divorced	11 (3.6%) 254 (83.3%) 39 (12.8%) 1 (0.3%)	15 (3.2%) 401 (85.3%) 52 (11.1%) 2 (0.4%)	26 (3.4%) 655 (84.5%) 91 (11.7%) 3 (0.4%)	0.873
Educational level Alliterative Elementary Secondary High School Diploma University	108 (35.9%) 103 (34.2%) 47 (15.6%) 24 (8.0%) 14 (4.7%) 5 (1.7%)	167 (35.7%) 131 (28.0%) 87 (18.6%) 43 (9.2%) 19 (4.1%) 21 (4.5%)	275 (35.8%) 234 (30.4%) 134 (17.4%) 67 (8.7%) 33 (4.3%) 26 (3.4%)	0.153
Residency Village City Camp	291 (95.1%) 9 (2.9%) 6 (2.0%)	459 (93.9%) 20 (4.1%) 10 (2.0%)	750 (94.3%) 29 (3.6%) 16 (2.0%)	0.698

B-Neuropathy and various follow up criteria

Neuropathy was significantly associated with FBS, HbA1c and ECG, while, no significant association only with lipid profile testing (P >0.05, see table 5.8).

Table 5.8: The distribution of reported neuropathy with various follow up criteria for 800 medical files in Jenin and Tubas district

Variable	Neuropathy No: 307 (38.4%)	No-Neuropathy No:493 (61.6%)	Total No: 800 (100%)	P value
FBS				
Yes	85 (28.6%)	180 (37.0%)	265 (33.8%)	0.016
No	212 (71.4%)	306 (63.0%)	518 (66.2%)	
HbA1c				
Yes	67 (22.1%)	74 (15.1%)	141 (17.8%)	0.012
No	236 (77.9%)	417 (84.9%)	653 (82.2%)	
Lipid profile				
Yes	244 (80.0%)	409 (83.0%)	653 (81.8%)	0.292
No	61 (20.0%)	84 (17.0%)	145 (18.2%)	
ECG				
Yes	218 (72.7%)	131 (26.7%)	349 (44.2%)	0.000
No	82 (27.3%)	359 (73.3%)	441 (55.8%)	

C-Neuropathy and diabetes family history and history of previous chronic diseases

A significant difference was found between the frequency of neuropathy and family history of diabetes, hypertension and obesity (P <0.05. No significant association was found with dislepedimia and previous coronary artery disease (P >0.05 see table 5.9)

Table 5.9: The distribution of reported neuropathy with diabetes family history and other diabetes risk factors for 800 medical files in Jenin and Tubas districts

Variable	Neuropathy No: 307 (38.4%)	No-Neuropathy No:493 (61.6%)	Total No: 800 (100%)	P value
Family history Positive Negative	224 (75.4%) 73 (24.6%)	300 (67.9%) 142 (32.1%)	524 (70.9% 215 (29.1%)	0.027
Hypertension Yes No	110 (35.8%) 197 (64.2%)	235 (47.7%) 258 (52.3%)	345 (43.1%) 455 (56.9%)	0.001
Dislepedimia Yes No	77 (25.1%) 230 (74.9%)	148 (30.0%) 345 (70.0%)	225 (28.1%) 575 (71.9%)	0.131
CAD Yes No	42 (13.7%) 265 (86.3%)	48 (9.7%) 445 (90.3%)	90 (11.3%) 710 (88.8%)	0.086
Obesity Yes No	98 (31.9%) 209 (68.1%)	216 (43.8%) 277 (56.2%)	314 (39.3%) 486 (60.8%)	0.001

5.2.3 Section three: Patients' file: Multivariate analysis:

5.2.3.1. Retinopathy

From the regression analysis, we can see that there is an increased estimated risk to develop retinopathy among patients attending the MOH(5 folds) compared to those attending the PMRS clinics. The risk to develop retinopathy also increased by the age (3.5 folds) within those patients between 80-99 years compared to those between 20-39. Those patients who have a previous history of coronary artery disease, have a double risk to develop retinopathy. For those patients that did not check their lipid profile yearly, they also have an increase estimated risk (1.7 folds) compared to those who regularly check their serum lipids. Higher educational level is a preventive factor for retinopathy.

Table 5.10: Logistic regression analysis for retinopathy.

Variable	Retinopathy-yes	AOR	CI	P value
Health provider				
MOH	168 (78.5%)	1.00	1.00	
UNRWA	29 (13.6%)	0.284	0.174 - 0.463	0.000
PMRS	17 (7.9%)	0.196	0.106 - 0.362	
Age				
20-39	4 (1.9%)	1.00	1.00	
40-59	70 (32.7%)	0.987	0.308 - 3.157	0.000
60-79	130 (60.7%)	2.263	0.692 - 7.397	
80-99	10 (4.7%)	3.556	0.826 - 15.310	
Educational level				
Alliterative	0 (42.7%)	1.00	1.00	
Elementary	69 (32.7%)	1.019	0.653 - 1.590	
Secondary	31 (14.7%)	0.864	0.491 - 1.518	0.013
High School	12 (5.7%)	0.653	0.304 - 1.402	
Diploma	7 (3.3%)	0.874	0.334 - 2.290	
University	2 (0.9%)	0.231	0.051 - 1.049	
Lipid profile				
Yes	164 (77.4%)	1.00	1.00	
No	48 (22.6%)	1.759	1.106 - 2.797	0.049
CAD				
Yes	38 (17.8%)	2.152	1.252 - 3.700	0.000
No	176 (82.2%)	1.00	1.00	
Ophthalmologist visit				
Yes	109 (51.4%)	1.00	1.00	
No	103 (48.6%)	0.641	0.431 - 0.954	0.06

5.2.3.2. Nephropathy

From the regression analysis, we can see that there is an increased estimated risk to develop nephropathy among patients attending the MOH(61 folds) compared to those attending the PMRS clinics. The risk to develop nephropathy also increased by the age (15 folds) within those patients between 60-79 years compared to those between 20-39. Males have an a higher risk than females to develop nephropathy (1.6 folds).Those patients who have a previous history of coronary artery disease, have a double risk to develop nephropathy. Patients who regularly perform serum creatinin and urine for microalbumin have a greater chance to be early diagnosed with nephropathy.

Table 5.11: Logistic regression analysis for nephropathy.

Variable	Nephropathy-yes	AOR	CI	P value
Health provider				
MOH	147 (89.6%)	1.00	1.00	0.000
UNRWA	16 (9.8%)	0.201	0.113 - 0.358	
PMRS	1 (0.6%)	0.016	0.002 - 0.122	
Age				
20-39	1 (0.6%)	1.00	1.00	0.000
40-59	63 (38.4%)	7.535	0.972 - 58.428	
60-79	97 (59.1%)	15.356	1.971 - 119.656	
80-99	3 (1.8%)	7.757	0.694 - 86.733	
Gender				
Male	77 (47.0%)	1.629	1.101 – 2.412	0.001
Female	87 (53.0%)	1.00	1.00	
KFT				
Yes	136 (83.4%)	1.00	1.00	0.000
No	27 (16.6%)	0.771	0.452 - 1.314	
Microalbumin				
Yes	42 (26.1%)	1.00	1.00	0.000
No	119 (73.9%)	0.636	0.393 - 1.031	
Dislepedimia				
Yes	36 (22.0%)	0.872	0.541 - 1.404	0.049
No	128 (78.0%)	1.00	1.00	
CAD	28 (17.1%)			
Yes	136 (82.9%)	1.953	1.057 - 3.611	0.008
No		1.00	1.00	

5.2.3.3. Neuropathy

From the regression analysis, we can see that there is an increased estimated risk to develop neuropathy among patients attending the MOH(17 folds) compared to those attending the PMRS clinics. The risk to develop neuropathy also increased by the age (5 folds) within those patients between 60-79 years compared to those between 20-39. Males are at higher risk to develop neuropathy. Checking hemoglobin A1c regularly each three months has no effect in developing retinopathy. The risk to develop retinopathy was slightly affected by previous history of hypertension. Regular FBS and HbA1c testing help in early diagnosis of neuropathy.

Table 5.12: Logistic regression analysis for neuropathy.

Variable	Neuropathy- yes	AOR	CI	P value
Health provider				
MOH	269 (87.6%)	1.00	1.00	0.000
UNRWA	30 (9.8%)	0.218	0.121 - 0.394	
PMRS	8 (2.6%)	0.058	0.026 - 0.126	
Age				
20-39	5 (1.6%)	1.00	1.00	
40-59	129 (42.0%)	3.065	1.016 - 9.250	0.000
60-79	167 (54.4%)	5.889	1.924 - 18.026	
80-99	6 (2.0%)	2.254	0.468 - 10.861	
Gender				
Male	126 (41.0%)	1.178	0.807 - 1.720	0.026
Female	181 (59.0%)	1.00	1.00	
FBS				
Yes	85 (28.6%)	1.00	1.00	
No	212 (71.4%)	0.766	0.491 - 1.195	0.016
HbA1c				
Yes	67 (22.1%)	1.00	1.00	0.012
No	236 (77.9%)	0.976	0.602 - 1.584	
ECG				
Yes	218 (72.7%)	1.00	1.00	0.000
No	82 (27.3%)	0.312	0.209 - 0.465	
HTN				
Yes	110 (35.8%)	1.090	0.734 - 1.619	0.001
No	197 (64.2%)	1.00	1.00	
Obesity				
Yes	98 (31.9%)	0.607	0.408 - 0.903	0.001
No	209 (68.1%)	1.00	1.00	

5.3 Part 2 results: Physicians data

The first part of physicians' results presents the physicians' demographic characteristics, as reported by physicians themselves in the self administered questionnaire. The second part shows various aspects of health care system for the management of diabetes. The third part presents physicians compliance with diabetes guidelines.

5.3.1 Physicians' Demographic characteristics

The response rate of physicians was 97,8% (n=13). The total number of physicians in both districts who were registered at the medical association was 230 physicians with various types of specialties. From those 230 physicians, just 156 physicians were included in our study, i.e. general practitioners, internists, Endocrinologists, diabeticians, gynecologists, Nephrologists and Neurologists. Four physicians from 156 were not working as physicians (managers, teacher assistants), two physicians had no diabetic patients in their clinics, and eight physicians were out of country at the time of research.

Total No. of registered physicians	**eligible physicians**	**Not eligible physicians**	**Respondents physicians**	**Not respondents physicians**
230	142	14	139 (97,8%)	3 (2,2 %)

In the study, 82.7% of physicians were males (see figure 5.15). The mean age of the physicians was 42.8± 10.6 years(mean± S.D) (see figure 5.16). Of the study population, 40.2% graduated from Soviet Union Republics, followed by the universities presented in the various Arab countries (see figure 5.17). Two third of physicians in our study were general practitioners (GPs) (see figure 5.18). Of the study physicians 36.7% were working at the Primary Health Care Departments of the Ministry of Health (MOH) (see figure 5.19). Also, 46.7% had secondary job at private clinics, but 35.3% have no secondary job (see figure 5.20).

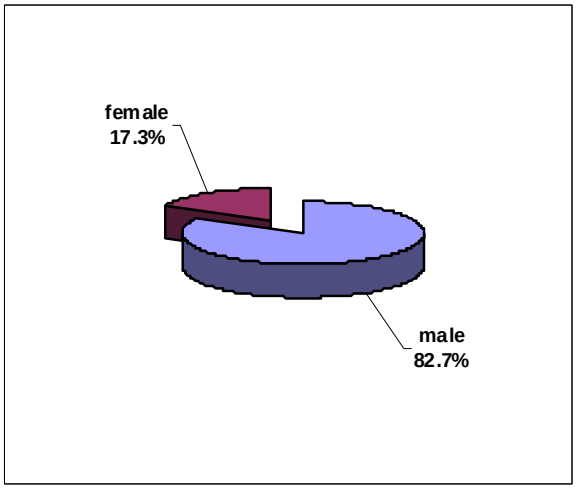

Figure 5.15 Distribution of physicians by gender

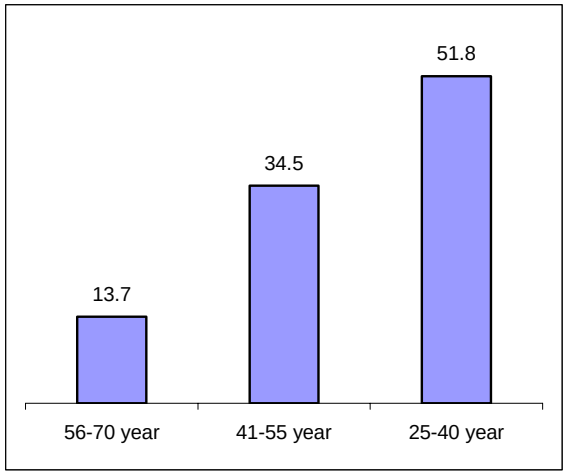

Figure 5.16 Distribution of physicians by age group

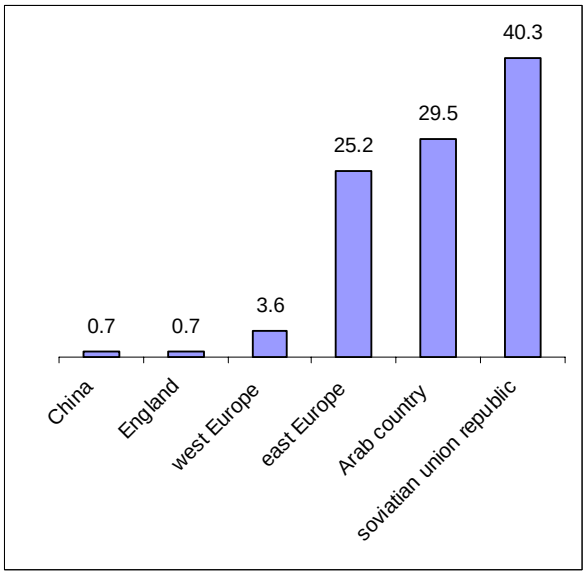

Figure 5.17 Distribution of physicians by country of graduation

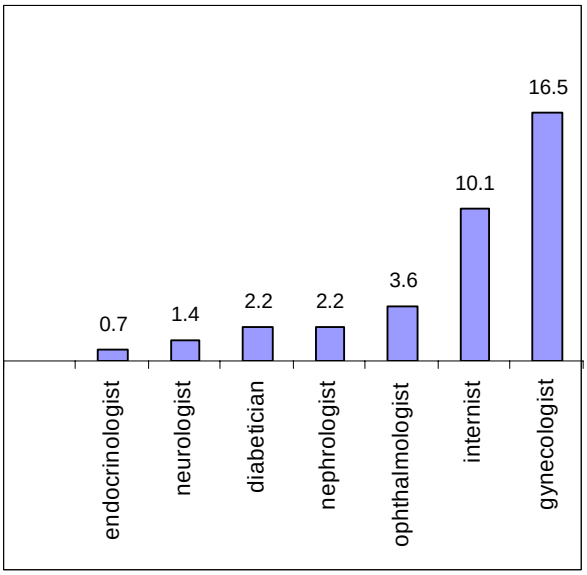

Figure 5.18 Distribution of physicians by type of specialty

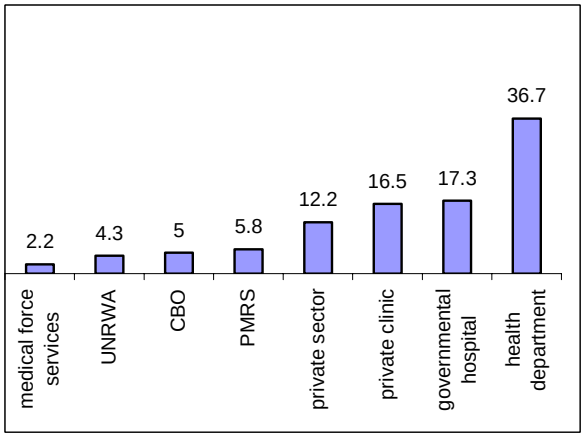

Figure 5.19: Distribution of physicians by their essential job

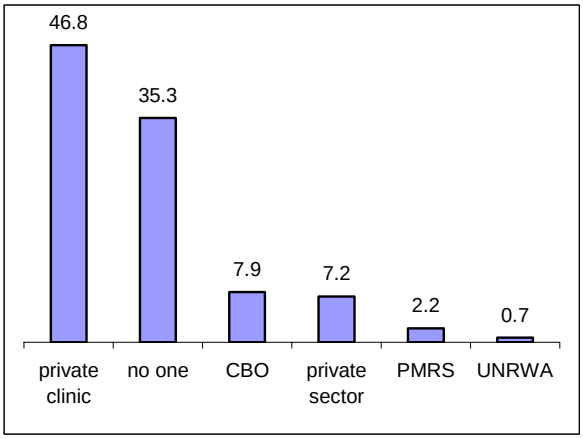

Figure 5.20: Distribution of physicians by place of their secondary job

5.3.2 Compliance of physicians with type 2 diabetes guidelines

1- Home monitoring and HbA1c testing

Of study population 82% of physicians recommend their patients for glucose home monitoring (see figure 5.21).

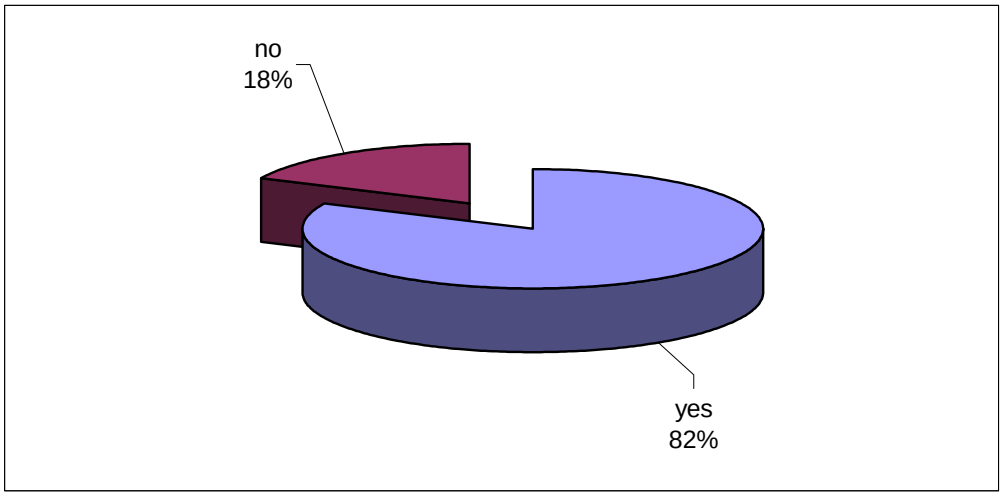

Figure 5.21: Recommend type 2 diabetics for glucose home monitoring

Of the physicians, 28.8% recommend patients to check it once weekly (see figure 5.22).

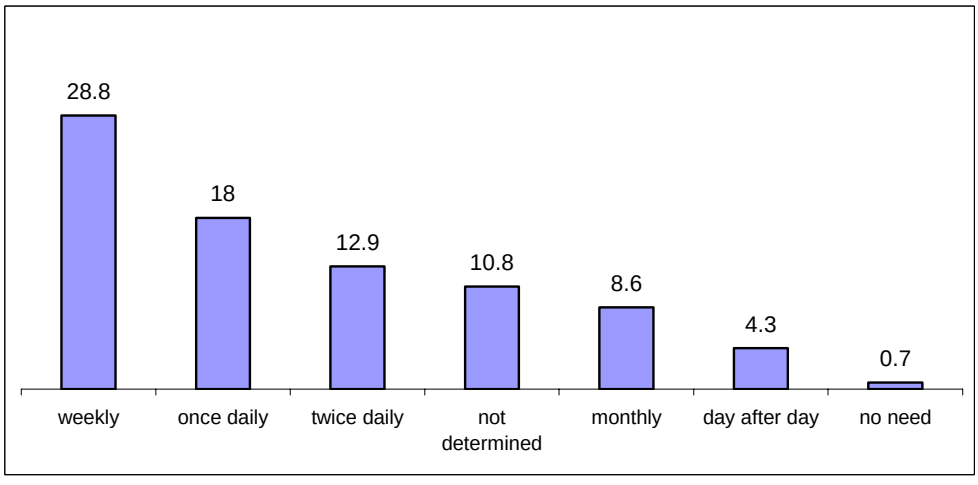

Figure 5.22: How often physicians recommend patients to check their blood sugar at home

From our study population 94.2% were familiar with a test called a glycosylated hemoglobin or a hemoglobin A1C (see figure 5.23).

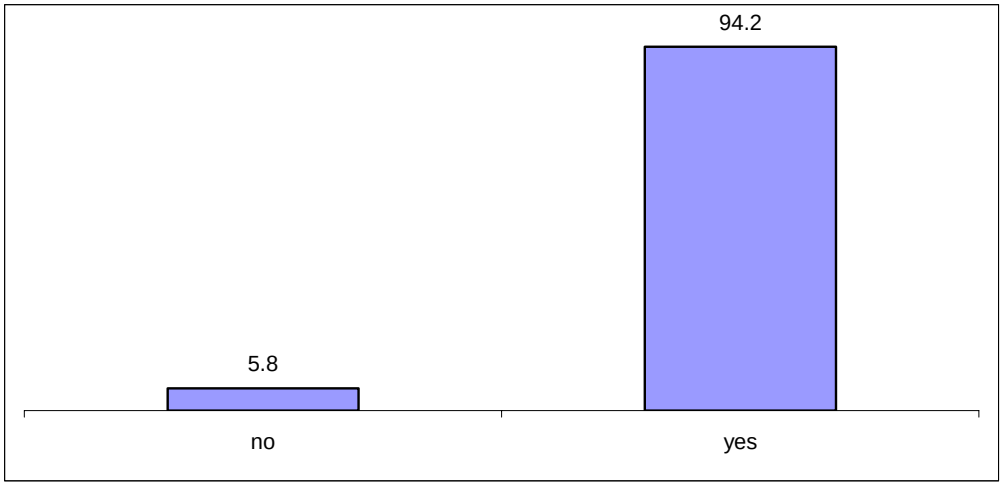

Figure 5.23: Familiar physicians with a test called hemoglobin A1C

61.2% of our study population routinely use HbA1c test to help them manage their diabetics (see figure 5.24).

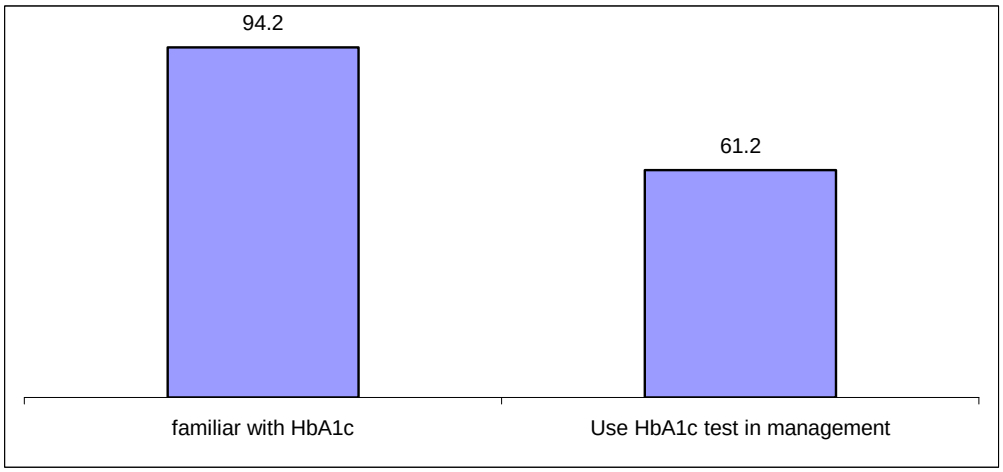

Figure 5.24: Use HbA1c test for managing type 2 diabetes patients

A 35.3% of physicians recommend their patient to repeat HbA1c quarterly (see figure 5.25).

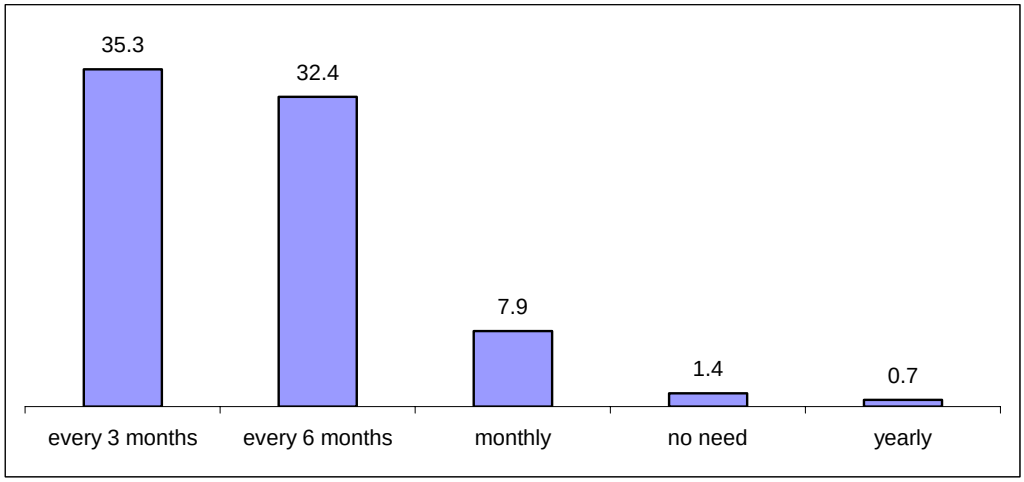

Figure 5.25: How often physicians recommend their diabetics to repeat HbA1c test

10.8% of physicians are not use HbA1c test due to the high cost of the test and 10.2% found it unnecessary for type 2 diabetes patients management (see figure 5.26).

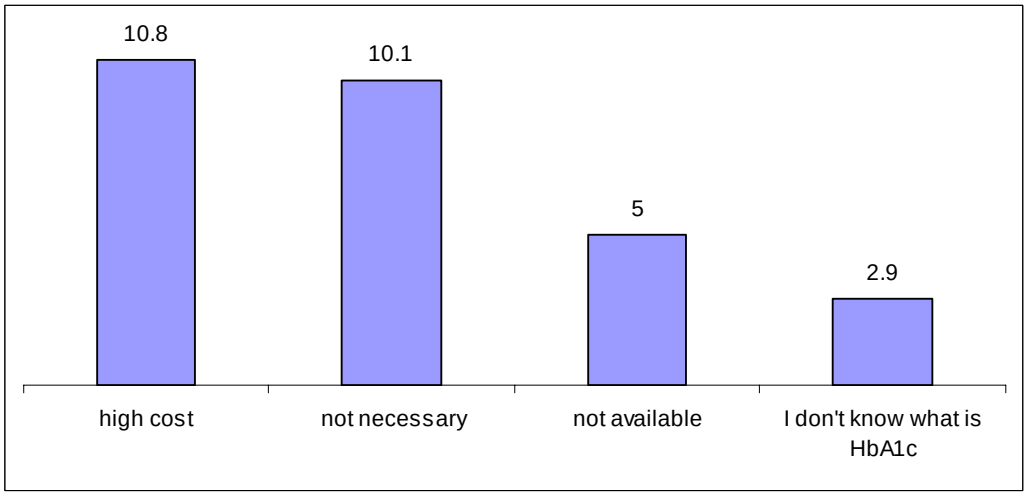

Figure 5.26: causes of not using HbA1c test for patients management

2-Ophthalmologist visit

In the study, 86.3% of study population recommended routine ophthalmologic examination for their diabetic patients (see figure 5.27).

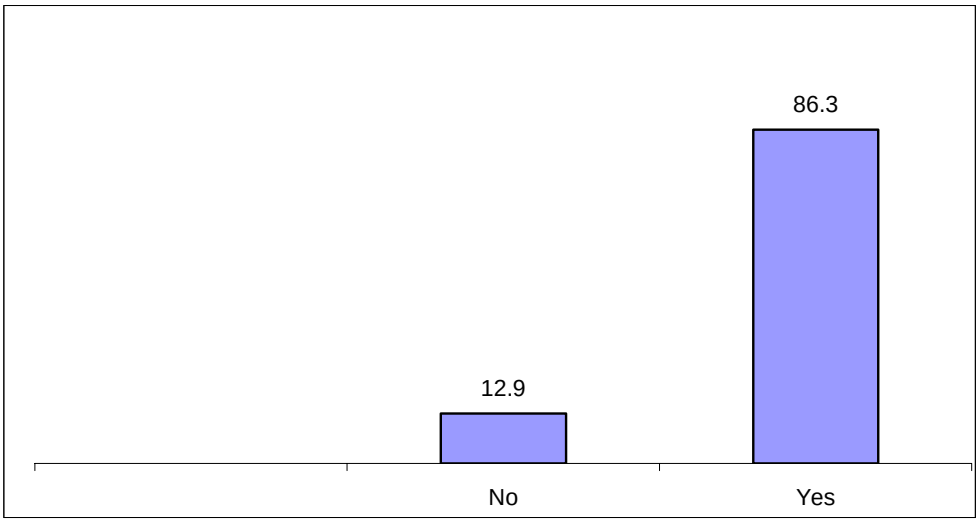

Figure 5.27: Physicians recommend routine ophthalmologic examination for diabetic patients

49.6% of physicians recommend routine ophthalmologic examination every six months (see figure 5.28).

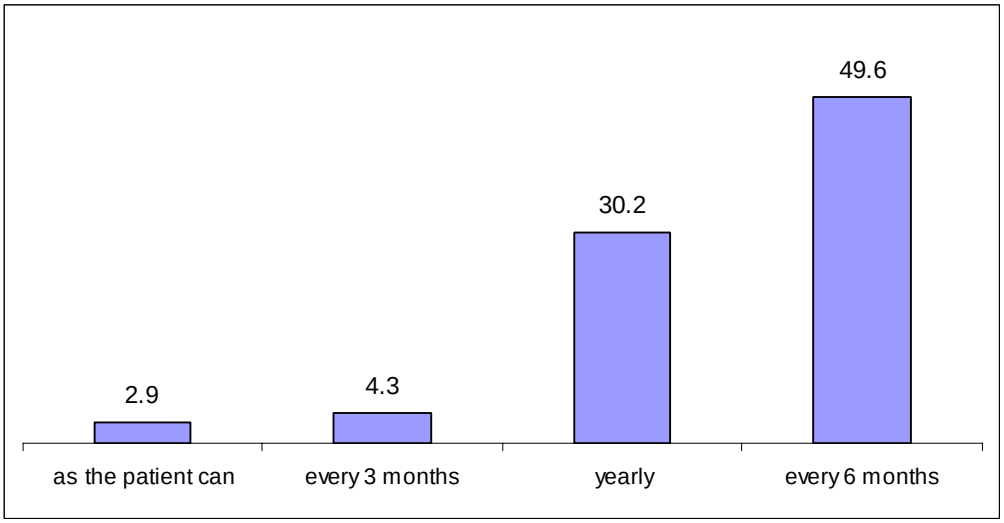

Figure 5.28: how often physicians recommend ophthalmologic examination for their diabetic patients

A 77% from those physicians receive a report from an ophthalmologist. 25.9% have phondoscope at their work place, and more than two third of physicians believe that they need training in using phondoscope (see figure 5.29

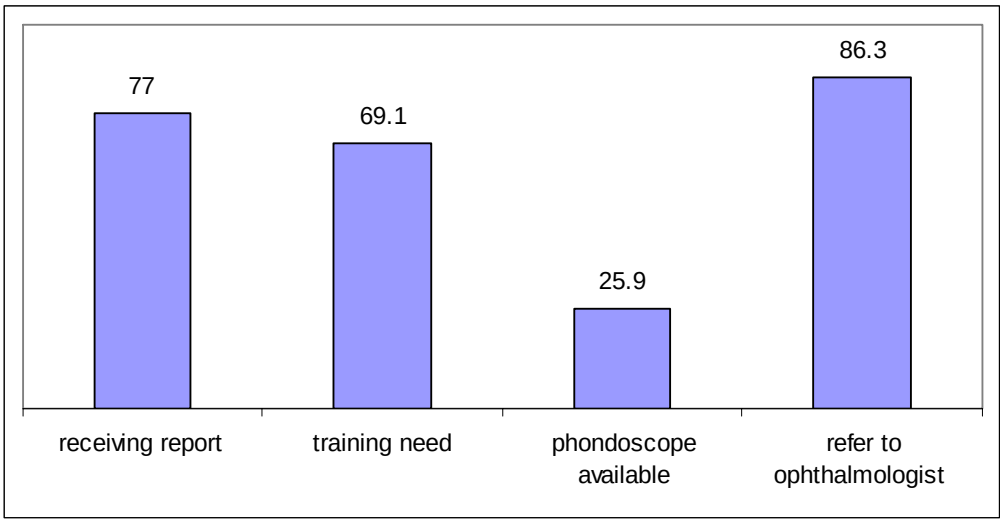

Figure 5.29: Availability of phondoscope in the work place and physician's training need

3- Diabetes patients follow up

Of the study population 45.3% repeat fasting blood sugar (FBS) once monthly. Of physicians 23.7% perform electrocardiography in yearly basis (see figure 5.30)

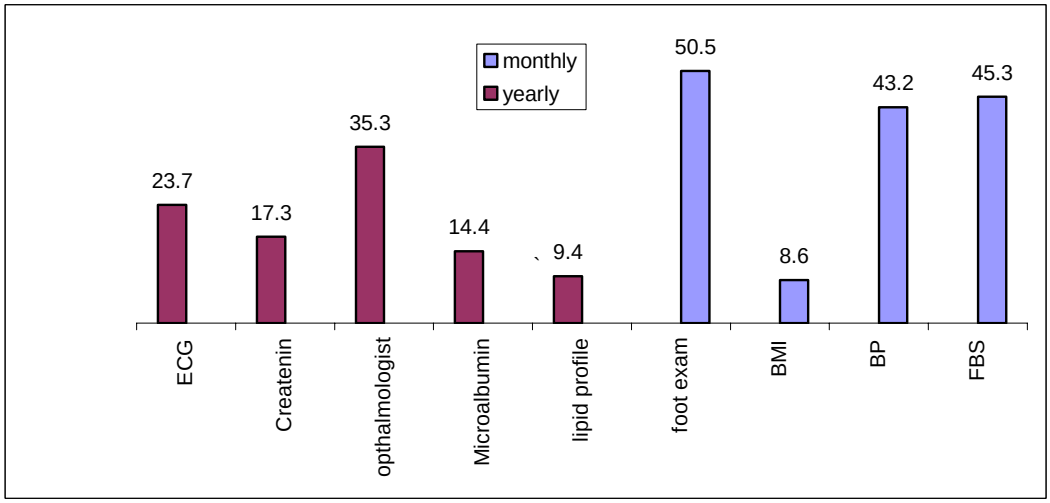

Figure 5.31: How often physicians repeat diagnostic studies for healthy type 2 diabetics

4-Endocinologist's consult

In our study 44.6% of study population refer their type 2 diabetes patients to be seen by endocrinologist (see figure 5.32).

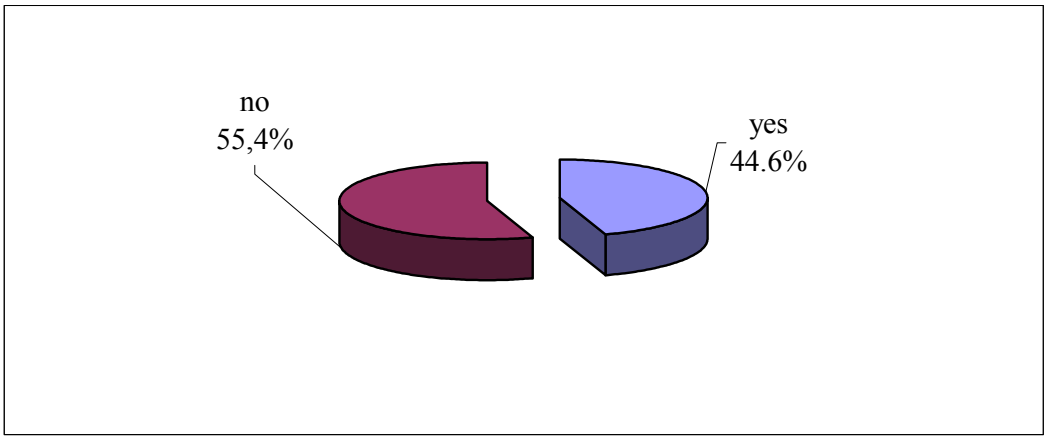

Figure 5.32: percentage of physicians who refer patients to endocrinologist

21.6% of physicians said that the endocrinologist consult is not needed (see figure 5.33).

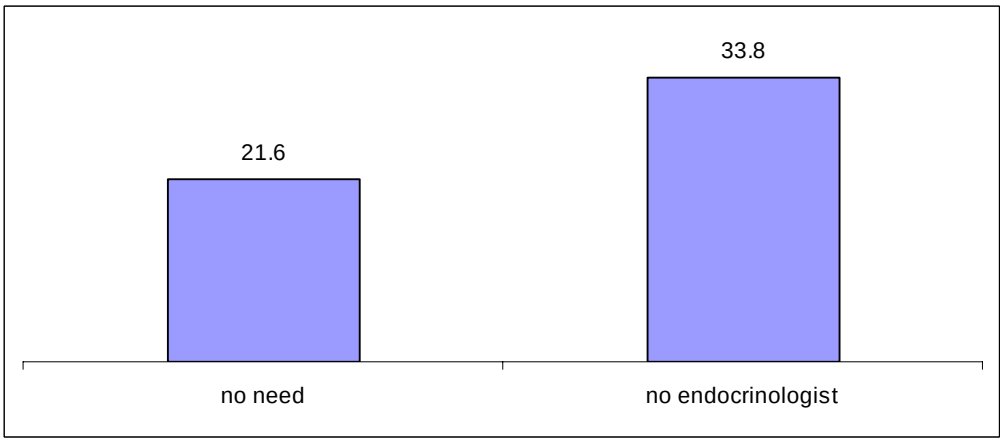

Figure 5.33: Why physicians do not refer patients to endocrinologist

Of the study population 84.9% said that the endocrinologist is available in another district (see figure 5.34).

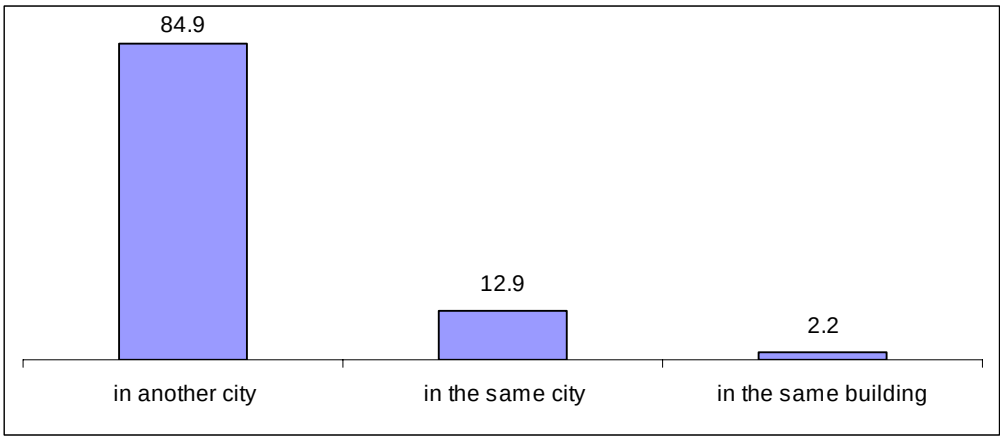

Figure 5.34: The distance between physicians and endocrinologist

40.3% of physicians in our study can use phone consultation with an endocrinologist (see figure 5.35)

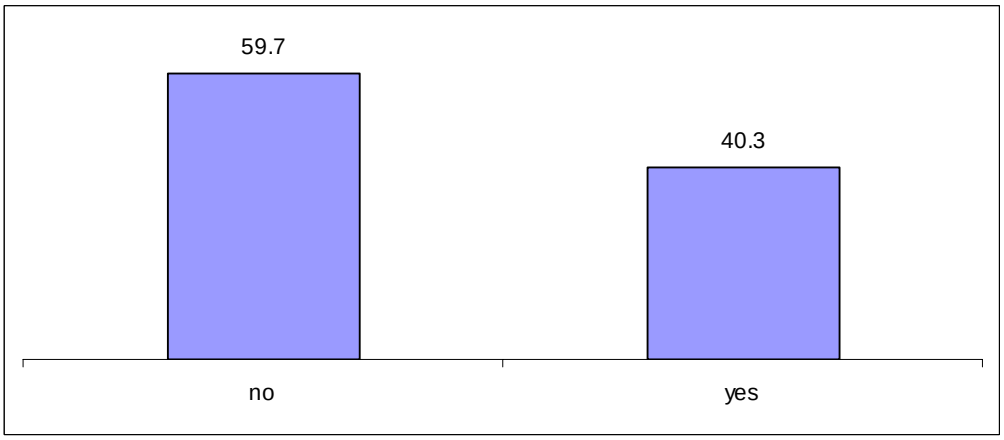

Figure 5.35: Physicians ability to use phone consultation with an endocrinologist

5-Availability of various specialists in the work place

3.6% of physicians have endocrinologist in their work place, 34.5% of study population have nutritionist in their work place (see figure 5.36).

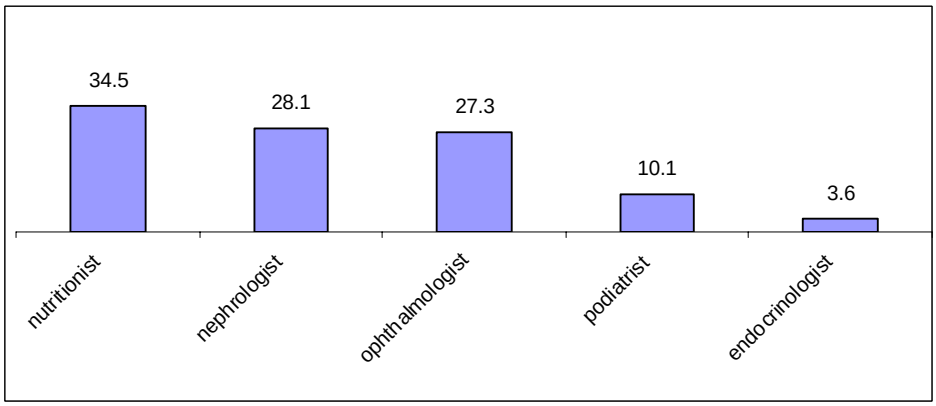

Figure 5.36: Availability of specialists in the work place

Of our study population 74.1% have brushers and posters about diabetes in their work place, 30.9% of physicians conducted group health education for diabetic patients in their work place (see figure 5.37).

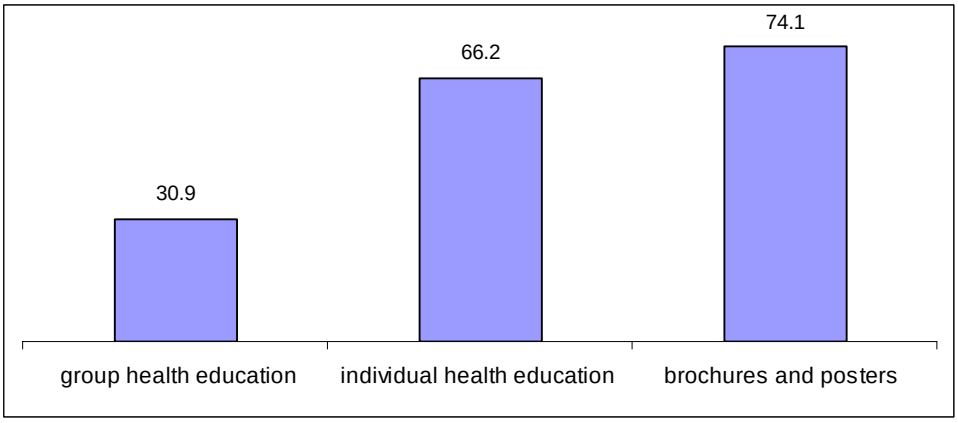

Figure 5.37: Availability of health Education tools in the work place

6-Appointment system

Of our study population 18% believe that an otherwise healthy diabetic should be seen for his/her diabetes by his/her physician once per month (see figure 5.38).

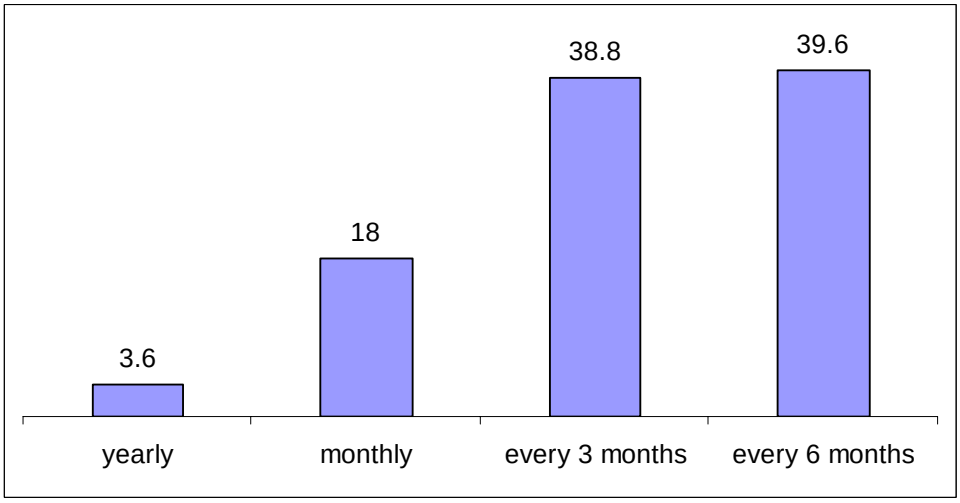

Figure 5.38: How often an otherwise healthy diabetic should be seen for his/her diabetes by his/her physician

83.5% of physicians said that their diabetic patients can call them for counseling in any time (see figure 5.39).

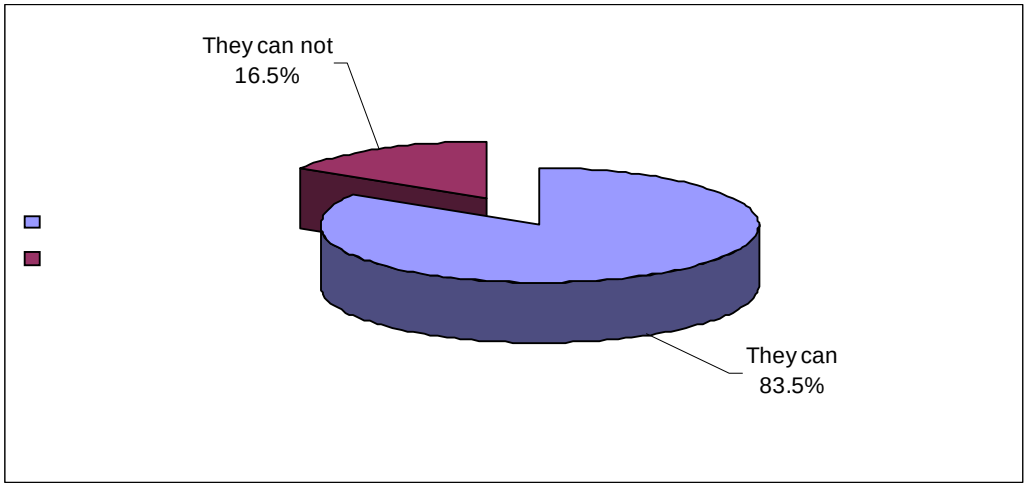

Figure 5.39: patients can call physicians for counseling in any time

7- Physical exam during diabetes clinic visit

Of our study population, 71.9% required results of blood glucose at home, 18% perform phundus exam (see figure 5.40)

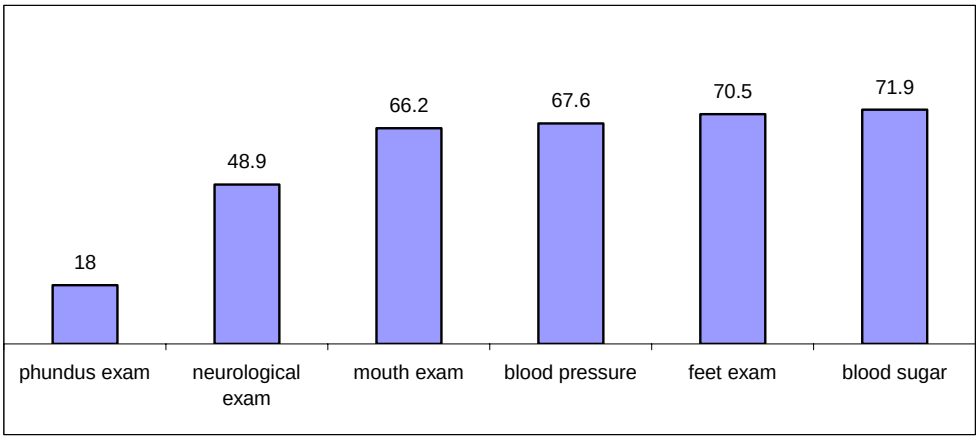

Figure 5.40: Physical exam during clinic visit

8- Physical exam in gynecological clinic

Of 23 gynecologists, 16.5% required results of blood glucose at home and 1.4% perform phundus exam (see figure 5.41)

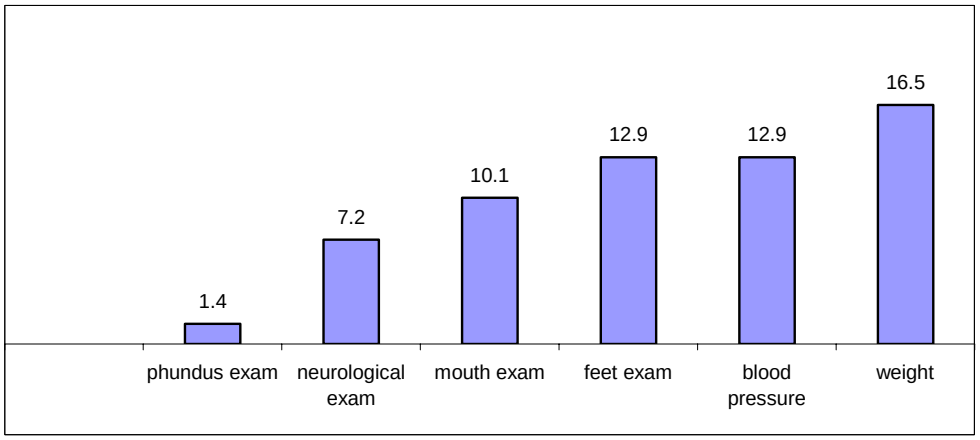

Figure 5.41: Patients physical exam in gynecological clinic

Of 23 gynecologists, 21 (91.3%) refer their diabetic patients to diabetician before giving any medication (see figure 5.42)

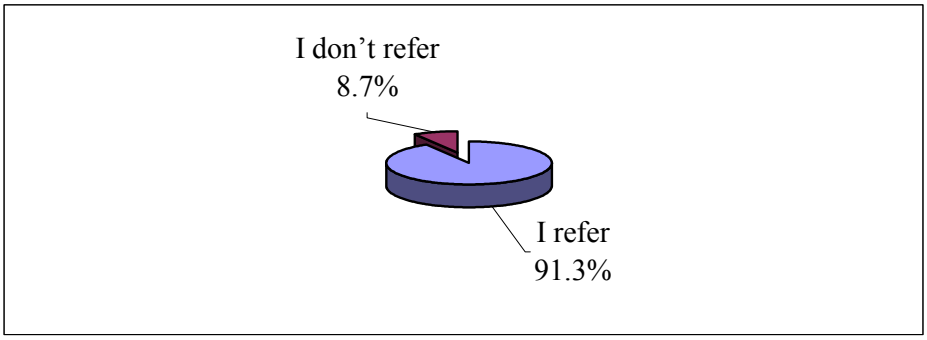

Figure 5.42: Referring patients before giving any medication by Gynecologists

9- Familiarity with guidelines

Of the study population 40.3% of physicians are familiar with a guidelines for management of type 2 diabetic patients, 20.9% of physicians have a copy of the guidelines in the work place and 25.2% of physicians said undergo special training to use the guidelines (see figure 5.43).

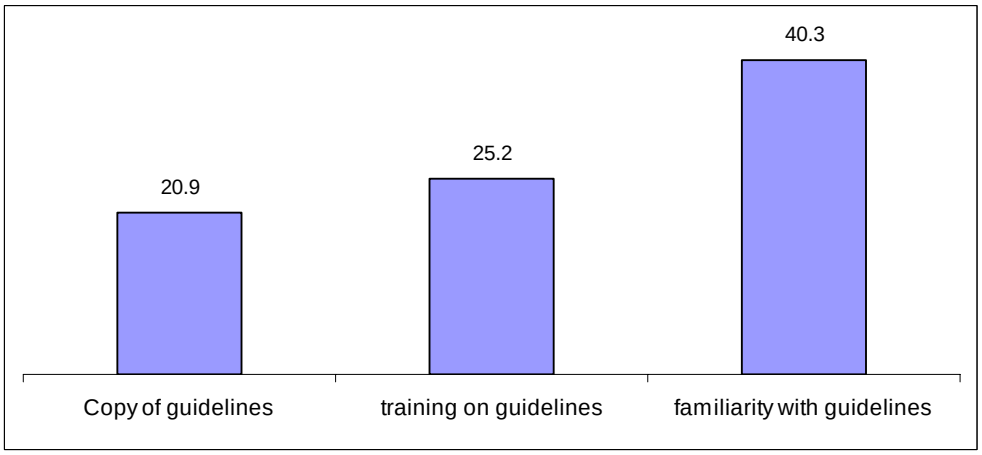

Figure 5.43: Familiarity of physicians about diabetes management guidelines

In the study 24.5% of physicians were never adhere these guidelines in diabetes management (see figure 5.44).

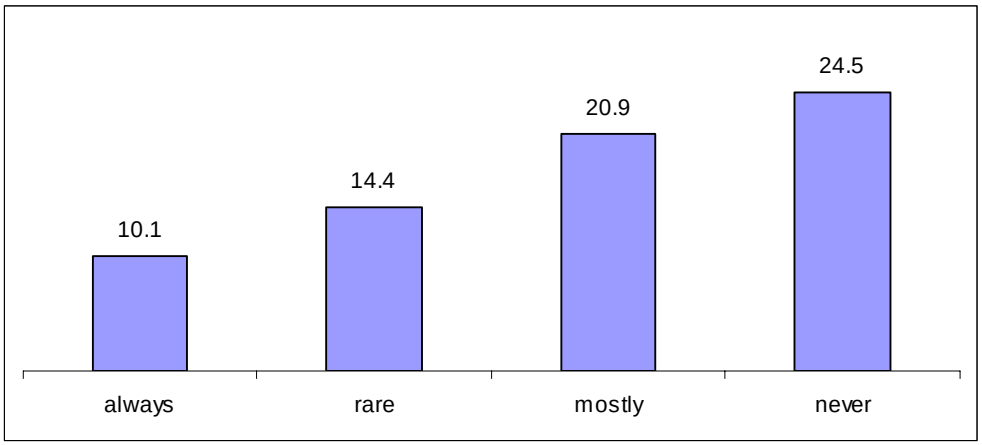

Figure 5.44: Adherence of physicians for diabetes management guidelines

7.9% of physicians assessed the guidelines as widely applicable in the work place (see figure 5.45).

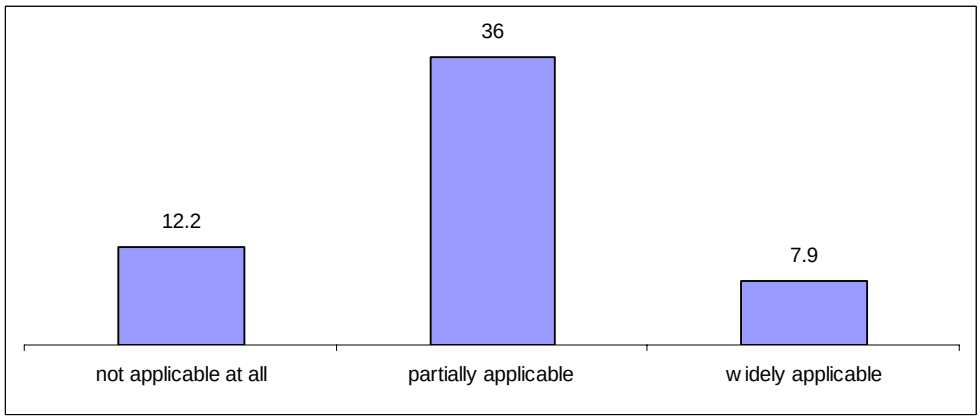

Figure 5.45: The applicability of guidelines in the work place

21.6% of physicians are familiar with the diabetes management guidelines of MOH, followed by WHO (13.7%) (see figure 5.46)

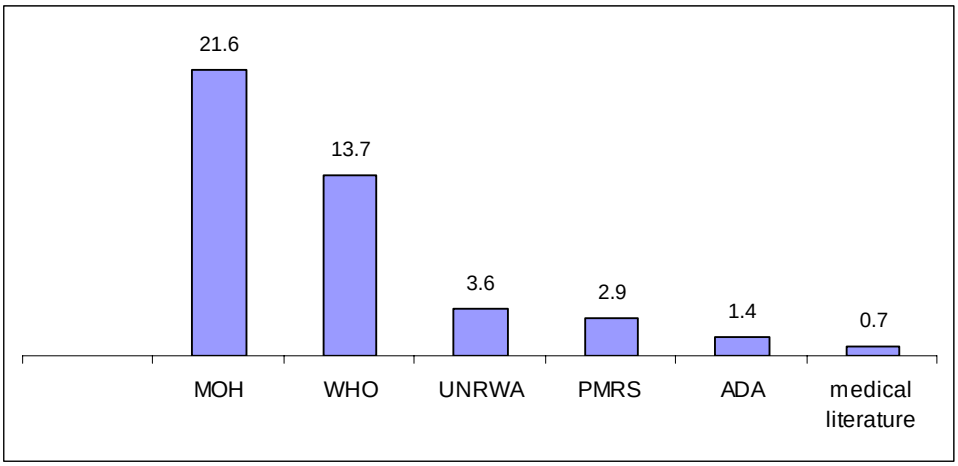

Figure 5.46: Who developed guidelines

10- Obstacles for adherence diabetes management guidelines

46.8% of study population considered that the most problematic factor was unavailability of guidelines followed by the absence of supervisors support (37.4%) (see figure 5.47)

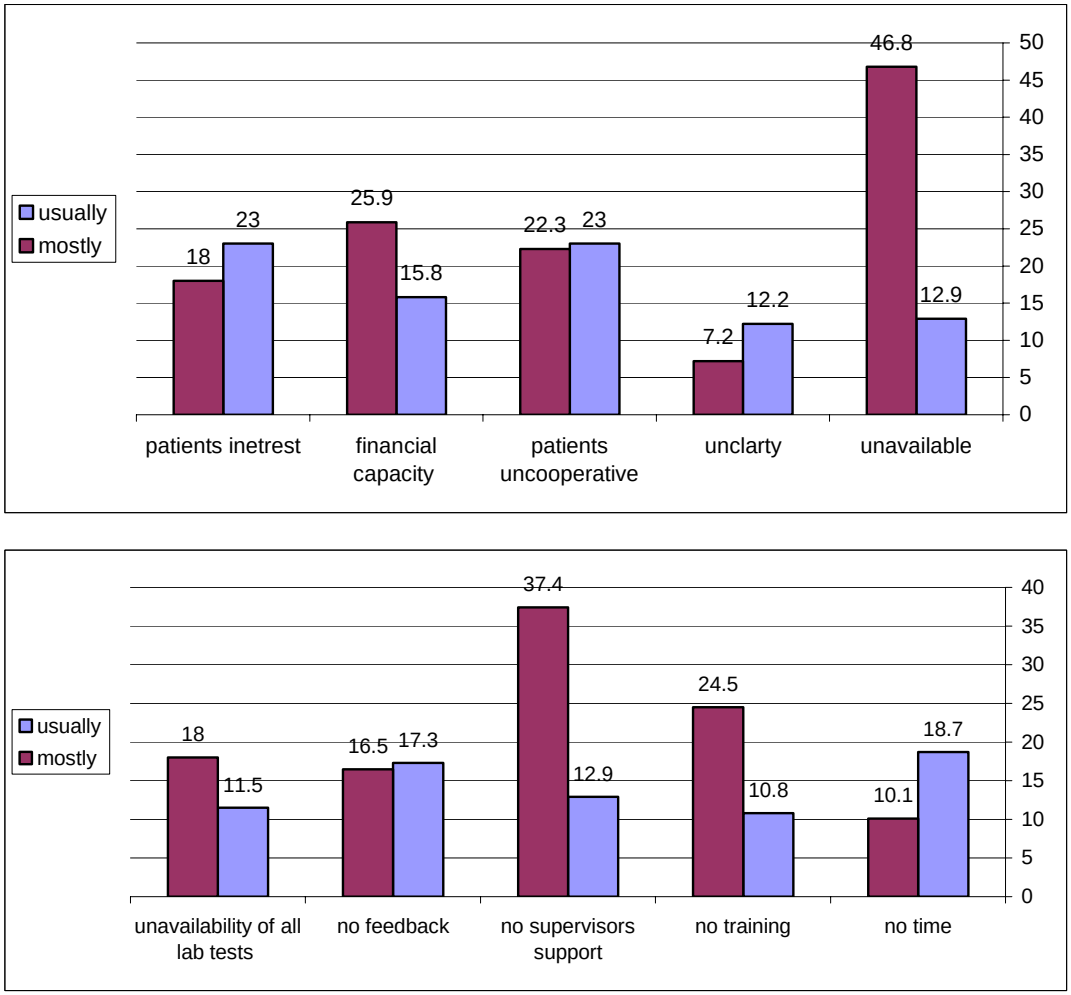

Figure 5.3.26: Problematic factors in adherence to the guidelines

5.3.3 Physicians data univariate analysis

5.3.3.1 Self reported familiarity with diabetes management guidelines and demographic characteristics of physicians

A statistically significant difference was observed between the self reported familiarity with the diabetes management guidelines and type of specialty, gender and place of essential job for physicians. No association was found between self reported familiarity with the guidelines and age category and country of graduation ($P > 0.05$, see table 5.13).

Table 5.13: Association between self reported familiarity with guidelines and physicians demographic characteristics

Variable	Familiar with guidelines No: 56 (40.3%)	Not familiar with guidelines No: 83 (59.7%)	Total No: 139 (100%)	P value
Specialty				
Endocrinologist	1 (1.8%)	0 (.0%)	1 (.7%)	
Diabetician	2 (3.6%)	1 (1.2%)	3 (2.2%)	
Internist	7 (12.5%)	7 (8.4%)	14 (10.1%)	
Ophthalmologist	0 (.0%)	5 (6.0%)	5 (3.6%)	0.02
Nephrologist	0 (.0%)	3 (3.6%)	3 (2.2%)	
Gynecologist	4 (7.1%)	19 (22.9%)	23 (16.5%)	
Neurologist	0 (.0%)	2 (2.4%)	2 (1.4%)	
GP	42 (75.0%)	46 (55.4%)	88 (63.3%)	
Gender				
Male	51 (91.1%)	64 (77.1%)	115 (82.7%)	0.033
female	5 (8.9%)	19 (22.9%)	24 (17.3%)	
Age category				
25-40 years	27 (48.2%)	45 (54.2%)	72 (51.8%)	0.369
41-55 years	23 (41.1%)	25 (30.1%)	48 (34.5%)	
56-70 years	6 (10.7%)	13 (15.7%)	19 (13.7%)	
Country of graduation				
West Europe	4 (7.1%)	2 (2.4%)	6 (4.3%)	
East Europe	17 (30.4%)	18 (21.7%)	35 (25.2%)	
Soviatian Union	17 (30.4%)	39 (47.0%)	56 (40.3%)	0.163
Arab country	17 (30.4%)	24 (28.9%)	41 (29.5%0	
China	1 (1.8%)	0 (.0%)	1 (0.7%)	
Essential Job				
Health department	26 (46.4%)	25 (30.1%)	51 (36.7%)	
UNRWA	6 (10.7%)	0 (.0%)	6 (4.3%)	
CBO	4 (7.1%)	3 (3.6%)	7 (5.0%)	
Private sector	4 (7.1%)	13 (15.7%)	17 (12.2%)	0.001
Private clinic	7 (12.5%)	16 (19.3%)	23 (16.5%)	
Governmental hospital	4 (7.1%)	20 (24.1%)	24 (17.3%)	
Medical force service	0 (.0%)	3 (3.6%)	3 (2.2%)	
PMRS	5 (8.9%)	3 (3.6%)	8 (5.8%)	
Number of years in the institution				
< 10 years	32 (57.1%)	32 (57.1%)	79 (56.8%)	
10-19 years	15 (26.8%)	15 (26.8%)	43 (30.9%)	0.497
20-29 years	5 (8.9%)	5 (8.9%)	11 (7.9%)	
> 29 years	4 (7.1%)	4 (7.1%)	6 (4.3%)	
Number of years managing diabetics				
< 10 years	35 (62.5%)	56 (67.5%)	91 (65.5%)	
10-19 years	11 (19.6%)	14 (16.9%)	25 (18.0%)	
20-29 years	7 (12.5%)	8 (9.6%)	15 (10.8%)	0.908
> 30 years	3 (5.4%)	5 (6.0%)	8 (5.8%)	

5.3.3.2 Self reported familiarity with diabetes management guidelines and diabetes management indicators

No significant difference was found between self reported familiarity with guidelines and recommendation of blood sugar home monitoring, familiarity of physicians with HbA1c test, use HbA1c test for diabetes management, recommendation of eye exam, next appointment for healthy type 2 diabetics to be seen by physician, the ability of patients to use phone consult with their physicians and recommendation of endocrinologist's consult ($P > 0.05$, see table 5.14). The significant association was found just between self reported familiarity with guidelines and the ability of physicians to use phone consult with the endocrinologist ($P < 0.05$, see table 5.14).

Table 5.14: Association between self reported familiarity with guidelines and diabetes management indicators

Variable	Familiar with guidelines No: 56 (40.3%)	Not familiar with guidelines No: 83 (59.7%)	Total No: 139 (100%)	P value
Recommend BS home monitoring				
Yes	50 (89.3%)	64 (77.1%)	114 (82.0%)	0.067
No	6 (10.7%)	19 (22.9%)	25 (18.0%)	
Familiarity with HbA1c test				
Yes	54 (96.4%)	77 (92.8%)	131 (94.2%)	0.364
No	2 (3.6%)	6 (7.2%)	8 (5.8%)	
Use HbA1c test in diabetes management				
Yes	37 (66.1%)	48 (60.0%)	85 (62.5%)	0.472
No	19 (33.9%)	19 (33.9%)	51 (37.5%)	
Recommend eye examination				
Yes	52 (92.9%)	68 (82.9%)	120 (87.0%)	0.089
No	4 (7.1%)	14 (17.1%)	18 (13.0%)	
Appointment for healthy diabetic				
Monthly	21 (37.5%)	21 (25.3%)	42 (30.2%0	
Every 3 months	13 (23.2%)	35 (42.2%)	48 (34.5%0	
Every 6 months	16 (28.6%)	23 (27.7%)	39 (28.1%)	0.117
Yearly	3 (5.4%)	3 (3.6%)	6 (4.3%)	
Not regularly	3 (5.4%)	1 (1.2%)	4 (2.9%)	
Patients can use phone for consult				
Yes	47 (83.9%)	69 (83.1%)	116 (83.5%)	0.901
No	9 (16.1%)	14 (16.9%)	23 (16.5%)	
Recommend endocrinologist's consult				
Yes	25 (44.6%)	37 (44.6%)	62 (44.6%)	0.994
No	31 (55.4%)	46 (55.4%)	77 (55.4%)	
Physician can use phone to consult with endocrinologist				
Yes	30 (53.6%)	26 (31.3%)	56 (40.3%)	0.009
No	26 (46.4%)	57 (68.7%)	83 (59.7%)	

5.3.3.3 Self reported familiarity with diabetes management guidelines and diabetes follow up criteria

No significant association was observed between self reported familiarity with guidelines and all follow up criteria ($P > 0.05$, see table 5.15)

Table 5.15: Association between self reported familiarity with diabetes management guidelines and patients follow up criteria

Variable	Familiar with guidelines No: 56 (40.3%)	Not familiar with guidelines No: 83 (59.7%)	Total No: 139 (100%)	P value
FBS				
Weekly	20 (35.7%)	33 (39.8%)	53 (38.1%)	
Monthly	27 (48.2%)	36 (43.4%)	63 (45.3%)	
Every 3 months	8 (14.3%)	8 (9.6%)	16 (11.5%)	0.166
Every 6 months	1 (1.8%)	0 (.0%)	1 (0.7%)	
Not necessary	0 (.0%)	6 (7.2%)	6 (4.3%)	
Blood pressure				
Weekly	24 (42.9%)	35 (42.2%)	59 (42.4%)	
Monthly	25 (44.6%)	35 (42.2%)	60 (43.2%)	0.650
Every 3 months	5 (8.9%)	5 (6.0%)	10 (7.2%0	
Every 6 months	1 (1.8%)	2 (2.4%)	3 (2.2%)	
Not necessary	1 (1.8%)	6 (7.2%)	7 (5.0%0	
Lipid profile				
Weekly	0 (.0%0	1 (1.2%)	1 (0.7%)	
Monthly	3 (5.4%0	3 (3.6%)	6 (4.3%)	
Every 3 months	14 (25.0%)	24 (28.9%)	38 (27.3%)	0.231
Every 6 months	33 (58.9%)	35 (42.2%)	68 (48.9%)	
Yearly	4 (7.1%)	9 (10.8%)	13 (9.4%)	
Not necessary	2 (3.6%)	11 (13.3%)	13 (9.4%)	
Microalbumin				
Weekly	0 (.0%)	1 (1.2%)	1 (0.7%)	
Monthly	5 (8.9%)	6 (7.2%)	11 (7.9%)	
Every 3 months	9 (16.1%)	19 (22.9%)	28 (20.1%)	0.108
Every 6 months	28 (50.0%)	26 (31.3%)	54 (38.8%)	
Yearly	9 (16.1%)	11 (13.3%)	20 (14.4%)	
Not necessary	5 (8.9%)	20 (24.1%)	25 (18.0%)	
Eye examination				
Weekly				
Monthly	0 (.0%)	1 (1.2%)	1 (0.7%)	
Every 3 months	1 (1.8%)	5 (6.0%)	6 (4.3%)	0.108
Every 6 months	27 (48.2%)	31 (37.3%)	58 (41.7%)	
Yearly	22 (39.3%)	27 (32.5%)	49 (35.3%)	
Not necessary	6 (10.7%)	19 (22.9%)	25 (18.0%)	
BMI				
Weekly	0 (.0%)	1 (1.2%)	1 (0.7%)	
Monthly	4 (7.1%)	8 (9.6%)	12 (8.6%)	
Every 3 months	6 (10.7%)	9 (10.8%)	15 (10.8%)	
Every 6 months	22 (39.3%)	15 (18.1%)	37 (26.6%)	0.081
Yearly	9 (16.1%)	12 (14.5%)	21 (15.1%)	
Not necessary	15 (26.8%)	38 (45.8%)	53 (38.1%)	

Table **5.15…. continues**

Variable	Familiar with guidelines No: 56 (40.3%)	Not familiar with guidelines No: 83 (59.7%)	Total No: 139 (100%)	P value
Creatinin				
Weekly	2 (3.6%)	6 (7.2%)	8 (5.8%)	
Monthly	15 (26.8%)	18 (21.7%)	33 (23.7%)	
Every 3 months	29 (51.8%)	36 (43.4%)	65 (46.8%)	
Every 6 months	9 (16.1%)	15 (18.1%)	24 (17.3%)	0.420
Yearly	1 (1.8%)	7 (8.4%)	8 (5.8%0	
Not necessary	0 (.0%)	1 (1.2%)	1 (0.7%)	
Foot inspection				
Weekly	4 (7.1%)	3 (3.6%)	7 (5.0%)	
Monthly	27 (48.2%)	43 (51.8%)	70 (50.4%)	
Every 3 months	11 (19.6%)	14 (16.9%)	25 (18.0%)	0.575
Every 6 months	11 (19.6%)	13 (15.7%)	24 (17.3%)	
Yearly	0 (.0%)	3 (3.6%)	3 (2.2%)	
Not necessary	3 (5.4%)	7 (8.4%)	10 (7.2%)	
ECG				
Weekly	0 (.0%)	2 (2.4%)	2 (1.4%)	
Monthly	1 (1.8%)	6 (7.2%)	7 (5.0%)	
Every 3 months	5 (8.9%)	6 (7.2%)	11 (7.9%)	0.265
Every 6 months	28 (50.0%)	28 (33.7%)	56 (40.3%)	
Yearly	12 (21.4%)	21 (25.3%)	33 (23.7%)	
Not necessary	10 (17.9%)	20 (24.1%)	30 (21.6%)	

5.3.3.4. Self reported familiarity with diabetes management guidelines and availability of team work in the institution

Statistically significant difference was observed between self reported familiarity with guidelines and presence of podiatrist, nutritionist in the work place, significant association was noted with tools of health education like presence of posters and brochures and personal health education ($P < 0.05$), very significant difference was found between familiarity with guidelines and presence of group health education in the work place ($P = 0$, see table 5.16). No significant association was observed between familiarity with guidelines and presence of nephrologist, endocrinologist and ophthalmologist ($P > 0.05$).

Table 5.16: Association between self reported familiarity with diabetes management guidelines and availability of team work in the institution

Variable	Familiar with guidelines No: 56 (40.3%)	Not familiar with guidelines No: 83 (59.7%)	Total No: 139 (100%)	P value
Podiatrist Yes No	11 (19.6%) 45 (80.4%)	3 (3.6%) 80 (96.4%)	14 (10.1%) 125 (89.9%)	0.002
Nephrologist Yes No	12 (21.4%) 44 (78.6%)	27 (32.5%) 56 (67.5%)	39 (28.1%) 100 (71.9%)	0.153
Endocrinologist Yes No	2 (3.6%) 54 (96.4%)	3 (3.6%) 80 (96.4%)	5 (3.6%) 134 (96.4%)	0.989
Ophthalmologist Yes No	13 (23.2%) 43 (76.8%)	25 (30.1%) 58 (69.9%)	38 (27.3%) 101 (72.7%)	0.370
Nutritionist Yes No	25 (44.6%) 31 (55.4%)	23 (27.7%) 60 (72.3%)	48 (34.5%) 91 (65.5%0	0.039
Brochures, posters Yes No	48 (34.5%) 91 (65.5%)	55 (66.3%) 28 (33.7%)	103 (74.1%) 36 (25.9%)	0.010
Personal health education Yes No	45 (80.4%) 11 (19.6%)	47 (56.6%) 36 (43.4%)	92 (66.2%) 47 (33.8%)	0.004
Group health education Yes No	27 (48.2%) 29 (51.8%)	16 (19.3%) 67 (80.7%)	43 (30.9%) 96 (69.1%)	0.000

5.3.3.5. Self reported familiarity with diabetes management guidelines and clinical exam for type 2 diabetics in the clinic

In table 5.17 we can note that no statistically significant association between familiarity with guidelines and clinical exam, requiring results of blood sugar, measuring blood pressure in supine position, Phondoscopy, feet inspection, mouth inspection and neurological exam ($P > 0.05$).

Table 5.17: Association between self reported familiarity with diabetes management guidelines and clinical exam in the clinic

Variable	Familiar with guidelines No: 56 (40.3%)	Not familiar with guidelines No: 83 (59.7%)	Total No: 139 (100%)	P value
Results of home BS Yes No	46 (88.5%) 6 (11.5%)	54 (84.4%) 10 (15.6%)	100 (86.2%) 16 (13.8%)	0.526
Check BP Yes No	45 (86.5%) 7 (13.5%)	49 (77.8%) 14 (22.2%)	94 (81.7%) 21 (18.3%)	0.226
Phondoscopy Yes No	14 (26.9%) 38 (73.1%)	11 (17.2%) 53 (82.8%)	25 (21.6%) 91 (78.4%)	0.205
Foot inspection Yes No	43 (82.7%) 9 (17.3%)	55 (85.9%) 9 (14.1%)	98 (84.5%) 18 (15.5%)	0.631
Mouth inspection Yes No	98 (84.5%) 18 (15.5%)	49 (76.6%) 15 (23.4%)	92 (79.3%) 24 (20.7%)	0.418
Neurological exam Yes No	35 (67.3%) 17 (32.7%)	33 (51.6%) 31 (48.4%)	68 (58.6%) 48 (41.4%)	0.087

5.3.3.6. Association between self reported familiarity with diabetes management guidelines and clinical exam for type 2 diabetic patients in gynecological clinic

No significant association was observed between self reported familiarity with diabetes management guidelines and clinical exam in gynecological clinic ($P > 0.05$, see table 5.18).

Table 5.18: Association between self reported familiarity with diabetes guidelines and diabetic patients clinical exam in gynecological clinic

Variable	Familiar with guidelines No: 56 (40.3%)	Not familiar with guidelines No: 83 (59.7%)	Total No: 139 (100%)	P value
Check BP Yes No	4 (100.0%) 0 (0.0%)	14 (73.7%) 5 (26.3%)	18 (78.3%) 5 (21.7%)	0.246
Phondoscopy Yes No	0 (0.0%) 4 (100.0%)	2 (10.5%) 17 (89.5%)	2 (8.7%) 21 (91.3%)	0.497
Foot inspection Yes No	4 (100.0%) 0 (0.0%)	4 (100.0%) 0 (0.0%)	18 (78.3%) 5 (21.7%)	0.246
Mouth inspection Yes No	2 (50.0%) 2 (50.0%)	12 (63.2%) 7 (36.8%)	14 (60.9%) 9 (39.1%)	0.624
Neurological exam Yes No	2 (50.0%) 2 (50.0%)	2 (50.0%) 2 (50.0%)	10 (43.5%) 13 (56.5%)	0.772
Refer for specialist consult Yes No	4 (100.0%) 0 (0.0%)	17 (89.5%) 2 (10.5%)	21 (91.3%) 2 (8.7%)	0.497
Change previous treatment for pregnant Yes No	0 (0.0%) 4 (100.0%)	1 (5.3%) 18 (94.7%)	1 (4.3%) 22 (95.7%)	0.369
Change tablet treatment to insulin Yes No	3 (75.0%) 1 (25.0%)	7 (36.8%) 12 (63.2%)	10 (43.5%) 13 (56.5%)	0.162
Refer to diabetician Yes No	3 (75.0%) 1 (25.0%)	17 (89.5%) 2 (10.5%)	20 (87.0%) 3 (13.0%)	0.435

5.3.3.7. Self reported familiarity with diabetes management guidelines and adherence to guidelines

High statistically significant association was observed between self reported familiarity with guidelines and presence of a copy of the guidelines, undergo training on the guidelines use, adherence to the guidelines and applicability of the guidelines in the work place (P = 0.000, see table 5.16). No significant difference was found with guidelines developer (P > 0.05, see table 5.19).

Table 5.19: Association between self reported familiarity with diabetes management guidelines and adherence to guidelines

Variable	Familiar with guidelines No: 56 (40.3%)	Not familiar with guidelines No: 83 (59.7%)	Total No: 139 (100%)	P value
Copy of guidelines				
Yes	29 (51.8%)	0 (0.0%)	29 (40.3%)	
No	27 (48.2%)	16 (100.0%)	43 (59.7%)	0.000
Training on guidelines				
Yes	32 (57.1%)	3 (3.8%)	35 (25.7%)	
No	24 (42.9%)	77 (96.3%)	101 (74.3%)	0.000
Adherence to guidelines				
Always	13 (23.2%)	1 (2.4%)	14 (14.4%)	
Mostly	26 (46.4%)	3 (7.3%0	29 (29.9%)	
Rare	15 (26.8%)	5 (12.2%)	20 (20.6%)	0.000
Never	2 (3.6%0	32 (78.0%)	34 (35.1%)	
Applicability of guidelines				
Widely applicable	11 (19.6%)	0 (0.0%)	11 (14.1%)	0.000
Partially applicable	40 (71.4%)	10 (45.5%)	50 (64.1%)	
No applicable	5 (8.9%)	12 (54.5%)	17 (21.8%)	
Guidelines developer				
MOH	24 (44.4%)	6 (75.0%)	30 (48.4%)	
UNRWA	5 (9.3%)	0 (0.0%)	5 (8.1%)	
WHO	17 (31.5%)	2 (25.0%)	19 (30.6%)	0.762
PMRS	4 (7.4%)	0 (0.0%)	4 (6.5%)	
ADA	2 (3.7%)	0 (0.0%)	2 (3.2%)	
Germany	1 (1.9%)	0 (0.0%)	1 (1.6%)	
Medical literature	1 (1.9%)	0 (0.0%)	1 (1.6%)	

5.3.3.8. Self reported familiarity with diabetes management guidelines and problematic factors for adherence the guidelines

Table 5.17 present very high significant association between self reported familiarity with guidelines and problematic factors for adherence like, unavailability of the guidelines, unclearness of the guidelines (P =0, see table 5.20), very high significant difference was observed with physicians have no time to follow guidelines and lack of supervisors support (P = 0.01, see table 5.20). No significant association was found with Patients uncooperativity, Patients financial capacity, Patients noninterest, Physicians not trained on guidelines, No feedback from specialists and Unavailability of all lab tests (P > 0.05, see table 5.20)

Table 5.20: Association between self reported familiarity with diabetes management guidelines and problematic factors for adherence the guidelines

Variable	Familiar with guidelines No: 56 (40.3%)	Not familiar with guidelines No: 83 (59.7%)	Total No: 139 (100%)	P value
Unavailability				
Never	24 (43.6%)	4 (5.7%)	28 (22.4%)	
Rarely	13 (23.6%)	1 (1.4%)	14 (11.2%)	0.000
Usually	8 (14.5%)	10 (14.3%)	18 (14.4%)	
Mostly	10 (18.2%)	55 (78.6%)	65 (52.0%)	
Unclearness				
Never	24 (43.6%)	1 (4.2%)	25 (31.6%)	
Rarely	21 (38.2%)	6 (25.0%)	27 (34.2%)	0.000
Usually	7 (12.7%)	10 (41.7%)	17 (21.5%)	
Mostly	3 (5.5%)	7 (29.2%)	10 (12.7%)	
Patients uncooperativity				
Never	5 (9.1%)	0 (0.0%)	5 (6.0%)	
Rarely	13 (23.6%)	3 (10.3%)	16 (19.0%)	0.071
Usually	21 (38.2%)	11 (37.9%)	32 (38.1%)	
Mostly	16 (29.1%)	15 (51.7%)	31 (36.9%)	
Patients financial capacity				
Never	5 (9.3%)	1 (3.4%)	6 (7.2%)	
Rarely	15 (27.8%)	4 (13.8%)	19 (22.9%)	0.084
Usually	16 (29.6%)	6 (20.7%)	22 (26.5%)	
Mostly	18 (33.3%)	18 (62.1%)	36 (43.4%)	
Patients noninterest				
Never	6 (10.9%)	1 (3.4%)	7 (8.3%)	
Rarely	16 (29.1%)	4 (13.8%)	20 (23.8%)	0.153
Usually	20 (36.4%)	12 (41.4%)	32 (38.1%)	
Mostly	13 (23.6%)	12 (41.4%)	25 (29.8%)	

Table 5.20: …continues

Variable	Familiar with guidelines No: 56 (40.3%)	Not familiar with guidelines No: 83 (59.7%)	Total No: 139 (100%)	P value
No time for adherence the guidelines				
Never	13 (24.1%)	2 (8.0%)	15 (19.0%)	0.01
Rarely	15 (27.8%)	9 (36.0%)	24 (30.4%)	
Usually	21 (38.9%)	5 (20.0%)	26 (32.9%)	
Mostly	5 (9.3%)	9 (36.0%)	14 (17.7%)	
Physicians not trained				
Never	23 (42.6%)	6 (18.2%)	29 (33.3%)	
Rarely	6 (11.1%)	3 (9.1%)	9 (10.3%)	0.091
Usually	7 (13.0%)	8 (24.2%)	15 (17.2%)	
Mostly	18 (33.3%)	16 (48.5%0	34 (39.1%)	
No supervisors support	12 (22.2%)	2 (5.1%)	14 (15.1%)	0.015
Never	7 (13.0%)	2 (5.1%)	9 (9.7%)	
Rarely	12 (22.2%)	6 (15.4%)	18 (19.4%)	
Usually	23 (42.6%)	29 (74.4%)	52 (55.9%)	
Mostly				
No feedback from specialists				
Never	10 (18.9%)	3 (12.0%)	13 (16.7%)	
Rarely	12 (22.6%)	6 (24.0%)	18 (23.1%)	0.490
Usually	18 (34.0%)	6 (24.0%)	24 (30.8%)	
Mostly	13 (24.5%)	10 (40.0%)	23 (29.5%)	
Unavailability of all lab tests				
Never	8 (14.8%)	2 (7.7%)	10 (12.5%)	
Rarely	22 (40.7%)	7 (26.9%)	29 (36.3%)	0.095
Usually	12 (22.2)	4 (15.4%)	16 (20.0%)	
Mostly	12 (22.2%)	13 (50.0%)	25 (31.3%)	

Chapter six. Discussion and Conclusion

Introduction

The distinguishing feature of this study is that is the first to identify the determinants of type 2 diabetes complications management in Palestine. This study provides a baseline for further studies to improve diabetes complications' management.

According the patient's medical files, the study was performed in primary health care clinics (PHC) that are supervised by the MOH, UNRWA and PMRS in Jenin and Tubas districts.

6.1 Summary of study findings

A sample of 800 patient files were included in this study. These files were randomly selected from 16 primary health care centers and from each center 50 medical files were selected. The 19 PHC centers were distributed as follows: 9 medical centers operated by the MOH; 4 centers by the UNRWA and 3 were operated by the PMRS.

In this study, type 2 diabetes was more prevalent in the age group 40-59 years with a mean age 58.8 (SD ± 11.4). More than half of the patients were followed by MOH clinics. Two third of study population had a positive family history of diabetes and 39.3% of patients were obese.

Results showed the frequency of follow up tests for type 2 diabetes patients by PHC centers. In 17.6% of patients' medical files, included a HbA1c test for the last three months.

In describing the complications among the study population as reported by medical files, micro-vascular complications was found to be common among the study population over 60 years old.

The association of socio-demographic, follow up tests and risk factors with diabetes complications was also investigated. Significant association was found between

retinopathy and health provider, age, educational level, lipid profile testing, diabetes family history and history of coronary artery disease. Nephropathy was significantly associated with health provider, age group, gender, kidney function test, urine for microalbumin testing and history of coronary artery disease. Significant association was found between neuropathy and health provider, age, gender, FBS, HbA1c, ECG, diabetes family history, history of hypertension and obesity.

The multiple regression models were done for diabetes complications that included all significant variables in the univariate analysis. For the retinopathy model age, low educational level, lipid profile testing and history of coronary artery disease were shown a significant estimated risk for retinopathy in the model. In the neuropathy model, age, gender, FBS, HbA1c, ECG monitoring and history of hypertension and diabetes were a significant risk factor for neuropathy. Age, gender, KFT, urine for microalbumin monitoring, history of dislepedimia and coronary artery disease were also shown as risk factors for nephropathy.

In the coming sections the study results will be discussed and compared to the present literature and study conceptual model in details.

6.2 Socio-demographic factors associations with diabetes complication management.

In the study conceptual model and study first objective, socio-demographic factors; i.e. age, gender….etc were included as a group of variables that might have an association with diabetes complications management. Each of these complications will be discussed separately in the coming sections.

6.2.1 Retinopathy

The prevalence of retinopathy in all age groups was 26.8%. Retinopathy was higher in age groups 40-59 and 60-79 years. The mean age of the study population with retinopathy was 63.55 ± 10.38 years. The mean duration of diabetes for patients with retinopathy was 15.5 years. The majority of retinopathy patients was diagnosed at MOH PHC centers (78.5%).

Strong significant association was found between development of retinopathy with age (P= 0.000), and educational level of patients (P= 0.013). No association was found between the presence of retinopathy with the job category (worker or not worker), gender, marital status and place of residency (P >0.05). Multiple regression analysis showed that the risk to develop retinopathy increased by the age (3.5 folds) within those patients between 80-99 years compared to those between 20-39 years, (OR=3.556,95% CI=0.826 - 15.310; P=0.000)

Several studies have shown age as a risk factor for having retinopathy among diabetic patients. In Oman was higher in age groups 50-59 and 60-69 (Khandekar et al., 2003). In Iran the prevalence of retinopathy was higher 37% (Javadi et al., 2009). The strong positive association with duration is frequently reported (Goldberg, 1972; Kahn, 1975), prevalence of retinopathy rose with age (Draper, 1968). In our study the prevalence of retinopathy decreased by the duration of diabetes. Most of this study sample was old people. As known, the pattern of frequency of retinopathy is largely determined by age at diagnosis of diabetes, therefore, the longer the duration of diabetes before retinopathy becomes common. Goldberg (1972) stated that "ageing makes the retinal vasculature more vulnerable to the diabetes process whatever it may be, and makes the older patients more likely than his younger counterpart to develop retinopathy within a given period of time.''

Education is also a powerful and unique predictor of health outcomes. Lower levels of education are associated with poor health, and higher levels of education are associated with better health (Al-khdoor, 2007).This study showed that 88.1% of patients did not finish high school, they were either illiterates or did not finish 12 years of basic education. Significant association was found between retinopathy and educational level (P=0.013). Multiple regression showed that the risk to develop retinopathy among illiterates (4.3 folds) higher those who finished university (OR=0.231, 95% CI=0.051 - 1.049).

In China, no significant association between retinopathy and educational level was seen (Chen et al., 1992). In the United States of America, retinopathy was weakly associated with lower education level (Moniques, 2000). In Sweden, a study showed that the group in poor metabolic control was characterized by a lower education level (Dick larsson, 1999). In this study, retinopathy was significantly associated with educational level. (P value=0.013; OR=0.171, 95% CI=0.040-0.7410). These results contradict some studies

around the world. A potential explanation of our results is that the more the patient was educated the better awareness he/she had about the importance of metabolic control and regular ophthalmological exam.

6.2.2 Nephropathy

The prevalence of nephropathy among study population was 20,5% . majority of patients (89.6%) were diagnosed at MOH centers, 9.8% at UNRWA and 0.6% at PMRS. Nephropathy was higher in age group 60-79 years (59.1%). The mean age with nephropathy was 58 ± 7.89 years Our results showed a small difference in male and female in the overall prevalence of diabetic nephropathy (47% vs. 53%). A significant difference was found between nephropathy with the health provider institution (P= 0.000), age category (P=0.000) and gender (P=0.001), but no association was found between the presence of neuropathy with the job category (worker or not worker), educational level, marital status and place of residency (P >0.05). The risk to develop nephropathy also increased by the age (15 folds) within those patients between 60-79 years compared to those between 20-39 (OR=15.356, 95% CI=1.971 - 119.656). logistic regression showed that males have a higher risk than females to develop nephropathy (1.6 folds), (OR=1.629, 95% CI=1.101-2.412).

In Egypt multivariate logistic regression analysis revealed that diabetic patients over 49 years of age, were more likely to develop chronic diabetic complications (M.El-Shazly et al., 2009). Poor glycemic control, hypertriglyceridemia, and longer duration of diabetes were independently associated with prevalent microalbuminuria and macroalbuminuria (Bessie et al., 2005). Our results showed age and duration of diabetes are significantly associated with development of nephropathy The risk to develop nephropathy increased by the age (15 folds) within those patients between 60-79 years compared to those between 20-39 (OR=15.356, 95% CI=1.971 - 119.656). Duration of diabetes has significant contribution for the development microalbuminuria by prolonged exposure to hyperglycemia-induced advanced glycosylation end products accumulations (Jungmann et al., 2001).

Male gender has been associated with the development of nephropathy in diabetes in many studies. Gall et al., in a prospective observational study involving 176 patients with type-2

diabetes, found that males had a 2.6 times greater risk of developing incipient or overt nephropathy. In Mexico, female gender associated significantly with reduced nephropathy (Dante Amato, 2005). Male sex (OR 2.6 (95% CI 1.2-5.4); P<0.02) (Mari-Anne gall, 1997). In Canada, female sex appears to be protective (Amrit et al., 2007). Our findings are consistent with the previous studies. There was a strong association with gender and logistic regression showed that males have a higher risk than females in 1.6 folds (OR, 1.624, 95% CI, 1.10-2.41; P, 0.001). Several studies explained the dominance of male gender in developing diabetic nephropathy. Sex-determining region Y-box 2 (SOX2) genetic polymorphism has gender-specific effects on DN, and also implies that transcription factors in pluripotency mechanisms may be involved in the pathogenesis of diabetes and DN (Gu et al., 2009). Sex hormones may mediate the effects of gender on chronic renal disease, through alterations in the renin-angiotensin system, reduction in mesangial collagen synthesis, the modification of collagen degradation, and upregulation of nitric oxide synthesis (Seliger et al., 2001). Nitric oxide (NO) availability in the renal circulation is greater in female than in male patients with type 2 diabetes that is associated with reduced levels of oxidative stress in females. The role of this gender-related difference in renal endothelial function for the initiation and progression of diabetic nephropathy (Markus et al., 2010)

6.2.3 Neuropathy

The prevalence of neuropathy in all age groups was 38.4%. neuropathy was higher in age group 40-59 and 60-79 (42% and 54.4%). The mean age of study population with neuropathy was 61.25 ± 10.08 years. The mean duration of diabetes for those with neuropathy was 13.68 ± 7.69 years. Our results showed a difference in prevalence of diabetic neuropathy among males and females (41% and 59%). 87.6% of patients were diagnosed with neuropathy at MOH clinics, 9.8% at UNRWA and 2.6% at PMRS. A significant association was found with health provider institution (P=0.000) , age category (P= 0.000) and gender (P=0.026). No significant association was found between neuropathy and jab category, marital status, place of residence and educational level (P > 0.05). The risk to develop neuropathy also increased by the age (5 folds) within those patients between 60-79 years compared to those between 20-39 (OR=5.889, 95% CI=1.924 - 18.026). Males have a higher risk to develop neuropathy than females in 1.178 folds (OR=1.178, 95% CI=0.807 - 1.720).

Age and duration of diabetes are listed as risk factors for developing neuropathy by many literatures. In UK, a cross-sectional multicentre study was performed to establish the prevalence of peripheral neuropathy in Type 2 (non-insulin-dependent) diabetic patients it was 32.1 % . It increases with both age and duration of diabetes, until it is present in more than 50% of Type 2 diabetic patients aged over 60 years (Young et al., 1992).
The prevalence of diabetic neuropathy across Europe was 28 %.Significant correlations were observed between the presence of diabetic peripheral neuropathy with age ($p < 0.05$), duration of diabetes ($p < 0.001$) (Tesfaye et al., 1996). Age significantly
independent predictors for first foot ulceration (P 0.01). (Caroline et al., 1998)
Prevalence of diabetic neuropathy in our study was higher than previous studies (38.4%). Neuropathy was higher in age group 60-79 years, it is similar to study in UK. Strong significant association was found in our study between age, duration of diabetes and neuropathy (P=0.000)

A lot of researches around the world confirm the role of gender in developing neuropathy. In Iran statistically significant relationships were found between neuropathy and age, gender, quality of diabetes control and duration of disease (P values in the order: 0.04, 0.04, < 0.001 and 0.005). More attention must be paid to elderly male diabetic patients with poor diabetes control (Fargol et al., 2005). The presence of clinical neuropathy correlated with greater age, longer duration of IDDM, and male gender. The somatic and autonomic test results confirm the relationship between age, diabetes duration, and male gender and diabetic neuropathy. These results support an effect of age and gender on the development of diabetic complications (DCCT, 1988). In New York this study demonstrates that the males in the study population developed neuropathy earlier than did the females (Aaberg et al., 2008). Our findings showed that male gender has a higher risk to develop neuropathy and significant difference was detected between gender and neuropathy (P=0.026). Males have a higher risk to develop neuropathy in 1.4 folds than females (OR=1.397, 95% CI=1.040 - 1.875).

6.3 follow up at personal level

The data extracted from patients medical files showed that 33,1% of study population had their fasting blood sugar test once in the last month, 17,6% did HbA1c test before three months, 81,6% of study population tested their lipid profile (cholesterol and triglyceride) once in the last year, ophthalmologist's report was found in the 45,6% of files of study population for the last year and electrocardiogram (ECG) was done for 43,6% of study population at least once as base line.

6.3.1 Retinopathy

A significant difference was found between the frequency of retinopathy with lipid profile test (P=0.049). No association was found between the presence of retinopathy with FBS, HbA1c, and ophthalmologist visit (P >0.05).

As recommended by the WHO guidelines for patients with type 2 diabetes mellitus follow up criteria for retinopathy, patients should be screened for retinopathy soon after diagnosis and subsequent examinations should be done on a yearly basis. A structured eye surveillance should be at one year interval. (WHO, 2006)

In Austria, nearly half of people with diabetes in Melbourne are not receiving adequate screening or follow up for diabetic retinopathy, despite universal health care. People with diabetes were not significantly more likely to have visited an optometrist than people without diabetes (P=0.51) (Catherine et al., 1998). In Germany 80% of diabetic patients to have had an examination of the retina by an ophthalmologist. (Mühlhauser et al., 1998). Regular screening for diabetic retinopathy and more aggressive management of modifiable risk factors could reduce the numbers of people who develop vision-threatening retinopathy. HbA1c testing is associated with retinopathy (Robyn et al., 2003).

In this study, 33,1% of study population had their fasting blood sugar test once in the last month, 17,6% did HbA1c test before three months, 81,6% of study population tested their lipid profile (cholesterol and triglyceride) once in the last year. 45.6% of our sample visited the ophthalmologist in the last year

Our results showed that, association was not significant with ophthalmologist visit (P=0.06), because almost of our sample are old agers and with low educational level, so they are not aware about the importance of regular eye exam. The service is not available at health provider institutions and patients must do fundus exam at private centers and the cost may be a real barrier for our people. From the physicians study results, almost of the physicians (87%) recommend their patients for regular eye exam. However, we found reports from eye doctors only in 45.6% of the patients medical files. A potential explanation is that patients did not really did the eye examination due to its cost at the private sector or they did the eye examination but did not put their results in their files. Patients may check their eyes, but the reports are not inserted in files.

Another interesting finding with retinopathy is that no significant association was found between having retinopathy and the HbA1c level at the (OR=1.021, 95% CI=0.675-1.544, P=0.921). A possible explanation could be, that the HbA1C testing also can be done out the health care service itself (whether the MOH, UNRWA or PMRS) since this service is not provided and should be done at the private sector. Therefore, these results might be inaccurate since 17,6% did HbA1c test before three months ,and just 62% of our physicians use the test in management of diabetes. Another reason that, HbA1c test is not included in UNRWA technical instruction, so no one HbA1c test we found in medical files at UNRWA PHC centers.

Adherence to lipid testing recommendations by primary care physicians for elderly patients with diabetes has much room for improvement (Massing et al., 2003). more effort is needed to ensure that CAD patients with diabetes receive aggressive lipid management (Massing et al., 2003). In our study, a significant association was found between lipid profile yearly testing and retinopathy (P=0.049), logistic regression showed that patients who did not check their lipid profile yearly, they also have an increase estimated risk (1.7 folds) compared to those who regularly check their serum lipids. If patients did not check their serum lipids, so lipids level may increase and this will develop several health problems like hypertension and hypertension will lead to retinopathy.

6.3.2 Nephropathy

In this study, kidney function test was done for 70,5% of study population, urine for Microalbumin was repeated for just 15,6% for the last year of study population.

Type 2 diabetes mellitus should have their urinary albumin excretion measured at least once a year until the age of 70. Follow up should also include regular assessment of HbA1c, blood pressure, serum creatinin and serum lipids (WHO, 2006).The likelihood of success in preventing and reducing the consequences of diabetic kidney disease will depend on the availability of resources to monitor patients continuously (WHO, 1994).
HbA_{1c} levels were not associated with morbidity and mortality in cardiovascular disease or development of renal insufficiency. (Diabetes Research and Clinical Practice, 2009*)*
In Germany, hemoglobin A1C, dyslipidaemia are risk factors for nephropathy (Raile et al., 2008).

Our results showed that HbA1c testing is not associated significantly with diagnosis of nephropathy (P=0.431). HbA1c test in MOH clinics not available all the time, so patients need to do it at private laboratories. UNRWA guidelines not require HbA1c for management.

The study conducted in Nigeria, shows that microalbuminuria is prevalent amongst diabetic patients. In Austria, Due to the obvious hazards of nephropathy, it is recommended that diabetic patients optimize glucose control, blood pressure control and perform annual kidney function tests to prevent unprecedented health complications and death could result from nephropathy (Maduka, 2009). Albumin execration rate should be assessed at an early stage in patients being evaluated for diabetic nephropathy (Jerums et al., 2009). In Spain Early intervention to maintain strict blood pressure control and to prevent the development of microalbuminuria is mandatory and will constitute the primary aim of intervention in patients with diabetes and also in prediabetes (Ruilope et al., 2009). In UK, use of urinary albumin measurement as the front-line test for proteinuria detection offers the best chance of improving the sensitivity, quality and consistency of approach to the early detection and management of CKD (Lamb, 2009). In our study strong significant association was found between annually urine for microalbumin, creatinin testing and nephropathy. 93.6% of physicians recommend kidney function testing for their patients.

70.5% of medical files present kidney function tests for the last year. Of our study population more than 80% of physicians reported that they recommend urine for microalbumin test to these patients, but only 15.65% of medical files presented this test for the last year.

6.3.3 neuropathy

In this study, 33,1% of patients had their fasting blood sugar test once in the last month, 17,6% did HbA1c test before three months, 81,6% of study population tested their lipid profile (cholesterol and triglyceride) once in the last year, ophthalmologist's report was found in the 45,6% of files of study population for the last year and electrocardiogram (ECG) was done for 43,6% of study population at least once as base line.

Large scale studies have shown that glycemic control is beneficial in reducing the frequency of progression of neuropathy (WHO, 2006). good control of blood glucose levels can substantially reduce diabetes complications (UKPDS, 1998). In UK, apart from tight blood glucose control, no other treatments have been shown to retard the progression of diabetic peripheral neuropathy (DPN). The Eurodiab baseline DPN study found a prevalence of 28% for DPN, with glycemic control and duration of diabetes being major determinants (Tesfaye et al., 2009). The control of glycosylated hemoglobin (HbA(1c)) levels is crucial to the successful treatment of patients with diabetes mellitus (T2DM). Glycemic control is a cornerstone for reducing end-organ disease, and HbA(1c) is the benchmark for defining glucose control over long durations. The author reviews available information from published clinical trials regarding the benefits of tight glycemic control in type 1 diabetes mellitus (T1DM) and type 2 diabetes mellitus (T2DM). He notes that published data support the use of tight glucose control for reducing risks of retinopathy, nephropathy, and neuropathy in both patients with T1DM and patients with T2DM (Spellman, 2009). In Taiwan, blood pressure and fasting glucose level were related to somatic neuropathy whereas only systolic blood pressure was correlated with autonomic neuropathy. In a univariate analysis, age, renal insufficiency, HbA1c and fasting glucose level were significantly associated with somatic neuropathy whereas only systolic blood pressure was statistically significantly associated with autonomic neuropathy. In a multivariate analysis, systolic blood pressure and fasting glucose level were positively associated with somatic neuropathy and systolic blood pressure remained statistically

significant for autonomic neuropathy (Hsu et al., 2009). In India, Cardiac autonomic neuropathy predisposes patients with diabetes mellitus to silent myocardial infarction (SMI). Twenty four hour ambulatory ECG monitoring provides useful diagnostic information in early detection and evaluation of SMI in asymptomatic diabetic patients. Incidence of SMI was significantly higher in patients with autonomic neuropathy 12/30 (40%) compared to those without 3/30 (10%) $p < 0.001$. (Jalal et al., 1999).

Our results are similar to previous studies around the world. We found a significant association between development of neuropathy and FBS (P=0.016), HbA1c (P=0.012) and ECG monitoring (P=0.000). More than two thirds of providers state that they recommend hemoglobin Alc testing to their patients, but only one quarter (17.6%) of the patients medical files confirm this recommendation. Of those physicians who do recommend hemoglobin Alc testing to their patients, but only one third of them (35.3%) recommend repeat it every three months. Nearly all providers (95.7%) recommend fasting glucose monitoring, but fewer than the third (33.1%) of medical files report that they actually perform it. Of those physicians who do recommend fasting glucose monitoring, less than one half (45.3%) recommend check it even once a month. 43.6% of patients were evaluated by ECG since they diagnosed with diabetes. Of our physicians 23.7% perform ECG testing to these controlled diabetics.

6.4 Physicians compliance with diabetes management guidelines

In this part we will discuss the compliance of physicians with guidelines in general, but not separately for the various health care providers. The number of physicians who are included in this study was 6 physicians working at the UNRWA and 8 are from the PMRS.

For diabetic patients follow up, WHO recommends fasting and postprandial glucose on monthly basis, quarterly HbA1c, yearly chemistry panel, fasting lipid profile, urinalysis (including microscopy and urine microalbumin screening). Also, thyroid stimulating hormone should be measured for diabetes type 1 and type 2, ECG for adults at baseline, and then as clinically indicated, to refer to patients to the ophthalmologist for annual retinal screening, or more often as indicated (WHO, 2006)

In our study, table 6.1 shows that FBS in the last month was done for 33.1% of patients, 17.6% of population were tested for HbA1c, lipid profile was performed for the last year for 81.6% of diabetics, 70.5% of medical files present kidney function tests for the last year, ECG was done only for 43.6% of patients, 45.6% of patients medical files showed that their physicians ever sent them for eye examinations.

Table 6.1: comparison between WHO follow up recommendations and our study findings

WHO recommendations	physicians who recommend test	Physicians who recommend test according to guidelines	Study data
FBS monthly for all patient	95.7%	45.3%	33.1%
HbA1c quarterly for all	61.2%	35.3%	17.6%
Lipid profile yearly for all	90.6%	9.4%	81.6%
Kidney function tests yearly for all	93.6%	17.3%	70.5%
Urine for microalbumin yearly	82%	14.4%	15.65%
ECG base line for all	78.4%	23.7%	34.6%
Ophthalmologist visit yearly for all	86.3%	30.2%	45.6%

In United States only half of patients with diabetes undergo an appropriate examination every year (Sinclair et al., 2004). In Saudi Arabia, it was shown the presence of a gap between recommendations of the international guidelines and the actual practices (Al-Elq Ah, 2009). In US, Before any intervention, rates of adherence to guidelines were low (15% for foot exams, 20% for HbA(1c) measurement, 23% for eye exam referrals, 33% for urine protein screening, 44% for lipid profiles, 73% for home glucose monitoring, and 78% for blood pressure measurements). One year after development of local consensus guidelines and feedback of baseline performance, significant improvements were seen in blood pressure measurements (71 vs. 83%; $P = 0.002$), foot exams (19 vs. 42%; $P < 0.001$), HbA(1c) measurements (26 vs. 37%; $P = 0.012$), and PCP eye exams (38 vs. 46%; $P = 0.043$); a trend toward improvement was seen in referral to eye specialists (25 vs. 33%; $P = 0.059$) (Kirkman, 2002). Only 53% patients had HbA1c measurements done in the previous year; these persons had a significantly longer duration of diabetes that those who did not have their HbA1c measured. Eighty-seven percent of patients had optimal or good plasma glucose levels. Compliance with CDA guidelines by physicians was poor; physicians were doing about half the recommended checks and procedures (Worrall et al., 1997). In Estonia, Blood pressure, serum creatinin, eye examination and checking patients'

ability to manage their diabetes were the best-followed items while glycosylated hemoglobin and weight reduction were the most poorly followed (Anneli et al., 2006). Among diabetic patients, regular HbA1c control was reported for 65%, yearly fundoscopy for 62%, yearly feet examination for 65%, yearly microalbuminuria control for 49%, regular blood pressure control for 96%, and yearly lipid profile for 89%. Regular screening of microangiopathic complications was reported for only 33% of diabetic patients. (Patrick et al.,2007) In our study, comparing between self-reported physician advice to patients on fasting glucose testing and files-reported physician advice is noteworthy (Table 6.1). Nearly all providers (95.7%) recommend fasting glucose monitoring, but fewer than the third (33.1%) of medical files report that they actually perform it. Of those physicians who do recommend fasting glucose monitoring, less than one half (45.3%) recommend check it even once a month.

These actually low percentages which indicated in table 6.1, and this lack of compliance could be explained by the lack of knowledge of the guidelines by our physicians. 40.3% of physicians are familiar with a guidelines for management of type 2 diabetic patients.

In US, the recommendations of ADA include annual comprehensive foot examinations, yearly ophthalmologic screening for retinopathy, and urine analysis for microalbuminuria. Compliance with practice guidelines by primary care physicians has historically been poor. Mechanisms such as the use of patient problem lists and diabetic flow sheets can serve as reminders to physicians and can facilitate closer adherence to practice guidelines (Zoorob et al., 1997). In Budapest, Microalbuminuria is a sensitive but relatively late marker of diabetic kidney disease. Still, screening of diabetic patients for microalbuminuria is of great importance since there is no other screening test capable of diagnosing diabetic nephropathy at an earlier stage. Compliance with therapeutic guidelines outlined in milestone clinical studies of the last years may significantly decrease morbidity, the progression of, and the mortality associated with diabetic kidney disease (De chattel et al., 1997). In Toronto, microalbuminuria screening meets the fundamental some of the burden on our health care system. The Canadian Diabetes Association practice guideline regarding microalbuminuria screening is an important contribution to the management of patients with diabetes. In conscientiously applying the guideline, physicians may be able to prevent progressive renal disease, and ultimately renal failure, in many patients with diabetes (Sheldon et al., 2002). All individuals with diabetes mellitus should be screened yearly

with a spot urine albumin to creatinin ratio to identify those who are at increased risk for the development of complications of diabetes mellitus, including nephropathy, retinopathy, and cardiovascular disease (Bennett et al., 2009).

In Palestine, more than two thirds of providers state that they recommend hemoglobin Alc testing to their patients, but only one quarter (17.6%) of the patients medical files confirm this recommendation. Of those physicians who do recommend hemoglobin Alc testing to their patients, but only one third of them (35.3%) recommend repeat it every three months. physicians who stated that they did not use the test said that they do not know what is HbA1c test (n = 4), and the test is not necessary (n = 14).

The reason for these discrepancies, that majority of physicians are not trained in using the guidelines. 25.2% of physicians said that they undergo special training to use the guidelines.

Similar discrepancies between physicians' and patients' medical files expectations of care were noted for eye examinations of patients with diabetes. More than 86% of providers stated that they recommend eye examinations to these patients. Only 45.6% of patients medical files showed that their physicians ever sent them for eye examinations, although one third 30.2% of physicians said that they recommend eye specialist visit for their healthy diabetics once yearly.

Lack of knowledge of guidelines is standing behind this incompliance, because lack of knowledge leads to incompliance, just 10% of physicians always adhere the guidelines. 25.9% of physicians have phondoscope at their work place, and more than two third of physicians (69.1%) believe that they need training in using phondoscope.

More than 90% of physicians stated that they recommend lipid profile testing for their patients, but we found the lipid profile for the last year in 81.6% of medical files. Just 9.4% of physicians ordered lipid profile testing once yearly for their health diabetic. 93.6% of physicians told us that they recommend kidney function testing for their patients. 70.5% of medical files present kidney function tests for the last year. Only 17.3% of physicians recommend repeat kidney function testing for their controlled diabetics once yearly. Of our population study more than 80% of physicians reported that they recommend urine for

microalbumin test to these patients, but only 15.65% of medical files presented this test for the last year. Only 14.4% of physicians know that they should repeat microalbumin testing for healthy diabetics at last once yearly. More than two third of physicians (78.4%) stated that they recommend electrocardiography (ECG) for their patients. We found ECG in only 43.6% of patients medical files. Of our physicians 23.7% perform ECG testing to these controlled diabetics (Table 6.1).

As revealed by patients' medical files in this study, the physicians did not undertake diabetic management activities recommended by their organizations or WHO recommendations. The reasons for this lack of compliance with guidelines could be explained by lack of knowledge of the guidelines, lack of training in using these guidelines, lack of supervision, lack of belief in the value of the guidelines, and, possibly, poor recall of physician advice by patients. 40.3% of physicians are familiar with a guidelines for management of type 2 diabetic patients, 20.9% of study population have a copy of the guidelines in the work place and 25.2% of physicians said that they undergo special training to use the guidelines, just 10% of physicians always adhere the guidelines. High statistically significant association was observed between self reported familiarity with guidelines and presence of a copy of the guidelines, undergo training on the guidelines use, adherence to the guidelines and applicability of the guidelines in the work place (P = 0.000).

Summary:

The compliance of our physicians with diabetes management guidelines is low, because the majority of them are not familiar with these guidelines and a lot of those who are familiar with guidelines are not trained in using these guidelines, which leads to poor follow up of our patients which leads to miss diagnosing diabetes complication as earlier as possible to prevent their deterioration.

6.5 Health care system's follow up

World health organization (WHO) recommend referral of diabetes patients to different kinds of specialists for follow up, WHO emphasize on multi disciplinary team for care about diabetics. Health care system should include, diabetes educator, to evaluate patient's

ability to perform self-monitoring of blood glucose and his/her ability to interpret the data, dietician, foot-care specialist, ophthalmologist for annual retinal screening, or more often as indicated, nephrologists, neurologist, and cardiologist, if needed. The use of multidisciplinary mini clinics for diabetes care has the potential to improve clinical outcome. These provide team care by a physician, nurse, dietician, chiropodist and health educator that will improve treatment and help establish a referral system for diabetic complications. (WHO, 2006)

In our study, according to the availability of different kinds of specialists in the work place, just 3.6% of physicians have endocrinologist in their work place, 10.15 have podiatrist, 27.3% have ophthalmologist, 28.1% have nephrologist, 34.5% of study population have nutritionist in their institutions. The services for diabetes diagnosis and follow up and it is availability by health care providers are presented previously(see chapter 4, page, 50, annex 5).

Of our study population 74.1% of physicians have brushers and posters about diabetes in their work place, 30.9% of physicians conducted group health education for diabetic patients, 66.2% of physicians performed individual health education. Two third (59.7%) of our physicians could not call endocrinologist for consult. The majority (39.6%) of our physicians believe that healthy diabetic should be seen by doctor every six months. Statistically significant difference was observed between self reported familiarity with guidelines and presence of podiatrist (P=0.002), nutritionist in the work place (P=0.039), presence of tools of health education like posters and brochures (P=0.010), personal health education (P=0.004), and group health education (P=0.000).

In Australia, a one-time, advanced diabetes education program teaching intensive insulin self-management with an empowerment style can lead to sustained improvement in patient outcomes and reduce use of hospital services for people with Type 2 diabetes on insulin (Lowe et al., 2009). In United states, only by teamwork between primary care physician and ophthalmologist can blindness from diabetic retinopathy be reduced (Sinclair et al., 2004). A multifaceted approach to improving diabetes management has led to improved performance in clinical measures related to diabetes care that have been shown to reduce the risk of patients with diabetes developing diabetes- related complications. All components of the diabetes management continuum of care, including primary care

physicians, specialists, office staff, patients, diabetes educators, and others, were involved in the care improvement activities. The percentage of patients with at least one annual HbA1c test increased from 78.5% in 1998 to 90.5% in 2002. During the same time period, the percentage of patients whose most recent HbA1c was less than 7.0 increased from 33.5% to 52.8%, average HbA1c decreased from 8.1 to 7.3, and the percentage of patients whose most recent HbA1c was greater than 9.5 decreased from 34.6% to 21.4%. The percentage of patients who had an LDL cholesterol screening test within the prior 2 years increased from 65.9% in 1998 to 91.7% in 2002. During the same time period, the percentage of patients whose most recent LDL cholesterol was less than 130 mg/dL increased from 39.9% to 69.8%. The percentage of diabetes patients who had an annual eye exam increased from 52% in 1998 to 62% in 2002 (Larsen et al., 2003). In Mexico, multidisciplinary team (family practitioner, social worker, dietician, and physical trainer) show improvements in the lifestyle and dietary habits of patients with overweight or obesity, diabetes, or hypertension (Cueto-Manzano et al., 2009). Modest relationships were noted between visit duration and quality of care. Providing counseling or screening required additional physician time (Chen et al., 2009). subjects with more frequent visit**s** to a multidisciplinary diabetes clinic had lower HbA1C levels during the 3 years of this study (Francine et al., 1998). In table 6.2 we can summarize the explanation for discrepancies between what physicians recommend and what we actually found in the files.

Table 6.2: Physicians recommendations and health care system feasibilities

Comments on health care system	**Test**	**physicians who recommend test**	**Study results**
HCS in MOH, UNRWA and PMRS recommend stable diabetics to visit the clinic minimum every 3 months, therefore patients could not do FBS monthly.	FBS	95.7%	33.1%
UNRWA not recommend test at all. In MOH not always is available, so patients do it in private lab. In PMRS patients can do it once per year for free. (MOH 24.7%, UNRWA 0.0%, PMRS 20%).	HbA1c	61.2%	17.6%
Test recommended and available in all organizations for free, so high number of patients who did the test (MOH 81.3%, UNRWA 95%, PMRS 64.7%)	Lipids	90.6%	81.6%

Test recommended and available all the time in MOH and UNRWA for free, patients pay for this service at PMRS (MOH 78%, UNRWA 98%, PMRS 11.3%)	KFT	93.6%	70.5%
Test not available in all health providers, therefore, patients should do this expensive test out the clinics. (MOH 23.1%, UNRWA 9%, PMRS 2%)	Microalbumin	82%	15.65%
In MOH PHC centers internist is available and he can do ECG testing for diabetics, majority of ECG sheets (68.5%) we found in MOH patients' files. PMRS and UNRWA have only GPs, 12% of patients both institutions have ECG report in their fails.	ECG	78.4%	34.6%
Our three health providers are not offer eye care service for their client. MOH give patients yearly special form, by which he can check their eyes at private sector for some exemption, 50% of MOH patients have report in their files. UNRWA refer their patients to Sant Johns hospital in Toulkarem or Jerusalem for free. 70.5% of UNRWA clients have checked their eyes. 2% from PMRS have a report.	Eye care	86.3%	45.6%

Summary:

Quality of care of diabetic patients can be influenced by health care system (Lobo, 2003). Palestinian health care system in general is a mixture, and that is clearly noted in diabetes health services, different kinds of health providers with different kinds of guidelines and different feasibilities. No one of our three health providers (MOH, UNRWA and PMRS) can offer all health services to diabetes patients, absence of multidisciplinary team (no endocrinologist, no nephrologist, no ophthalmologist,…ets), no one of health providers has all necessary lab tests for diabetics for better follow up, the appointment system which give the patient chance to be seen by GP every three months or six months, all of that can lead to mismanagement of diabetes complications. Team approach and guidelines give us a structured care approach to prevention and treatment. Structured care approach improves outcomes (CDA, 2003).

6.6 Conclusion:

This study described, for the first time in Palestine, the determinants of type 2 diabetes complications management, we identified in this study factors affecting type 2 diabetes complications. Diabetic patients medical files in this study reported to have 38.4% neuropathy, 26.8% retinopathy, 20.5% nephropathy, 12.1% diabetic foot, 9.5% heart attack, 2.4% hypoglycemic crises, 1.1% organ amputation and 0.1% erectile dysfunction. We discussed in this study the most prevalent diabetic complications (neuropathy, retinopathy and nephropathy). From socio-demographic factors, we found that retinopathy was affected by age and educational level. A significant difference was observed between retinopathy with age and educational level. Logistic regression showed that the risk to develop retinopathy increased by age and the education is a preventive factor. Patients with previous coronary artery diseases have a double risk to develop retinopathy. Retinopathy was significantly associated with lipid profile testing.

We observed high significant association between nephropathy with age, gender, previous coronary artery diseases and annual screening for microalbumin and serum creatinin. Multiple regression analysis showed that males have a higher risk to develop nephropathy.

Neuropathy was significantly associated with age, gender, FBS, HbA1c and ECG monitoring. Male gender has a greater risk to develop neuropathy.

Lack of physicians compliance with national or WHO guidelines due to lack of knowledge, lack of training on use guidelines and lack of supervision on true implementation of these guidelines, lead to a lot of discrepancies between what physician reported and what done.

Palestinian health care system is a mixture, and not offered to the patients all health services (multidisciplinary team, education, lab test…ets), which need for better follow up to prevent or delay or early diagnosing diabetes complications.

6.7 Recommendations

The most important issue in diabetes management is to develop strategies which help us to prevent or postpone diabetes complications. Therefore, the following are the general recommendation at the national level:

1) There is a need for an awareness program that is development targeting the patients who should be aware about the importance of their compliance with the physicians' instructions and requests for doing some testing as follow up to control their diabetes condition and prevent unnecessary complications.
2) To work in modifying the health provision for diabetic patients in cooperation between all health care providers according to the patients needs.
3) To have a national advocacy for applying the diabetes guidelines by all health care providers, in particular by those working in the private sector.
4) To have an action plan for having a well trained specialized physicians in diabetes care.
5) From research point of view, to conduct a national study in which the private sector will be involved and to assess the diabetic patients needs regarding their health care.

Recommendations for the MOH :

1) To conduct training sessions for all GPs at the PHC centers on diabetes management guidelines, the main care provider for diabetes management,.
2) To provide health education and nutrition clinic service at each diabetes clinic.
3) To introduce the necessary lab tests, such as: LDL, HDL, urine for microalbumin and HbA1c test at the MOH laboratories.
4) To provide an ophthalmology and podiatristology consultations services in Jenin and Tubas districts, and whenever is needed.
5) To set up monitoring and surveillance plans for the "proper" diabetes management.
6) To modify patients' files to include more information regarding patients' condition such as method of follow up like referral for eye examination, date of diagnosis of complications, etc…
7) To make other types of treatments and medications available at their pharmacies.
8) To coordinate with the other health care providers to have a unified national plan for controlling diabetes complications.

Recommendations for the PMRS:

1) To adopt the local national guidelines, and conduct training for GPs and other specialists on these guidelines.
2) To train the health workers and nurses on diabetes management, since they are in direct contact with those patients.
3) To provide ophthalmology and podiatristology consultations at the PHC centers.
4) To provide health educator and nutrition services at each diabetes clinic.
5) To introduce the necessary lab tests, such as: LDL, HDL, urine for microalbumin and HbA1c test at the PMRS laboratories with exemption for diabetics.
1) To modify patients' files to include more information regarding patients' condition such as method of follow up like referral for eye examination, date of diagnosis of complications, etc…

Recommendations for the UNRWA:

1) To adopt HbA1c test to be done quarterly for diabetic patients monitoring
2) To modify the policy in the monthly FBS and RBS testing and consultations.
3) To add urine testing for microalbumin in the laboratory testing for these patients.
4) Registration of the date of diagnosis for each complication in the files
5) To provide internist and neurologist consultations for the diabetic patients at their clinics.

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Appendix (1)

استمارة خاصة بالأطباء

أخي\ أختي المشارك\ة: عند الاجابة على أسئلة الاستبيان الرجاء وضع رقم الجواب الصحيح في المربع

(للاستفسار عن أي سؤال يمكنك الاتصال على رقم 0599475557)

1.الاسم الثلاثي (إذا رغبت): الاسم الأول_____الثاني_____العائلة_____

2. رقم الهاتف أو الجوال (إذا رغبت):_____

	3.الجنس:	1.ذكر	2.أنثى

	4.العمر:_____(سنوات)

	5.سنة التخرج من الجامعة(بكالوريوس):_____

	6.بلد التخرج:	1.أوروبا الغربية	2.أوروبا الشرقية
		3.دول الاتحاد السوفييتي	4.دولة عربية
		5.غير ذلك,حدد	

	7.إذا كنت أخصائي,نوع التخصص:	1.غدد صماء	2.سكري	3.باطني
		4.عيون	5.كلى	6.غير ذلك,حدد

	8.سنة إنهاء التخصص:_____

	9.مكان عملك الأساسي:	1.صحة	2.وكالة غوث	3.جمعية أهلية	4.قطاع خاص
		5.عيادة خاصة	6.مستشفى حكومي	7.خدمات عسكرية	8.غير ذلك, حدد

	10.عدد السنوات التي عملتها في تلك المؤسسة أو العيادة:_____(سنوات)

	11.مكان عملك الثانوي:	1.وكالة غوث	2.جمعية أهلية	3.قطاع خاص
		4.عيادة خاصة	5.لا يوجد	6.غير ذلك, حدد

	12.هل يراجعك في مكان عملك مرضى سكري النوع الثاني؟	1.نعم	2.لا

	13.عدد السنوات التي تعاملت فيها مع مرضى السكري:_____(سنوات)

	14.كم مريض سكري النوع الثاني يراجعك شهريا؟_____(تقريبا)

	15.خاص بأطباء القطاع الخاص,ما هي نسبة المرضى الذين يراجعونك و في نفس الوقت يراجعون عيادات الصحة أو الوكالة ؟(تقريبا)_____%

	16.هل تنصح مرضاك بفحص السكر في الدم في المنزل؟	1.نعم	2.لا

	17. إذا كان الجواب نعم,كم مرة تنصحهم بعمل الفحص؟ (if the patient controlled)	1.مرة يوميا
		2.مرتين يوميا
		3.يوم بعد يوم
		4.اسبوعيا
		5.شهريا
		6.غير ذلك
		7. لم احدد لهم
		8.لا داعي

	18.هل تعرف ما هو فحص السكر التراكمي؟(HbA1c)	1.نعم	2.لا

	19.هل تستخدم هذا الفحص لتقييم مرضاك السكري النوع الثاني دائما؟	1.نعم	2.لا

	20.ما هي الفترة التي تطلب فيها من مرضاك إعادة الفحص؟ (if the patient controlled)	1.شهريا
		2.كل ثلاث شهور
		3.كل ست شهور
		4.سنويا
		5.كل سنتين
		6.لا اطلبه بتاتا
		7.غير ذلك,حدد

	21.ما هي نسبة المرضى من مجموع مرضاك الذين طلبت منهم إجراء الفحص؟_____%(تقريبا)

	22.إذا كنت لا تستخدم هذا الفحص,فما هو السبب؟	1.لا أعرف ما هية هذا الفحص
		2.بسبب تكلفته العالية بالنسبة للمريض
		3.غير ضروري
		4.غير ذلك,حدد

	23.هل تقوم بتحويل مرضاك السكري ليفحصوا عيونهم عند أخصائي العيون؟	1.نعم	2.لا

	24.إذا كان الجواب نعم,خلال اي فترة يجب عليهم فحص عيونهم؟ (في حال لا يوجد مضاعفات في عيون المريض)	1.شهريا
		2.كل ثلاث شهور
		3.كل ست شهور
		4.سنويا
		5.كل سنتين
		6. حسب امكانيتهم

	25.هل تحصل من المريض عل تقرير من أخصائي العيون؟	1.نعم	2.لا

	26.هل جهاز فحص العين(فوندوسكوبي) موجود عندك في العيادة؟	1.نعم	2.لا

	27.هل تشعر بالحاجة للتمرين على استخدام جهاز الفوندوسكوبي؟	1.نعم	2.لا

28.ما هي عدد المرات التي تجري فيها الفحوصات التالية لمرضى السكري النوع الثاني؟(الرجاء ضع رقم الاجابة الصحيحة بالمربع)							
		1.اسبوعيا	2.شهريا	3.كل ثلاث شهور	4.كل ست شهور	5.سنويا	6.لا أقوم بذلك
	1.فحص السكر						
	2.فحص الضغط						
	3.فحص الدهون						
	4.بروتين في البول (Microalbuminuria)						
	5.فحص الشبكية						
	6.مؤشر كتلة الجسم(BMI)						
	7.الكرياتنين						
	8.فحص الاقدام						
	9.تخطيط قلب						

	29.حسب وجهة نظرك,ما هي الفترة التي يجب على مريض السكري من النوع الثاني المسيطر عليه (Controlled) أن يفحص سريريا من قبل الطبيب؟	1.شهريا
		2.كل ثلاث شهور
		3.كل ست شهور
		4.سنويا
		5.غير ذلك,حدد

	30.متى يراجعك مريض السكري المسيطر عليه(Controlled)؟	1.كل شهر
		2.كل ثلاث شهور
		3.كل ست شهور
		4.كل سنة مرة
		5.غير ذلك

	31.هل يستطيع المريض الاتصال بك للاستشارة في أي وقت؟	1.نعم	2.لا

	32.هل تحول مرضاك لأخصائي الغدد **عادة؟**	1.نعم	2.لا

	33. إذا كان الجواب لا,لماذا؟	1.لا يوجد	2.لا داعي

	34.ما هي المسافة التي يبعدها عنك أخصائي الغدد؟	1.في نفس البناية
		2.في نفس المدينة
		3.في مدينة أخرى

	35.هل عندك الإمكانية للاتصال باخصائي غدد من اجل الاستشارة؟	1.نعم	2.لا

	36. في مكان عملك (مؤسسة أو عيادة خاصة), هل يوجد التالية:		
	1.أخصائي قدم (طبيب أو ممرض مدرب)	1.نعم	2.لا
	2.أخصائي كلى	1.نعم	2.لا
	3.أخصائي غدد	1.نعم	2.لا
	4.أخصائي عيون	1.نعم	2.لا
	5.أخصائي تغذية	1.نعم	2.لا
	6.هل يتوفر في مكان عملك نشرات أو بوسترات عن مرض السكري؟	1.نعم	2.لا
	7.هل يتم في مكان عملك تثقيف فردي للمرضى؟	1.نعم	2.لا
	8.هل يتم في مكان عملك تثقيف جماعي للمرضى؟	1.نعم	2.لا

الأسئلة التالية يستطيع الإجابة عليها جميع الأطباء باستثناء أطباء الأمراض النسائية:

	37.إذا حضر المريض لعيادتك بعد أكثر من شهر من زيارته السابقة و حسب موعد حددته له؟		
	1.هل تطلب منه نتائج فحص السكر التي جراها لنفسه في المنزل؟	1.نعم	2.لا
	2. هل تقوم بقياس الضغط له وهو مستلق؟	1.نعم	2.لا
	3.هل تقوم بفحص الشبكية (فوندوسكوبي) للمريض؟	1.نعم	2.لا
	4.هل تقوم بفحص قدميه؟	1.نعم	2.لا
	5.هل تقوم بفحص فم المريض؟	1.نعم	2.لا
	6.هل تقوم بالفحص العصبي للمريض(منعكسات,قوة,احساس)	1.نعم	2.لا

الأسئلة التالية خاصة فقط بأطباء الأمراض النسائية:

	38.اذاحضرت لعيادتك مريضة سكري من النوع الثاني:		
	1.هل تسألها عن نتائج فحص السكر لديها؟	1.نعم	2.لا
	2.هل تقيس لها الضغط و هي مستلقية؟	1.نعم	2.لا
	3.هل تقيس ها الوزن؟	1.نعم	2.لا
	4.هل تقوم بفحص أقدام المريضة؟	1.نعم	2.لا
	5.هل تقوم بفحص الشبكية؟	1.نعم	2.لا
	6.هل تقوم بفحص فم المريضة؟	1.نعم	2.لا
	7.هل تقوم بالفحص العصبي للمريضة(منعكسات,قوة,إحساس)	1.نعم	2.لا
	8.هل تحولها للطبيب المختص قبل إعطائها أي علاج؟	1.نعم	2.لا

	39.إذا حضرت لعيادتك سيدة حامل وهي بالأصل مريضة سكري نوع ثاني؟		
	1.هل تبقيها على علاجها السابق (حبوب سكري) ؟	1.نعم	2.لا
	2.هل تقوم أنت بتغيير الحبوب لانسولين؟	1.نعم	2.لا
	3.هل تقوم بتحويلها للمتخصص بحمل السكري؟	1.نعم	3.لا

الأسئلة التالية هي لجميع الأطباء بدون استثناء:

	40.هل أنت مطلع على دليل (Guidelines) لعلاج مرض السكري النوع الثاني؟	1.نعم	2.لا

	41.إذا كان الجواب نعم, هل تملك نسخة من هذا الدليل في مكان عملك؟	1.نعم	2.لا

	42.هل تلقيت تدريب على استخدام دليل لعلاج مرضى السكري النوع الثاني؟	1.نعم	2.لا

	43.هل تلتزم بإرشادات ذلك الدليل في علاج مرضى السكري النوع الثاني؟	1.دائما	2.غالبا	3.نادرا	4.مطلقا

	44.كيف تقيم استخدام هذا الدليل في علاج مرضى السكري النوع الثاني في مكان عملك أو مؤسستك؟	1.مطبقة جدا	2.مطبقة جزئيا	2.غير مطبقة

	45.من هي الجهة التي وضعت هذا الدليل؟	1.وزارة الصحة	2.وكالة الغوث	3.منظمة الصحة العالمية
		4الإغاثة الطبية	5.جهة أخرى, اذكرها	

	46.كيف تقيم المعيقات التالية للالتزام بدليل الإرشادات الخاص بعلاج مرضى السكري النوع الثاني؟				
		1.إطلاقا	2.نادرا	3.عادة	4.غالبا
	1.عدم توفر دليل للإرشادات				
	2.عدم وضوح تلك الإرشادات				
	3.عدم تعاون المرضى				
	4.الإمكانيات المادية للمرضى				
	5.عدم اهتمام المرضى				
	6.لا يوجد وقت كافي عند الطبيب لتتبع الإرشادات				
	7.عدم تدريبي على استخدام دليل الإرشادات				
	8.لا يوجد دعم من قبل المسئولين عن تعميم الدليل				
	9.عدم وجود تغذية راجعة من قبل الأخصائيين				
	10.عدم وجود إمكانيات لإجراء جميع الفحوصات اللازمة للمرضى				
	11. أخرى, اذكرها				

هل تود باضافة ملاحظات اخرى:

Appendix (2)

استمارة خاصة بملفات مرضى السكري النوع الثاني

التاريخ:_____

1.اسم المركز:_____

2. تبعية المركز: 1.وزارة الصحة 2.وكالة الغوث 3.الإغاثة الطبية

3.الاسم الثلاثي للمريض:_____

4. رقم الملف:_____

5. العمر بالسنوات: _____

6.المهنة: _____

7. الجنس: 1.ذكر 2.أنثى

8. الحالة الاجتماعية: 1. اعزب 2. متزوج 3. ارمل 4. مطلق

9.المستوى التعليمي: 1.أمي 2.ابتدائي 3.إعدادي 4.ثانوي 5.دبلوم .جامعي

10.مكان الإقامة: 1.قرية 2.مدينة 3.مخيم

11.تاريخ عائلي لمرض السكري: 1.ايجابي 2.سلبي

12.أمراض مزمنة أخرى: 1.ضغط 2. خلل في الدهون(دسلبيديميا) 3.أمراض شرايين القلب 4.السمنة

13.هل يوجد فحص لنسبة السكر خلال الشهر الماضي؟ 1 .نعم 2.لا

14.هل يوجد فحص سكري تراكمي خلال الثلاث شهور الماضية؟ 1.نعم 2.لا

15.هل يوجد فحص شامل للدهون خلال العام الماضي؟ 1.نعم 2.لا

16.هل يوجد فحص وظيفة الكلى خلال العام الماضي؟ 1.نعم 2.لا

17.هل يوجد فحص بول للمايكروألبومين خلال العام الماضي؟ 1.نعم 2.لا

18.هل يوجد تقرير من طبيب العيون خلال العام الماضي؟ 1.نعم 2.لا

19.هل يوجد تخطيط قلب و لو مرة واحدة عند فتح الملف؟ 1.نعم 2.لا

20.نظام العلاج: 1.حبوب 2.حبوب و انسولين 3.انسولين 4.حمية فقط

21.هل يوجد عند المريض جهاز لفحص السكر في البيت. 1.نعم 2.لا

22.وجود المضاعفات:

1.اعتلال في الشبكية (رتينوباثي)
2.اعتلال عصبي (نيوروباثي)
3.اعتلال كلوي (نفروباثي)
4.قدم سكرية
5.الإصابة بنوبة قلبية
6.ارتفاع ضغط الدم
7.هبوط السكر
8.بتر أعضاء بسبب السكري
9. ضعف جنسي

Appendix (3)

استمارة خاصة بالمركز الصحي

1.اسم المركز:_____

2.تبعية المركز:_____

3.الخدمات التي يقدمها المركز:_____

4.الفحوصات المخبرية المتوفرة لمرضى السكري:_____
_____

5.عدد الموظفين:_____

6.عدد التمريض:_____

7.هل تلقى التمريض تدريب خاص بالسكري؟ 1.نعم 2.ل
ا

8.هل يوجد أخصائي تغذية لمرضى السكري؟ 1.نعم 2.لا

9.إذا الجواب نعم, كيف يحصل مرضى السكري عادة على استشارة أخصائي التغذية في هذا المركز؟

1.كل زيارة 2.كل ثلاث شهور 3.كل ست شهور 4.كل سنة 5.لا يوجد جدول زمني 6.غير ذلك,حدد

10.هل تلقى طبيب المركز تدريب خاص بإدارة مرضى السكري؟ 1.نعم 2.لا

11.هل يوجد مثقف صحي؟ 1.نعم 2.لا

12.إذا الجواب نعم, كيف تجري عادة عملية التثقيف الصحي لمرضى السكري في المركز؟

1.في كل عيادة 2. شهريا 3. كل ثلاث شهور 4.كل ست شهور 5.لا يوجد جدول زمني .غير ذلك,حدد

13.عدد مرضى السكري النوع الثاني:_____

14.عدد زيارات طبيب السكري للمركز شهريا:_____

15.عدد العيادات العامة شهريا:_____

16.عدد عيادات الاختصاص:_____

17.هل يجري المختبر فحص(HbA1c)؟ 1.نعم 2.لا

18. هل يوجد تصوير أشعة؟ 1.نعم 2.لا

19	هل تتوفر أي من الاختصاصات التالية؟	1.نعم	2.لا	عدد الزيارات شهريا	عدد المرضى المفحوصين شهريا
	1.طبيب عيون				
	2.طبيب كلى				
	3.طبيب باطني				
	4.طبيب غدد				
	5.طبيب سكري				

20.من يقوم بمتابعة مرضى السكري في المركز؟ 1.طبيب العيادة 2.طبيب خاص بمرضى السكري

Appendix (4)

كلية الصحة العامة /جامعة القدس

بحث كمتطلب لماجستير الصحة العامة

اسم الطالب: إياد سمارة

يعتبر مرض السكري من أكثر الأمراض المنتشرة في فلسطين, حيث يقسم المرض إلى عدة أنواع, أهمها نوعين, نوع يصيب الأطفال و الشباب يطلق عليه النوع الأول, و نوع يصيب الكبار و هو النوع الثاني من المرض و هو ناتج عن نقص في إفراز الانسولين الذي ينظم نسبة السكر في الدم أو خلل في حساسية خلايا الجسم للانسولين مما يؤدي إلى ارتفاع نسبة السكر في الدم مما يؤدي بدوره إلى ظهور أعراض و مضاعفات هذا المرض كضعف البصر و مشاكل في الكلى و الأعصاب.

و يهدف هذا البحث إلى معرفة العوامل المؤثرة في إدارة مضاعفات مرض السكري النوع الثاني في محافظتي جنين طوباس من خلال الأطباء العاملين مع مرضى السكري النوع الثاني في مراكز الرعاية الأولية التابعة لوزارة الصحة و وكالة الغوث و الإغاثة الطبية و القطاع الخاص من اجل العمل على الوقاية و الحد من انتشار مضاعفات هذا المرض عند هؤلاء المرضى و بالتالي تقليل نسبة الوفيات الناتجة عنه. لذا سيتم مقابلة جميع الأطباء الذين يتعاملوا مع مرضى السكري النوع الثاني في محافظتي جنين و طوباس دون استثناء.

لقد قمنا بتجهيز استبيان يحتوي على أسئلة خاصة بأهداف الدراسة, لذا نرجو منكم الإجابة على أسئلة الاستبيان , و آملين من حضرتكم إجابة كافة الأسئلة بموضوعية تامة و بقراءة كل فقرة بتمعن و الإجابة عليها حسب التعليمات الواردة قبل كل سؤال, علما إن المعلومات الواردة في الاستبيان ستستعمل لأغراض البحث العلمي فقط, و نضمن لكم السرية التامة في المعلومات التي ستدلون بها. لذا نرجو منكم التوقيع بالموافقة على المشاركة لإتمام أهداف هذه الدراسة.

شاكرين لكم حسن تعاونكم

الباحث: إياد سمارة

لقد قمت بدراسة جميع التعليمات الواردة في هذا الاستبيان و عليه قررت المشاركة في هذه الدراسة, و إن وجود اسمي و توقيعي هو دليل على قبولي للمشاركة في هذه الدراسة.

التاريخ:_____

الساعة:_____

اسم المشارك: **التوقيع:**

اسم الباحث: إياد سمارة **التوقيع:**

Appendix (5)

Variable	MOH	UNRWA	PMRS
PHC centers	9 (56.3%)	4 (25%)	3 (18.7)
Health Services	1.mother health 2.family planning 3.GP 4.Well Baby 5.dental health in 2 centers 6.school health In 2 centers 7.internal medicine 8.diabetes clinic 9.medicines 10.laboratory 11.chronic diseases	1.mother health 2.family planning 3.GP 4.dental health in 1 center 5.school health in 1 center 6.medicines 7.laboratory 8. chronic diseases	1.mother health 2.family planning 3.GP 4.Well Baby 5.dental health in 1 center 6. school health 7.psychological health 8.medicines 9.laboratory 10. chronic diseases
Lab tests	1.CBC in 4 centers 2.FBS 3.HbA1c in 2 centers 4.lipid profile 5.KFT 6.urina analysis 7.liver function	1.CBC 2.FBS 3.lipid profile 4.KFT 5.urina analysis 6. liver function in 1 center	1.CBC 2.FBS 3.HbA1c 4.lipid profile 5.KFT 6.urina analysis 7. liver function
Mean of employees	9.2	15.7	8.3
Mean of nurses	2.1	5	4
Nurses get training on diabetes care	Yes in 2 centers	Yes in 3 centers	Yes
Availability of nutritionist	Yes in central clinic	No	No
GP get training on diabetes management	Yes in 3 centers	Yes	yes
Availability of health educator	Available in central clinic	Available in 1 center	Not available
Number of diabetics registered	5464	1269	628
Number of diabetes clinics per month	Twice monthly except central clinic daily	8 times per month except the camp clinic daily	4 times per monthly
GP clinic per month	22 (daily)	8 except the camp clinic 26 (daily)	26 (daily)

Availability of XR machine	No	No	No
Availability of ophthalmologist	No	No	No
Nephrologist	No	No	No
Internist	Yes	No	No
Endocrinologist	No	No	No
Diabetician	Yes	No	No
Physician responsible for diabetics	Diabetician	GP	GP

Appendix (6)

Components of the clinic visit by WHO:

Each patient visit to the health care facility should cover the following items.

- Medical history, including:
  - Symptoms of hyperglycemia or hypoglycemia
  - Results of prior HbA1c and home blood glucose records
  - Meal patterns including frequency and content, and any change in weight
  - Lifestyle and psychosocial elements
  - Any acute complications such as infection, hypoglycemia or ketoacidosis
  - Any chronic complications related to vision, kidney, nerve, or the cardiovascular system
  - Any associated cardiovascular risk factors such as a positive family history
  - hypertension, dislepedimia
  - Review of all medications; ask if the patient is taking aspirin

- Physical examination, including:
  - Height and weight
  - Vital signs, including blood pressure supine and sitting
  - Fundoscopic examination, looking for any signs of retinopathy
  - Oral examination, including gums
    - Cardiovascular including evaluation for pulses and bruits
    - Abdominal exam, assess liver size
    - Foot examination, for deformities
    - Neurological examination: light, touch, vibration sense, reflexes, motor strength.

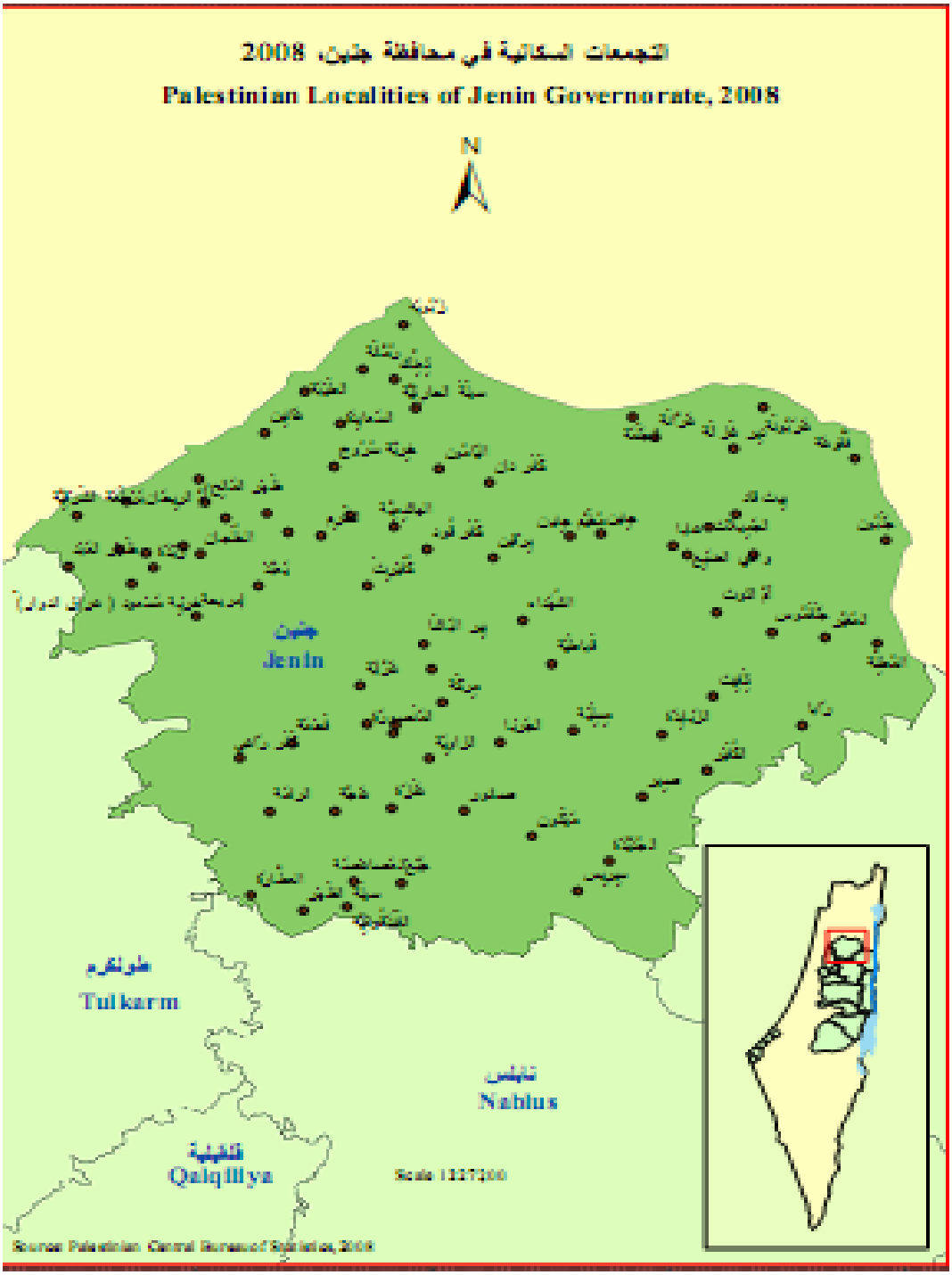
- Diagnostic studies, including:
    - Fasting and 2-hour postprandial glucose, if feasible
    - Quarterly HbA1c
    - Yearly chemistry panel, fasting lipid profile, urinalysis (including microscopy and urine Microalbumin screening)
    - Thyroid stimulating hormone for type 1 and for type 2, as indicated

- ECG in adults at baseline, and then as clinically indicated.

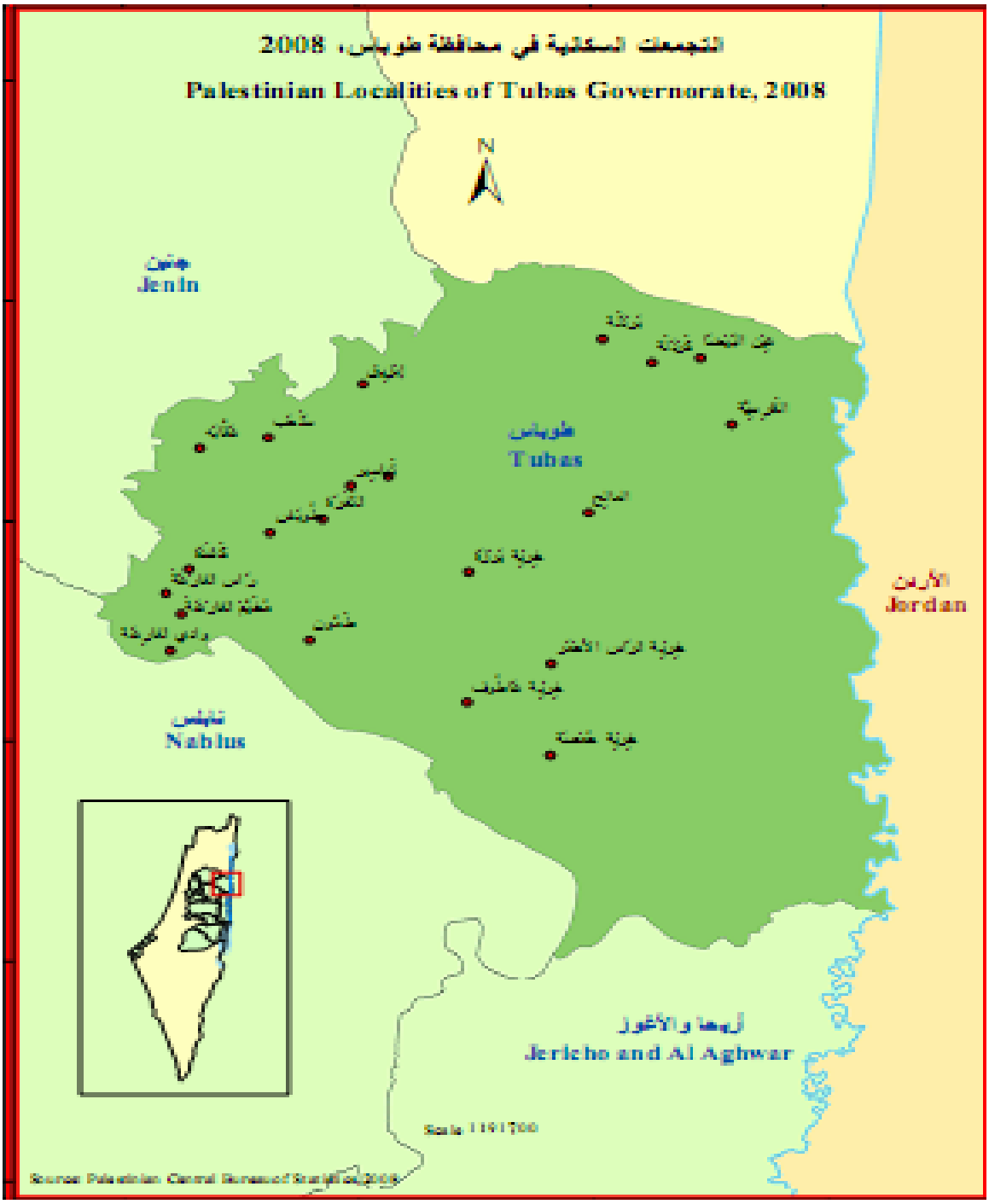
Quick guide of MOH just mention the medical history and full physical examination without details, but according to the laboratory test it provides us with which test should the patient perform in diabetic clinic:

- Fasting plasma glucose.
- HbA1c Q 3-6 months.
- Fasting lipid profile (14 hours).
- Ophthalmologic examination.
- Serum Creatinin in adults; and in children if proteinuria is present.
- Urinalysis: glucose, ketones, protein, sediment.
- Test for microalbuminuria (quantitative).
- Urine culture if sediment is abnormal or symptoms are present.
- Thyroid-stimulating hormone (TSH) in all diabetes type 1 patients.
- Electrocardiogram (ECG) in adults.

Appendix (7)


التجمعات السكانية في محافظة جنين، 2008
Palestinian Localities of Jenin Governorate, 2008
N
جنين
Jenin
طولكرم
Tulkarm
نابلس
Nablus
قلقيلية
Qalqilya
Scale 1:127,000
Source: Palestinian Central Bureau of Statistics, 2008

Appendix (8)


التجمعات السكانية في محافظة طوباس، 2008
Palestinian Localities of Tubas Governorate, 2008
N
جنين
Jenin
طوباس
Tubas
نابلس
Nablus
الأردن
Jordan
أريحا والأغوار
Jericho and Al Aghwar
Scale 1:91,700
Source: Palestinian Central Bureau of Statistics, 2009