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Deanship of Graduated Studies
School of Public Health

Thesis Approval

Nutritional Assessment for Type II Diabetes mellitus in Dheisheh refugee Camp – Bethlehem District

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2. Internal Examiner: Dr. Lina El-Khairy Signature .....
3. External Examiner: Dr. Abdellatief Shaower Signature .....

Jerusalem – Palestine

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Declaration

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

Abla Ali M. Soman

Jerusalem 2009

Abstract

Diabetes is one of the main health problems in the Palestinian society that is demonstrating an increased pattern due to different factors determining the occurrence of the disease. Its prevalence rate was about 9% in 2000, and the estimated prevalence rate among refugees was 4.7% in 2001. To date there are very limited numbers about nutritional diabetes in Palestine, and none of them were concerned with the food content consumed by these patients. Therefore, this study aims to assess nutritional status and food content for type 2 diabetes patients residing at Dheisheh Refugee Camp in Bethlehem district.

A cross-sectional design has been used. Our study sample was based on the list prepared by Ibdaa Diabetic Club which was based on the UNRWA registry. Accordingly, 154 type 2 patients fit with this study inclusion-exclusion criteria, though, 104 participated in this study. An Interview questionnaire and food frequency questionnaire (FFQ) were used to collect the need information. Weight and height measurements and the blood testing for HbA1c were done as objective tests for this study.

Results show that 30.8% of the study population were males (n=32) and 69.2% were females (n=72). The mean age was 54.6 years (SD 8.45).While the duration of diabetes illness varied between 1-27 years with an average of 7.5 years (SD 5.48). The mean level of HbA1c in this study was 8.27 (SD ±1.62, range 5.30-13.2).Of the study population 83.7 % (n=87) underwent HbA1c testing. A significant positive association was found between the frequency of nutritional advice with HbA1c ($P<0.05$).

Data showed that the mean consumption of carbohydrate was 231.6 g/day, 42.7 g/day fat, 52.7 g/d protein, and the average caloric intake of 1488 Kcal/day. None of the linear regression between total CHO, fat, protein, and caloric intake with HbA1c showed a significant association. Also, the t-test showed no significant difference in the means between these intakes and HbA1c categories.

Finally, the logistic regression model for HbA1C, in adjusting for age, gender, dependents number, disease duration , body mass index , none of the nutritional intakes per day, i.e. total CHO, fat, protein, and total caloric intake tertiles showed any significant adjusted odds ratios.

Study results show that there was no significant difference in food consumption between patients with HbA1c > or HbA1c $\leq$7. Setting up professional education programs and a national program for nutrition of Type 2 diabetes by using more advanced research methodology such as cohort or case-control designs might be more informative of some missing information needed for controlling diabetic patients' glycemia.

ملخص الدراسة

يعتبر مرض السكري من اهم المشاكل الصحية التي تواجهة المجتمع الفلسطيني في الوقت الحاضر, و لاسباب متعددة يظهر هدا المرض اعداد متزايدة من الحالات في المجتمع الفلسطيني. في عام 2000 كانت نسبة حدوثة في المجتمع الفلسطيني هي9%، في حين كانت في عام 2001 4.7% بين اللاجئين الفلسطينيين.لذلك هدفت هده الدراسة الى وصف الوضع الغدائي لمرضى السكري – النوع الثاني – في مخيم الدهيشة للاجئين في محافظة بيت لحم.

أجريت دراسة وصفية مقطعية في العام 2007، اختيرت عينة هدة الدراسة بالاعتماد على سجلات نادي ابداع لمرضى السكري في مخيم الدهيشة و التي بنيت على سجلات المرضى المسجلين في عيادة الوكالة بمخيم الدهيشة. و بهدا كان هناك 154 مريض سكري النوع الثاني قد انطبقت عليهم شروط الدراسة , 104 مريض شاركوا في هدة الدراسة.

تم استخدام الاستمارة كاداة لجمع المعلومات, شملت المعلومات الاجتماعية الخاصة بالمرضى,التاريخ المرضي,العلاجات المستخدمة, التاريخ الغذائي, بالاضافة الىانواع وكميات الاطعمة التي يتناولها المرضى ودلك باستخدام استمارة التكرار الغدائي . كماستخدم مقياس الطول والوزن بالاضافة الى فحص السكري التراكمي في هده الدراسة.اظهرت نتائج هدة الدراسة ان متوسط اعمار المرضى كان 54.6 عاما (انحراف معياري 8.45) ، 31% منهم في الفئه العمرية بين 50-59 سنة. منهم 30.8% دكور وعددهم32 , و منهم ما نسبتة 69.2 اناث و عددهن 72،يعانون من مرض السكري بمدد تتراوح من

سنة الى 27 سنة بمتوسط 7.5 عاما(انحراف معياري 5.48) و فقط ما نسبته 83.7 من عينة الدراسة عملوا فحص السكري التراكمي، وكانت ما نسبته 25.3 من النتائج أقل من 7.

بينت الحسابات بأن متوسط فحص السكر التراكمي للمرضى في مخيم الدهيشة هو 8.27 (انحراف معياري 1.62) ، بمدى يتراوح بين (5.30_13.2). و بينت الدراسة ايضا ان % 83.7 من المرضى الذين اشتركوا في الدراسة قد عملوا فحص السكر التراكمي و عددهم 87, منهم 25.3% فقط اقل من7 وعددهم22. بينت النتائج بأن استهلاك الكربوهيدرات يتوزع حول الوسط الحسابي 231.9غم / يوم، و42.7 غم / يوم للدهون,52.7 غم /يوم للبروتينات، في حين كان1488سعرحراري/ يوم للسعرات الحرارية

في هذه الدراسة بينت كل المعادلات الخطية بين الكربوهيدرات، البروتين، الدهون، و السعرات الحرارية مع فحص السكر التراكمي عدم وجود علاقة ايجابية، وقد اوجدت نتيجة مماثلة عند مقارنة الثلث العلوي مع الثلث السفلي لمجموع الكربوهيدرات ولمجموع البروتين ولمجموع الدهون ولمجموع السعرات الحرارية المستهلكة في اليوم من قبل المرضى بمستويات فحص السكر التراكمي الاكثر والاقل من 7. كماأوجد فحص العامل المستقل(t-test) بأنه لا توجدعلاقة بين العوامل السابقة ومستوى فحص السكر التراكمي.

أظهرت النتائج بأنه لا يوجد هناك اختلاف بين المرضى ذوي فحص السكر التراكمي الأكثر من 7 أو أقل من 7. ربما رجع ذلك الى حجم العينة الصغير نسبيا (87) التي شاركت في الدراسة. أو ربما رجع ذلك

الى الحاجة لاستخدام وسيلة اخرى لجمع المعلومات غير استمارة التكرار الغذائي و التي استخدمت في هذة الدراسة.

هذة الدراسة تظهر الحاجة الى برنامج تعليمي و برنامج وطني بما يخص الغذاء و مرض السكري. كما تبين الحاجة الى تفعيل البروتوكولات العلاجية الخاصة بمرض السكري في فلسطين و تشكيل هيئة وطنية لمتابعة هذا الموضوع.وكباحثة اوصي بدراسة تبحث المكونات الغذائية لمرضى السكري في فلسطين, وذلك باستخدام طرق بحثية ملائمة و اكثر دقة.

Chapter One

Introduction

1.1 Background

1.2 Study problem

1.3 Study justification

1.4 Subject area

1.5 Study aim

1.6 Study objectives

1.7 Study limitations

1.8 Expected result and information of this study

1.9 Thesis chapters' description

1.1 Background

Diabetes mellitus is a complex, heterogeneous, and a metabolic disease that is characterized by abnormal blood glucose" Sugar" concentration (WHO, 1991). This increase of blood sugar concentration is though to result from reduction in insulin secretion in the pancreas or reduced sensitivity to insulin in the peripheral tissues (WHO, 1994). Therefore, two major types of diabetes are recognized. The first type is diabetes type 1 (Insulin Dependent Diabetes Mellitus, IDDM) which is characterized by severe reduction of insulin secretion that is due to destruction of the mass of beta cells responsible for insulin secretion in the pancreas. The second type is diabetes mellitus type 2 (Non Insulin dependent Diabetes Mellitus, NIDDM) which appears at older age than type 1 diabetes and represents 85% of diabetes (WHO, 1991).

The onset and progress of diabetes type 2 is less acute compared to diabetes type 1 and its developments of complications are less aggressive. Type 2 developments complications are mainly due to insulin resistant in the muscle tissue and consequently increase insulin secretion (haffiner, 1996). However, the management of diabetes type 2 believes to be possible depending on life style changes through diet and exercise (Nelson, 2002).

1.2 Study problem:

Diabetes is considered as growing and threatening health problem for the whole world (Zimmet& lefevre, 1966). The prevalence and incidence of diabetes varies across racial/ ethnic classification as they are currently constituted, for example the prevalence among black have been found 1: 5 times that among white (Harris 1991, Roseman, 1985, wetterhall et al, 1992).

The prevalence of diabetes in Western life-style countries is estimated to be between 6-7% (Albarran et al. 2006).In some developing countries the prevalence is more than 6% (Middle East, Western Pacific) (Bacchus et al.1982).Between 1995 and 2025, it is predicted to be a 35% increase in the worldwide prevalence of diabetes. The rising number of people with diabetes will occur mainly in populations of developing countries, leading to more than 300 million people with diabetes worldwide by 2025 (see table 1) (WHO, 2002).

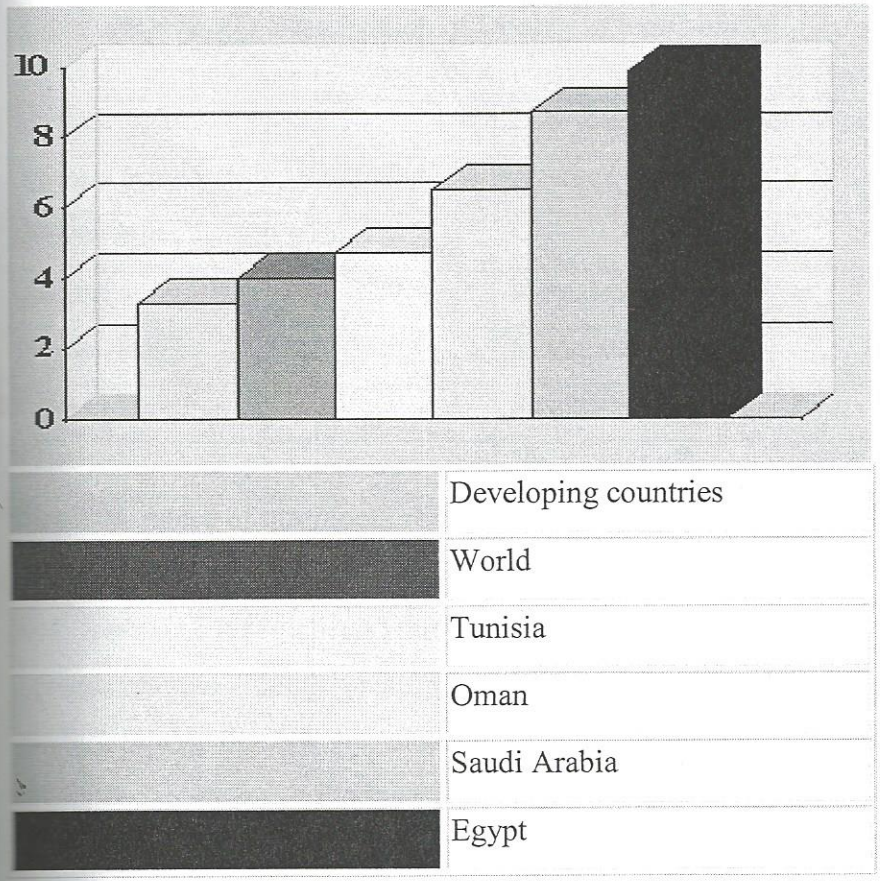
Table (1.1): Prevalence (%) and number of cases of Diabetes type two in million.

	1995	2000	2025
World	135.3(4%)	154.4(4.2%)	300(5.4)
Developed countries	51(5.9%)	54.8(6.2%)	72.2(7.6%)
Developing countries	84.3(3.3%)	99.6(3.5%)	227.7(4.9%)

King et al, Diabetes Care 1998, 21:1414-31

Hilary King et al provided estimates on diabetes prevalence for the years, 1995, 2000, and 2025 for people aged 20 years and above, using previous studies and the United Nations population estimates and projections. Some estimates for the Arab countries are shown and they clearly indicate the magnitude of the problem (see table 2) (King, 1993).

Figure (1.1): Prevalence Estimates of Diabetes in selected Arab Countries > 20 Years in the year 2025:



Source adapted from: King et al, Diabetes Care, 1993

Globally, changes in human behaviour and lifestyle over the last century have resulted in a dramatic increase in the incidence of diabetes, the epidemic is chiefly of type 2 diabetes and the associated conditions known as 'diabesity' and 'metabolic syndrome'. In conjunction with genetic susceptibility, type 2 diabetes is brought on by environmental and behavioural factors such as a sedentary lifestyle, overly rich nutrition and obesity (James,2001).

Rates of type 2 diabetes have increased within the last decades. This is due largely to the global epidemic of obesity, a major risk factor for developing type 2 diabetes. Development of obesity is related mainly to decreased physical activity and increased caloric intake, besides genetic background which determines the tendency to obesity (Coppack, 1998). Prevalence rates for overweight and obese people vary according to region, but obesity now associated with poverty even in low-income countries and burden of disease worldwide, and this turns obesity issue in a matter of concern for World Health Organization (WHO) and

urges it to issue consensus definition of different degrees of overweight and obesity in adults in 2000(Coppack, 1998) (see table 2).

Table (1.2): WHO classification of Obesity in terms of BMI (kg/m2)

Underweight	<18.5	Low (but risk of other clinical problems
Normal Range	18.5-24.9	Average
Overweight	≥ 25	
Pre-obese	25.0-29.9	Increases
Obese class 1	30.0-34.9	Moderate
Obese class 2	35.0-39.9	Severe
Obese class 3	≥	Very sever

The importance of nutritional recommendations for subjects with diabetes has been known as major issue in treatment of the disease. The target of dietary recommendations is prevention and treatment of diabetes through improving glycemic control and lipid profile and optimizing the blood pressure, as high risk of micro vascular abnormalities and cardiovascular diseases in diabetic subjects is linked to increased postprandial glucose response. However, adhering to dietary recommendation is not an easy task as dietary patterns differ greatly (Sudha, 2004).

1.3 Study justification

Diabetes is main health problem in the Palestinian society that is demonstrating an increased pattern due to different factors determining the occurrence of the disease. Dietary change, physical inactivity, stress, and genetic factors are thought to affect the increase in the incidence of diabetes in Palestine (shaar, 1998). In Palestine diabetes type 2 prevalence rate is about 9% in 2006. By the end of 2003, there were 15,844 diabetic Palestinian refugee patients (including those with hypertension) under supervision of UNRWA in Gaza Strip. The estimated prevalence rate of diabetes mellitus among Palestinian refugees aged 40 years and above was 4.3% in 2000 and 4.7% in 2001. The gap between the expected prevalence rates and cases under supervision requires special efforts to accelerate early case-finding activities in order to detect these diseases and meet the high cost of treating their complications and disabling consequences (MOH reports, 2003). In the West Bank, the distribution of incidence rate of type diabetes by age group shows that the peak onset started

since the age of 25-34 years at the rate of 43.1 per 100,000 to reach 1,310 per 100,000 among the age group of 55-64 years and 1,335 per 100,000 at the age of 65 years and over (MOH reports, 2003).

Palestinian community is living in transitional epidemiological stage which is characterized by changing of disease trends from communicable to non communicable diseases. The existence of high prevalence of modernization risk factors like obesity which is found to be 36.8% among women in rural Palestinian area and 49.1% in an urban area. While the percentage was among men in rural areas 18.1% and 30.6% in an Urban areas respectively (see table 3).

Table (1.3): Prevalence of Obesity, BMI> 30 by sex in a rural and an urban Palestinian community:

	Women	**Men**
Rural area	36.8%	18.1%
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Furthermore, the high prevalence of smoking, which approved by literatures to be another risk factor for type 2 diabetes, results according to Palestinian Central Bureau of statistics 2001, find that the prevalence of smoking among those older than 12 years in west bank was 43.3% in males and 4.3% in females. While in Gaza strip the prevalence rate was 35.8% in male and 1.2%. in female (Palestinian Central Bureau of Statistics, 2005).

In Palestine several studies was carried out but not all was published. These studies were concerned with diabetes type 2 treatments, management, complications, causes and sign and symptoms . Some local studies were concerned with diabetes type 2 patient's self-management. A study by Jilleh (Jilleh, 2002) showed clear weakness in self care management for diabetes mellitus on patient level. Anther study was conducted by community center, Birzeit University in 2002 to study constrains which face dealing with diabetic patients at crisis.Their results showed that reaching service centers and poor self-management are the main problems facing diabetic patients and health care providers who work within Palestine (Birzeit University,2002).Another study in Dheisheh refugee camp in 2005, on 162 diabetic

patients receiving their treatments in UNRWA clinic, studied the quality of services and types of self-care techniques, showed that 100% of patients have one or more (DM) complications; the most was Hypertension(HTN) with 51.6% and then eye problems with 48.4% (Ibdaa Center,2005).None of studies above aim to evaluate nutritional lifestyle for type 2 diabetes and it is position in disease prevention or treatment.

1.4 Study area

Dheisheh refugee camp is located in Bethlehem district. It is one of three refugee camps with 13,967 residents living there. It lies 850m above sea level, and far away 2.5 km to the west of Bethlehem city, surrounded by Beit Jala lands, Irtas village, Adoha, and Bethlehem city. Dheisheh is one of fifty-nine Palestinian refugee camps dispersed throughout the West Bank, Gaza Strip, Jordan, Lebanon, and Syria. Dheisheh refugee camp built on less than one square kilometer of land. The camp population was 9,680 individuals in 2007 (Palestinian Central Bureau of Statistics, 2005). There are two resourced schools and one part time doctor who serve the needs of the entire camp. Medical services (treatment and follow up), social services and education at Dheisheh camp, as any other Palestinian refugee camp, is run by UNRWA. Other non-governmental organization provides some other health services, which is not provided by the UNRWA focusing on primary level of prevention such as health and physical education. In addition, there are some medical centers working part time in the camp providing emergency treatments for camp residents who experience an urgent health situation or trauma in evening period of the day, other wise at this time patient has to go to any hospital or medical center outside the camp. Ibdaa Center, a non-governmental organization, provides primary level health services mainly for diabetic patients such as education programs through Ibdaa Diabetic Club which provides counseling in related topics, that also in addition for physical programs and medical follow up, beside to services for ophthalmic patients who receive weekly medical follow up and glasses which given for whom in need, and mental health counseling (UNRWA annual report, 2005).

1.5 Study aim:

This study aim to assess the nutritional status and content of diabetes type 2 patients residing in Dheisheh Refugee Camp in Bethlehem district.

1.6 Study objectives

1- To assess diabetes type 2 patients' disease history in association to their diet intake.
2- To assess patient's perception for identified food items.
3- To assess the glycemic control among these patients and its association to their diet regimes.

1.7 Study limitations

Several limitations rose in this study mainly since it was a cross sectional study, these limitations were:

A. Generalization problems: the study was done on a specific type of population, i.e. refugees, so the study results may not be applicable to others living outside the refugee camps
B. Bias: there are two kinds of bias may limit this study:

- Recall bias since the age of study sample from 40-75 years, and diet has to take long time to be noticed as a factor in patients life, so many people were not aware for what they eat and when ,that may affect their ability to remember especially when asking questions about frequent diet in last year.
- Volunteers' Bias that rise from the awareness of patients for study objectives, which leads to have answers depends on patients view not on the reality for some study questions.

C. Lost of some people location: many diabetic patients change their address or leaving the Camp prior to the survey.

1.8 Expected result and information of this study

Based on the results and outcomes of the study, we expect to assess the nutritional content of the diabetic patients residing at the refugee camp. This is supposed to highlight if there is a relationship between these regimes and the progress in those diabetic patients complications.

This information is aimed to be of use on both levels; policy makers and community level. Regarding the first one it will help policy makers in setting their priorities regarding the

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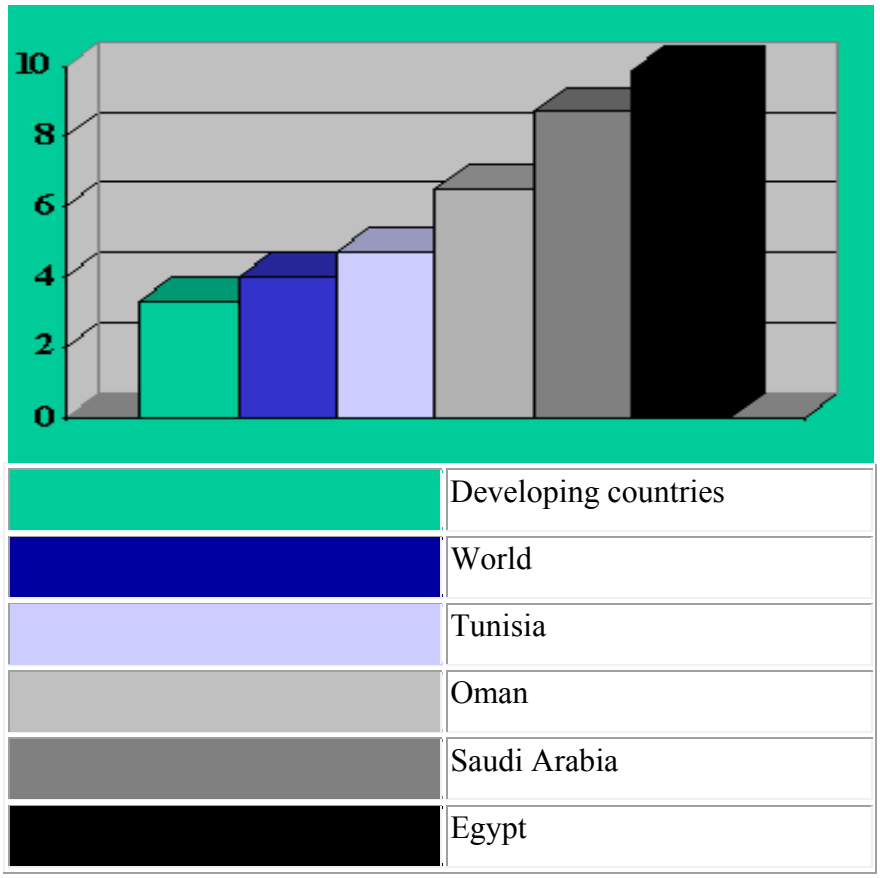

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patients receiving their treatments in UNRWA clinic, studied the quality of services and types of self-care techniques, showed that 100% of patients have one or more (DM) complications; the most was Hypertension(HTN) with 51.6% and then eye problems with 48.4% (Ibdaa Center,2005).None of studies above aim to evaluate nutritional lifestyle for type 2 diabetes and it is position in disease prevention or treatment.

1.4 Study area

Dheisheh refugee camp is located in Bethlehem district. It is one of three refugee camps with 13,967 residents living there. It lies 850m above sea level, and far away 2.5 km to the west of Bethlehem city, surrounded by Beit Jala lands, Irtas village, Adoha, and Bethlehem city. Dheisheh is one of fifty-nine Palestinian refugee camps dispersed throughout the West Bank, Gaza Strip, Jordan, Lebanon, and Syria. Dheisheh refugee camp built on less than one square kilometer of land. The camp population was 9,680 individuals in 2007 (Palestinian Central Bureau of Statistics, 2005). There are two resourced schools and one part time doctor who serve the needs of the entire camp. Medical services (treatment and follow up), social services and education at Dheisheh camp, as any other Palestinian refugee camp, is run by UNRWA. Other non-governmental organization provides some other health services, which is not provided by the UNRWA focusing on primary level of prevention such as health and physical education. In addition, there are some medical centers working part time in the camp providing emergency treatments for camp residents who experience an urgent health situation or trauma in evening period of the day, other wise at this time patient has to go to any hospital or medical center outside the camp. Ibdaa Center, a non-governmental organization, provides primary level health services mainly for diabetic patients such as education programs through Ibdaa Diabetic Club which provides counseling in related topics, that also in addition for physical programs and medical follow up, beside to services for ophthalmic patients who receive weekly medical follow up and glasses which given for whom in need, and mental health counseling (UNRWA annual report, 2005).

1.5 Study aim:

This study aim to assess the nutritional status and content of diabetes type 2 patients residing at Dheisheh Refugee Camp in Bethlehem district.

1.6 Study objectives

1- To assess diabetes type 2 patients' disease history in association to their diet intake.
2- To assess patient's perception for identified food items.
3- To assess the glycemic control among these patients and its association to their diet regimes.

1.7 Study limitations

Several limitations rose in this study mainly since it was a cross sectional study, these limitations were:

A. Generalization problems: the study was done on a specific type of population, i.e. refugees, so the study results may not be applicable to others living outside the refugee camps
B. Bias: there are two kinds of bias may limit this study:

- Recall bias since the age of study sample from 40-75 years, and diet has to take long time to be noticed as a factor in patients life, so many people were not aware for what they eat and when ,that may affect their ability to remember especially when asking questions about frequent diet in last year.
- Volunteers' Bias that rise from the awareness of patients for study objectives, which leads to have answers depends on patients view not on the reality for some study questions.

C. Lost of some people location: many diabetic patients change their address or leaving the Camp prior to the survey.

1.8 Expected result and information of this study

Based on the results and outcomes of the study, we expect to assess the nutritional content of the diabetic patients residing at the refugee camp. This is supposed to highlight if there is a relationship between these regimes and the progress in those diabetic patients complications.

This information is aimed to be of use on both levels; policy makers and community level. Regarding the first one it will help policy makers in setting their priorities regarding the

management of diabetes type 2. On the community base the results will assist the health care providers designing intervention programs targeting the health professionals (family physicians, pediatricians, nurses) as well as the patients themselves, focusing on the newly diagnosed patients or home intervention as early as possible will delay the progress of the disease and decrease the possibility of having any c omplications. Educational material is expected to be designed emphasizing on the traditional practices and showing their advantages and disadvantages as well as explaining the proper foods that should be avoided as possible and the proper balance of the food elements to have a good glycemic control.

1.9 Thesis Chapter's description

This thesis is presented in 6 chapters, listed as follows:

Chapter one: Introduction

This chapter contains the background and significance of the study, problem statement and study justification, objectives, research questions as well as study limitations. It also contains the benefits of diabetic patients regiems, demographic profile of Dheisheh refugee camp and a description of the health services provided in the study area.

Chapter two: literature review

This chapter includes the international studies and research that were conducted concerning the diabetes type 2 nutrition and its relation with those patients glycemic control.

Chapter three: conceptual frame work

It explains the methods of glycemic control among diabetic patients type 2. Types of controlling diabetes through nutrition, physical activity and treatment is also discussed.

Chapter four: methodology

It includes the study methods, population, sampling and sample size, ethical considerations, the way data was collected, coded and analyzed.

Chapter five: Results

In this chapter results are presented, frequencies, percentages and associations between the studied variables are included.

Chapter six: Discussion and recommendations

The main results of the studies are discussed in this chapter. Comparison between our study findings and international and regional ones are presented. Conclusions, recommendations and suggested future research plans are included in this chapter.

Chapter two

Literature Review

2.1 Introduction

Literatures review in this chapter will focus on the epidemiology of diabetes type 2; i.e. its prevalence and risk factors. The nutritional epidemiological studies for diabetes type 2, the use of food frequency questionnaire as a tool for nutritional assessment, and HbA1c as a predictor for glycemic control in diabetes type 2 will be discussed.

2.2 Diabetes type 2 epidemiology:

2.2.1 Age, gender, educational level and diabetes type 2

Several studies had been carried out in developed, developing and Arab countries concerning diabetes type 2. Diabetes type 2 became the center of attention as an increasingly prevalent chronic illness worldwide with the potential for debilitating complications. Diabetes type 2 contributes to increased morbidity and mortality and is the most common cause of end-stage renal disease, lower-extremity amputation, and new-onset blind-ness in adults 20–74 years of age. Adults with diabetes type 2 have heart disease mortality rates and a risk of stroke two to four times higher than adults without diabetes (National Diabetes Information Clearinghouse 1998, Diabetes UK 2003). Direct and indirect costs attributed to the disease are extremely high, exceeding 132 billion dollars in 2002 in the USA (American Diabetes Association 2003) and accounting for approximately 9% of the annual health budget in the UK (Diabetes UK 2003).

Many studies focus on differences between genders in relation with diabetes type 2 and age. Age was found to be one of the risk factor for developing diabetes type 2. Compared with men, women struggle more with diabetes self-management, have poorer metabolic control and have poorer outcomes over a wide-ranging of diabetes-related issues (quality of life, daily hassles and anxiety) (Connell 1991, Quackenbush et al. 1996, Rubin & Peyrot 1998). In a study at the USA **(**Mamie C. et. al.2005) among African American women with diabetes type 2, showed that despite high levels of internal locus of control and self-efficacy and scores indicating good mental, physical, emotional, and social health, and self-management among the women, HbA1C levels was still high. **(**Mamie C. et. al.2005). Further studies examining gender differences with self-management in diabetes, reported that men were more consistent with dietary and exercise behaviors than women, more confident in diabetes self-management, and had greater social support for making lifestyle changes related to

diabetes self-management (Fitzgerald et al. 1995, Quackenbush et al. 1996, Rubin & Peyrot 1998). Women with diabetes are also disproportionately affected with respect to mortality (Beckles & Thompson-Reid 2001). In addition, literature showed that the relative hazard of ischemic heart disease mortality in individuals with diabetes compared with those without diabetes is significantly higher in women than in men, after adjusting for age (Barrett-Connor et al. 1991, Diabetes UK 2003).

Educational level, in the literature, was shown as a positive factor in dealing with diabetes. A study in Mexico was concerned with exploring the risk factors, modifiers, as well as barriers and facilitators for behavioral change in Mexican patients with diabetes type 2 and their families. The study results showed that the 48 urban diabetic patients were older and less educated compared to their 38 relatives who participated in this study for 8 month (55.8 ± 11 and 34.7 ± 13.7 years old, and 4.5 ± 3.4 and 7.8 ± 3.7 years of schooling, respectively) (Albarran et al.2006).

2.2.2 Physical activity, overweight and diabetes type 2

Strong epidemiological evidence suggests that physical activity is associated with a reduced risk of diabetes type 2. The importance of exercise in the prevention of diabetes has been confirmed by various intervention studies. According to the World Health Report 2002, physical inactivity is estimated to cause, globally, about 10-16% of cases each of breast cancer, colon and rectal cancers and diabetes mellitus, and about 22% of ischemic heart disease. Overall, 1.9 million deaths are attributable to physical inactivity (WHO,2008). In the Da Qing study (Pan X.-P et al 1997) showed the effect of diet and exercise in preventing type 2 diabetes in people with impaired glucose tolerance. The exercise group reported a 46% decrease in incidence of diabetes type 2 compared to non-exercised group. Moreover, in the Finnish Diabetes Prevention Study, 522 overweight subjects with impaired glucose tolerance were randomly assigned to either an active intervention group or a standard treatment group (general advice on diet and physical activity) were followed for an average of 2–3 years. The intervention group who achieved the exercise goal (moderate exercise for at least 30 min per day) had an odds ratio for diabetes of 0.3 compared to the control group (95% CI 0.1–0.7) (Tuomı`lehto J., et al. 2001). Similar results were obtained in the DPP (Diabetes Prevention Program Research Group) Study (Palestinian Guidelines for diagnosis and treatment of Diabetes, MOH, 2003).

The worldwide obesity epidemic is a growing concern and it is considered a risk factor for diabetes type 2 (Nicklas, Baranowski, Cullen, & Berenson, 2001). In the United States, 34% of adults are overweight (defined as a body mass index [BMI] of 25–29.99 kg/m2) and 27% are obese (defined as a BMI of_30 kg/m2) (Wadden, Brownell, & Foster, 2002). These rates are over 50% higher than they were 30 years ago (Hays et al., 2002). The prevalence of this disorder increases with age (Laitinen,Power, & Jarvelin, 2001) and affects a higher percentage of women than men (Blocker & Freudenberg, 2001). Of women, African Americans are at especially high risk (Blocker & Freudenberg, 2001). Control of eating behavior is complex and subject to influences from biological processes, environmental processes, self-imposed modulations, and attempted self-control (Blundell &Gillett, 2001). Coupled with a culture that discourages physical activity (Wadden et al., 2002), eating behaviors may be increasing the prevalence of obesity (Hays et al., 2002). Various eating behaviors have been described in the literature as being problematic and possibly contributing to obesity. Being overweight or obese increases risk for diabetes. But if one already has diabetes, being overweight makes it harder to manage diabetes, and increases risk for high cholesterol, high blood pressure and cardiovascular disease.

In Israel, The First Israeli National Health and Nutrition Survey 1999-2001 (MABAT), was conducted on a representative sample of 3,246 adults (52.4%women) aged 25-64 years old (mean 43 years old). Body mass index (BMI) was shown as an indicator that is calculated by adjusting body weight for height. Thirty-nine percent of the sample was over-weight (25 < BMI <30), and 22.9% (women 25.8%, men 19.9%) was obese (BMI 30). Overall, 62.2%of the sample had a BMI of 25. The rates of obesity increased with age in both Arab and Jewish population groups and equally between both genders. This trend was particularly noticeable among Arab women –more than 50% of them aged 45-54 and 70%of those aged 55-64 were obese. After adjusting for age, Arab men were 1.1 times, and Arab women 1.4 times more obese than their Jewish counterparts. Almost 35% of the sample had an elevated waist-hip ratio over 50% of the women and 15% of men. Among Arab women, 66% had an elevated waist-hip ratio. Also, the socio-economic status affected women more than men, where 36.9% in the lowest tertile for SES (socioeconomic status) had a BMI >30 compared with 17.7% in the upper tertile ($p < 0.001$). The figures for men were 25.3% and 19.5% respectively (non-significant). Multiple logistic regression analysis indicated, that at the same weight, women in the lowest SES were almost four times more likely to be obese than those in the highest SES.(Kaluski et al.,2005).

In the following table, table (2.1), studies of diabetes determinants are summarized. Studies show that individuals self management play an important role in managing diabetes type 2, in addition to medication. The studies prove the importance of dietary habits and physical activity for patients with diabetes type 2 and also type 1. Also, individuals with diabetes type 2 are at high risk for coronary heart disease, and may benefit from aggressive lifestyle modification evaluated the prevalence of diabetes type 2.

A Greek study evaluated the physical activity and dietary habits from May 2001 to December 2002, among randomly enrolled 1514 men and 1528 women, showed that there was no evidence of association between cardiovascular or any other chronic disease and diabetes. (census 2001). Dietary habits were assessed through a validated food frequency questionnaire and a diet score was developed in which higher values suggest greater adherence to the Mediterranean diet. Weekly energy expenditure was assessed by considering frequency, duration and intensity of sports-related physical activity during a usual week. After age adjustment for the Greek adult population (2001 census), results showed that the projected prevalence of diabetes type 2 was 7.6% in men and 5.9% in women. A significant proportion of diabetic subjects (24% of men and 30% of women) were unaware of their condition. Moreover, a 10-unit increase in the diet score was associated with 21% lower odds of diabetes (P <0.05), while individuals taking light physical activity were at 35% lower odds ratio of diabetes compared with sedentary individuals (P <0.05) (D.B.Panagiotakos,2005).

In the DPP (Diabetes Prevention Program Research Group), in which 3234 subjects with IGT (impaired glucose tolerance) were randomly assigned to three groups: control, metformin, and lifestyle intervention. In this last group, the main aims were to reduce weight by 7% and exercising for 150 min/week; in subjects assigned to the intensive lifestyle intervention, the risk of diabetes type 2 was reduced by 58% compared to the control group. .Remarkably, this study shows that lifestyle interventions are significantly more effective than metformin, a very powerful anti-diabetic drug, in achieving diabetes prevention (Ricchardio ,2002).

Table (2.1): summarize some of studies that were concerned with diabetes type 2 prevalence and the risk factors in chosen countries and its worthy findings:

Author, Year, Country of study	**Study type**	**Sample size**	**Main results**	**conclusion**
R Bouguerra et al, 2006,Tunisia	Cross-sectional	3729	- Prevalence 9.9% and doubled over a 15-year period.	emphasize the benefit of lifestyle modification
Siba Al-Moosa et al, 2006,Oman	Cross-sectional	7179	- prevalence in urban areas 17.7% compared to 10.5% in rural -obesity (abnormal waist circumference) (OR = 1.8, 95% CI: 1.5–2.1)	Prevalence of diabetes and obesity high in urban population
AH Mokdad et al,2000,USA	Cross-sectional	12834	- Prevalence rose from 4.9% in 1990 to 6.5% in 1998--an increase of 33% and correlated with the prevalence of obesity (r = 0.64, P<0.001).	Between 1990-1998
Pereira MA et al 2005,USA	Prospective cohort study	3031 young participants	- Lifestyle factors, baseline fast-food frequency associated with changes in bodyweight in both black (p=0.0050) and white people (p=0.0013).	-Fast-food consumption has strong positive associations with weight gain and insulin resistance

Martin S et al,2007,Germany	Cross-sectional	8187	- Probability of developing the disease ranged from 17% (moderate risk) to 50% (very high risk). Elevated HbA1c in approximately 5% of the donors in the first study week and in approximately 19% in the second study week. -elevated HbA1c values correlate with known diabetes risk factors. body mass index greater than 25, and aged over 50 years .	- two week duration -The combination of a diabetes risk questionnaire and HbA1c testing could be used successfully for diabetes screening in an identified risk group

2.2.4 Nutrition, food content and diabetes type 2

Nutritional epidemiological studies are evidence for the importance to consume healthy food and proper quantity of food to control diabetes type 2 and maintain acceptable glycemic control. Fruit and vegetables are important components of a healthy diet, and their sufficient daily consumption could help prevent major diseases, such as cardiovascular diseases and certain cancers (WHO, 2008).

A recently published WHO/FAO report recommends as a population-wide intake goal the consumption of a minimum of 400g of fruit and vegetables per day (excluding potatoes and other starchy tubers) for the prevention of chronic diseases such as heart disease, cancer, diabetes and obesity, as well as for the prevention and alleviation of several micronutrient deficiencies, especially in less developed countries(WHO, 2008) .However, according to the World Health Report 2002: Low intake of fruit and vegetables is estimated to cause about 31% of ischemic heart disease, 11% of stroke worldwide and 19% of gastrointestinal cancer. Overall, 2.7 million deaths are attributable to low fruit and vegetable intake (WHO, 2008).

The Food and Agricultural Organization of the United Nations (FAO) reports that breads and cereal products were the primary source of food energy representing 49%of the calories consumed, followed by oils and fats (13.3%), and sugars and other sweeteners (13.1%).Protein consumption was at an estimated level of 56.3 g, representing about 10%of the total daily dietary intake (United states Department of agriculture, 2008).

A study in the USA that compared a simple meal plan emphasizing healthy food choices with a traditional exchange-based meal plan showed a reduction in HbA1c levels among urban African Americans with diabetes type 2 (Ziemer et al. 2003). A total of 648 patients with diabetes type 2 were randomized to receive instruction in either a healthy food choices meal plan (HFC) or an exchange-based meal plan (EXCH) to compare the impact on glycemic control, weight loss, serum lipids, and blood pressure at 6 months of follow-up. Dietary practices were assessed with food frequency questionnaires. At presentation, the HFC and EXCH groups were comparable in age (52 years), sex (65% women), weight (94 kg), BMI (33.5), duration of diabetes (4.8 years), fasting plasma glucose (10.5 mmol/1), and HbA1c

(9.4%). Improvements in glycemic control over 6 months were significant ($P < 0.0001$) but similar in both groups: HbA1c decreased from 9.7 to 7.8% with the HFC and from 9.6 to 7.7% with the EXCH. Improvements in HDL cholesterol and triglycerides were comparable in both groups, whereas other lipids and blood pressure were not altered. The HFC and EXCH groups exhibited similar improvement in dietary practices with respect to intake of fats and sugar sweetened foods. Among obese patients, average weight change, the percentage of patients losing weight, and the distribution of weight lost were comparable with the two approaches. In conclusion, this study focuses on that medical nutrition therapy is effective in urban African Americans with diabetes type 2. Either a meal plan emphasizing guidelines for healthy food choices or a low literacy exchange method is equally effective as a meal planning approach. Because the HFC meal plan may be easier to teach and easier for patients to understand, it may be preferable for low-literacy patient populations (Ziemer et al. 2003).

The effect of self-management can also be seen in relatives of diabetic patients who at risk to get type two diabetes, for that two lifestyle prevention strategies tested in first-degree relatives of patients with diabetes type 2 and to present the short-term effects of these strategies on nutrient intake, physical activity pattern, and body weight in the following study. In 16-week controlled intervention trial, subjects were assigned to one of three treatment conditions: diet group (D) (n=25), diet and exercise group (DE) (n=30), or control group (C) (n=22). Subjects/setting Non-diabetic relatives of individuals with diabetes were recruited (n=77; men and women; age 25 to 55 years). Intervention groups received group counseling on two occasions and follow-up through unannounced telephone interviews every 10 days. Counseling regarding diet and physical activity was based on the Nordic Nutrition Recommendations. In addition, increased intake of fatty fish and low glycemic index foods were recommended. Main outcome measures Changes in diet (assessed by food frequency questionnaires), leisure time physical activity (assessed through interviews), fatty acid composition of erythrocyte membrane, and body weight. Statistical analysis One-way analysis of variance and Mann-Whitney U test were used to compare changes among groups. Results find that healthy individuals with heredity for diabetes type 2 can achieve desired changes in lifestyle factors associated with increased risk for the disease (Brekke et al.2003).

In the Third National Health and Nutrition Examination Survey (NHANES III) ,diet and exercise practices from representative sample of U.S. adults with diabetes type 2 was describe, data from 1,480 adults older than 17 years with a self-reported diagnosis of diabetes type 2 analyzed . Fruit and vegetable consumption was obtained from a food frequency questionnaire; the percentages of total calories from fat and saturated fat were obtained from a 24-h food recall. Physical activity was based on self report during the month before the survey. Results find that, of individuals with diabetes type 2 , 31% reported no regular physical activity and another 38% reported less than recommended levels of physical activity. Sixty-two percent of respondents ate fewer than five servings of fruits and vegetables per day. Almost two thirds of the respondents consumed >30% of their daily calories from fat and > 10% of total calories from saturated fat. Mexican Americans and individuals over the age of 65 years ate a higher number of fruits and vegetables and a lower percentage of total calories from fat. Lower income and increasing age were associated with physical inactivity. Thirty-six percent of the sample was overweight and another 46% were obese. In conclusion the study find that the majority of individuals with diabetes type 2 were overweight, did not engage in recommended levels of physical activity, and did not follow dietary guidelines for fat and fruit and vegetable consumption (Murata, 2004).

A study among emigrants from Pakistan to Bradford, UK that was designed to study the reason for having more incidence of type 1 diabetes compared to their counterpart in Pakistan. Children from Pakistan moved from area with low incidence of type 1 diabetes to other considered high and South Asian children in this population have shown a marked rise in diabetes incidence. A study by university of Leeds in UK was permits to investigate that. Dietary information were collected on (1) South Asian children aged 9 to 11 in Bradford (group 1, n = 204); (*2*) recalled childhood diet of adult Asians in Bradford aged 10 (group 2, n = 53); and (3) comparative children in Pakistan (group *3*, n = 47). For groups 1 and 3, participants were asked to recall all items of food and drink consumed during the previous 24 hours. Nutrient intakes were generated from the raw food data using a computer algorithm. Broad food group consumption and median nutrient intakes were compared between groups. Food intake differed significantly in the Bradford children compared with their counterparts in Pakistan. The childhood diet recalled by adults was similar to that of children

currently in Pakistan. Bradford children consumed higher quantities of food that contained more fat, protein, CHO, and sugar than the other 2 groups. Bradford children were more likely to consume meat, fish, and fast food, although fewer vegetables and dairy products than the other groups. The diets of Pakistani children in Bradford differed significantly from their counterparts in Pakistan, both in broad content and nutrient composition. As a result, this study found that these dietary changes could be responsible for the increase in type 1 diabetes and for the emergence of diabetes type 2 in children; changes in the diet of a south Asia Tranmigratory population may be associated with an increase in incidence of childhood diabetes (Edwards, 2006).

In a solitary study in Japan 2002, aims to read the effect of high CHO diet on glucose tolerance in patients with diabetes type 2 mellitus. The current study indicates that high CHO diet improved glucose tolerance depending on patients and the improvement in FPG was predicted by HOMA-R on a standard CHO diet. 24 Japanese patients with mild diabetes type 2 mellitus were allocated either 55% standard CHO or 80% high CHO diets for 1 week, and OGTT and lipid profiles were examined. Then the diet was crossed over for another week, and OGTT and other identical parameters were re-evaluated. Results show that High CHO diet improved the area under the glucose concentration time curve (AUG) in 16 patients, and significantly increased and decreased 1,5-anhydroglucitol and homeostasis model assessment insulin resistance (HOMA-R) as a whole, respectively. Fasting plasma glucose (FPG) hc/sc ratio was inversely correlated with HOMA-R on a standard CHO diet. High CHO diet significantly decreased LDL- and HDL-cholesterol, whereas it significantly increased triglyceride. Furthermore, hc/sc ratios of the lipid parameters were inversely correlated with the respective parameters on standard CHO diet (Komiyama et al.2002).

Other studies on CHOs, study the optimal calorie for patients with diabetes type 2 mellitus which are individualized based on the standard body weight (SBW), physical activity, etc. On the other hand, recommended CHO composition ranges about 55–60% of the total calorie in the United State of America as well as in Japan. However, there is no evidence that the present CHO composition is optimal to all patients with diabetes type 2 mellitus (Komiyama et al.2002).

The Nurses' Health Study (G. Riccardi et al 2002) on 65,173 women followed for 6 years, in which 915 new cases of diabetes developed, reports an increase in the incidence of diabetes in those consuming a diet with a higher glycemic load especially in combination with a low intake of cereal fiber. In this study, the Relative Risk (RR) of diabetes type 2 was 2.50 (95% CI, 1.14–5.51) for women with the combination of high GL and low fiber intake. In another study about Legumes in shanghai, China, and it s role as postulated to lower the risk of diabetes type 2. The association between legumes and type 2 diabetes using data from a population-based prospective study of approximately 75,000 middle-aged women (mean age ± SD =51.7 ± 8.97 years), living in Shanghai, China. Dietary intake was assessed using a validated food frequency questionnaire (FFQ) at baseline survey and at first follow-up survey taken 2-3 year after study recruitment. Anthropometric measurements were taken. For women who developed diabetes type 2 between the baseline and follow-up FFQs, only dietary data from the baseline FFQ were included in this analysis. The average daily intake of individual food items (g/day) was combined to compute total legumes. In addition, three mutually exclusive groups (soy legumes, peanuts, other legumes) analyzed, that constitute total legumes. Associations between legume intake and diabetes type 2 incidence were evaluated using multivariable Cox proportional hazard models. A total of 64,227 women who had no prior history of diabetes at study recruitment were included in the current analysis. The average follow-up of the cohort women is 4.6 year. The relative risk for diabetes type 2 for the upper quintile relative to the lower quintile of total legumes intake was 0.62 (95% CI: 0.51-0.74) in analysis adjusted for age, kcal/day, BMI, WHR, smoking, alcohol intake, physical activity, occupation, income level, education level, vegetable intake, fiber intake and presence of hypertension at baseline. The RRs for increasing quintiles of intake were 1.00, 0.62, 0.57, 0.58 and 0.53 (P[sub trend] <0.001) for soy legumes, 1.00, 0.80, 0.95, 0.79 and 0.80; (P[sub trend] <0.001) for peanuts and 1.00, 0.78, 0.78, 0.78 and 0.76; (P[sub trend] <0.001) for other legumes. Analysis stratified by WHR and BMI categories showed similar results (Villegas, 2007).

In the seven country study(Karmous et al,2002) diet in medietarrian region was studied . Three centers in Greece, two in Italy and one in Algeria, Bulgaria, Egypt and Yugoslavia participated in the study. Randomly selected non-diabetic subjects from the general population, of age 35-60, not on diet for at least 3 months before the study.

All results were age adjusted. Energy intake varied in men, from 1825 kcal/day in Italy-Rome to 3322 kcal/day in Bulgaria and in women, from 1561 kcal/day in Italy-Rome to 2550 kcal/day in Algeria. Protein contribution (%) to the energy intake varied little, ranging from 13.4% in Greece to 18.5% in Italy-Rome, while fat ranged from 25.3% in Egypt to 40.2% in Bulgaria and carbohydrates from 41.5% in Bulgaria to 58.6% in Egypt. Fiber intake, g/1000 kcal, ranged from 6.8 in Bulgaria to 13.3 in Egypt and the ratio of plant to animal fat from 1.2 in Bulgaria to 2.8 in Greece. Comparison with the Mediterranean diet, as defined in the seven Country Study, showed significant differences especially for fruit, 123-377 vs 464 g/day of the Mediterranean diet, meat, 72-193 vs 35 g/day, cheese, 15-79 vs 13 g/day, bread, 126-367 vs 380 g/day(Brekke,2003) .

A study in Libyan Arab Jamahiriya, found that among type 1 and diabetes type 2 only 2.7% of them were on diet control (Roaeid R,and Kablan A.2007)

2.2.5 Studies in Palestine

According to the WHO global estimate, and the epidemic nature of diabetes; prevalence of diabetes is expected to increase in Palestine. The prevalence of DM in Palestine was examined a study conducted in 2000 in cooperation with Al- Quds University and MOH. The preliminary results indicated that the prevalence of DM in Palestine is about 9% in 2000. It is around the reported prevalence rate in Egypt and Tunisia (9%) and less than in Saudi Arabia (12%) and Oman (13%). In 2001, UPMRC (The Union of Palestinian Medical Relief committee) screened 2,482 people through their mobile clinics for obesity, hypertension, diabetes and dyslipidemia. The preliminary results showed that, overweight (BMI > 25) was present in 77%, obesity (BMI > 30) in 47%, hypertension in 31%, diabetes in 18% and dyslipidemia in 49%. These figures should be cautiously considered as the targeted population included men and women between 35 and 65 of age. The prevalence of diabetes and associated factors in a cross-sectional survey of urban Palestinian population of 492 men and women aged 30–65 years were studied by Abdul-Rahim et al. 2001, who found DM in 12.0% of the surveyed population (including 9.4% previously diagnosed). In 2004, according to the Demographic and Health Survey, which was done by the Palestinian Central Bureau of Statistics (PCBS), 2.2% of reported person's cases suffered from

DM, this increased to 21.1% among elderly aged 65 years while it was 11.1% among age group of 40- 64years, and 0.4% among age group of 18-39 years.

In Gaza, UNRWA clinics provide health services to Palestinian refugee patients; monitor and treat chronic diseases through NCDs clinics. The estimated prevalence rate of DM among Palestinian refugees aged 40 years and above was 4.3% in 2000 and 4.7% in 2001. In 2002, the prevalence rate was 1.6% (1.1% among males and 2.2% among females). In 2003, the incidence rate of new reported cases was 242 per 100,000(Palestinian ministry of health, 2008). However, in Al Remal health clinic (the only available data in governmental health institution in Gaza) the reported proportion of diabetic patients with obesity (BMI >=30) was 58.7% (43% in males and 69.5% in females) while the proportion of overweight diabetic patient was 27.4% (36.6% in males and 21.1% in females). New cases of Diabetes mellitus in Al-Rimal Heath clinics In 2004, out of total 623 new reported cases of diabetes in Al Rimal diabetic clinic, of them 31.3% were among the age group of 50-64, 31.0% were among the age group of 30-49 years, 18% were among age group 20-29 years, 16.1% among age 65 years and over and 3.4% among age group of 5-19 years (MOH,2008).

Moreover, only 4.7% of diabetic patients at Al-Remal center used diet to control their diabetes exclusively managed by lifestyle modification).About 28.1% of all diabetics were managed by insulin treatment. And about 18.7% were treated with a combined therapy (insulin and OHA). While Oral anti-diabetic agents was 42.1%.However , management in UNRWA NCD clinics for diabetic patients was about 26.1% of all diabetics were managed by insulin therapy, about 7.6% were treated with a combined therapy (insulin and OHA) , Oral anti-diabetic agents were 58.1%.while only 8.2% by life style management years (Palestinian health ministry (MOH),2008).

In the West Bank, in the year 2003 a total of 549 women and 387 men aged 30–65 y, excluding pregnant women participated in a population-based cross-sectional survey in a rural and an urban Palestinian West Bank community conducted at two phases. Obesity was defined as BMI ≥30 kg/m^2. Results show that the prevalence of obesity was 36.8% and 18.1% in rural women and men, respectively, compared with 49.1% and 30.6% in urban women and men, respectively. The mean difference (s.e) in BMI levels was 1.6 (0.52) kg/m^2 between urban and rural women and 0.9 (0.46) kg/m^2 in

men. At the household level, the mean energy consumption from 25 selected food items was 13.8 MJ (3310 kcal)/consumption unit/day in the rural community compared to 14.5 MJ (3474 kcal)/consumption unit/day in the urban community (P=0.021). BMI was positively associated with age in both men and women and with urban residence in women. BMI was negatively associated with smoking and physical activity in men and with educational level in women(Abdeen,2003).

Results of a series of Palestinian Central Bureau of Statistics (PCBS) household surveys indicated that between 1996 and 1998 Palestinians consumed an average of 2,114 kilocalories, a level of daily food energy consumption considered sufficient for individuals engaged in light physical activity. Two studies conducted in 2000 and 2002 provide insights into changes in the nutritional intake since the 1996-1998 period and during the first two years of the Intifada. The First Palestinian National Health and Nutrition Study was conducted in 2000 and the Nutritional Assessment of the West Bank and Gaza Strip was conducted in 2002. Comparisons of data between the two studies indicate marked declines in protein, CHO and fat intake among women of reproductive age. Given that CHOs and fats constituted 49%of the calories consumed in 1996-1998, and represent relatively inexpensive sources of calories (Abdeen 2005).

A recent study in 2007 was concerned with diabetes type 1 diabetes in relation to its complications and treatment protocols. In this cross sectional study, 60 patients (56%) of study sample reported they had follow diet regiment. However, no statistical significant found between diet regiment and glycemic control, and that explained by researcher that most patients do not consult with adietitian to discuss their medical nutrition plan (Al-khdoir, 2007). Table 2.2 summarizes major studies that were concerned with diabetes type 2 in association with the dietary factors and food content.

Table (2.2): Summary of nutritional epidemiological studies that concern with food and food groups in relation to type two diabetes:

Author, Year, Country of study	**Study type**	**Study Sample**	**Main results**
Rob M.Van dam et al,2002,USA	Prospective cohort study	42,504 male, Age 40-75yrs	- Western dietary pattern associated with an increased risk for diabetes type 2 (relative risk, 1.59 [CI, 1.32 to 1.93], and if combined with low physical activity or obesity the relative risk was 11.2 [CI, 8.07 to 15.6]
Malerbi DA et al,1996,Brazeil	Intervention study	16 patients, Well controlled diabetics patients	-No significant differences between either the fructose or the sucrose diet and the control polysaccharide diet in any of the measures of glycemic control, serum lipid levels, or insulin and C-peptide secretion.
Manisha Chandalia et al,USA	Randomized crossover study During six week	13 patients	-high intake of dietary fiber, particularly of the soluble type, improves glycemic control, decreases hyperinsulinemia, and lowers plasma lipid in diabetes type 2.
Rivellese AA et al,2007,Italy	Cross-sectional Method: 3 days diet record	540 patients	-43% of patients intake from saturated fat was >10% of total calories, only 6% fiber intake ≥20 g/1000 kcal (considered ideal), and 25% it was ≥15 g/1000 kcal (acceptable).

Rave K. et al,2007,Germany	randomized 2-way cross-over study with two 4-week treatment periods separated by a 2-week wash-out	31 patients	Total daily energy intake was limited to 7120 kJ After adjustment for body weight lost, fasting serum insulin (P = 0.031) and homeostasis model assessment insulin resistance score (P = 0.049) improved better with whole grain than with nutrient-dense meal replacement product.

Table 2.2 continues

Author, Year, Country of study	**Study type**	**Study Sample**	**Main results**
Grunberger G et al,2007,USA	double-blind study 3 month period	66 participants	-Patients average weight gain was 1.0 ± 0.4 kg, those in the placebo group continued to gain weight, in the FBCx group(a new dietary fiber) maintained their weight. In the FBCx group more energy required to maintain body weight while in the placebo group required less ($p < 0.05$). - Hypertriglyceridemia showed a reduction (-0.48 ± 0.24 mmol/L, 8.2%) in total cholesterol with FBCx, while with placebo had an increase (0.24 ± 0.21 mmol/L, 5.2%, $p < 0.05$).
Deutch B et al,2007,Denmark	Cross-section-Between the traditional foods sampled or analyzed 30-50 years ago -from2004-2006		-Percentage of local food had decreased, to a present average of about 20% and with it the dietary content of n-3 fatty acids. - 20-30% local food, corresponding to a daily intake of 3-5 g of n-3 fatty acids. Body weight, height, body mass index (BMI), cholesterol, and S-triglycerides had increased significantly

			between 1976 and 2004.
Tracey McLaughlin et al,2007,USA	Randomized trial to –750 kcal/day diet: 60% CHO, 25% fat, and 15% protein; or *2*) 40% CHO, 45% fat, and 15% protein.	29 diet treated patients	- Macronutrient consumption in the 60% vs. the 40% CHO group, respectively, 52 vs. 43% CHO ($P < 0.0001$), 18 vs. 19% protein ($P = 0.31$), 29 vs. 38% total fat ($P = 0.006$), and 8 vs. 9% saturated fat ($P = 0.31$). no significant difference in the amount of weight loss

Table 2.2. continues..

Author, Year, Country of study	**Study type**	**Study Sample**	**Main results**
Song Y et al,2004,USA	Prospective cohort	37,309 participants, Over an average of 8.8 years Age ≥45	- Comparing women in the highest quintile with those in the lowest quintile, (RRs) of diabetes type 2 were 1.28 for red meat (95% CI 1.07-1.53, P < 0.001 for trend) and 1.23 for processed meat intake (1.05-1.45, P = 0.001 for trend). - Significantly risk for frequent consumption of total processed meat (RR 1.43, 95% CI 1.17-1.75 for ≥5/week vs. <1/month, P < 0.001 for trend) and two major subtypes, which were bacon (1.21, 1.06-1.39 for ≥2/week vs. <1/week, P = 0.004 for trend) and hot dogs (1.28, 1.09-1.50 for ≥2/week vs. <1/week, P = 0.003 for trend). -Intakes of total cholesterol, animal protein, and heme iron significantly associated with a higher risk of diabetes type 2 .
McAuley KA et al,2005, new Zeland	Randomized trail, 3 dietary interventions: a high-	96 normoglycaemic, insulin-resistant	- compared with the HC diet, the HF and HP diets produce significantly (p<0.01) greater reductions in several parameters,

	CHO, high-fibre (HC) diet, the high-fat (HF) Atkins Diet, or the high-protein (HP) Zone Diet	women (BMI >27 kg/m(2)	including weight loss (HF -2.8 kg, HP -2.7 kg), waist circumference (HF -3.5 cm, HP -2.7 cm) and triglycerides (HF -0.30 mmol/l, HP [corrected] -0.22 mmol/l). --the HF diet, 25% showed a >10% increase in LDL cholesterol, whereas t only 13% on the HC diet and 3% on the HP diet.
Sargrad KR et al,2005,USA	Intervention-Randomized trail -during 8 weeks assigned to the high-protein diet (40% CHO, 30% protein, 30% fat) and six patients (4 women and 2 men) to the high-CHO diet 55% CHO 15% protein, 30% fat).	12 patients	- High-CHO and high-protein groups lost weight (-2.2±0.9 kg, -2.5±1.6 kg, , P <.05) - In the high-CHO group, HbA1C decreased (from 8.2% to 6.9%, P <.03) -FBS decreased (from 8.8 to 7.2 mmol/L, P <.02) -Insulin sensitivity increased (from 12.8 to 17.2 micromol/kg/min, P <.03).

Table 2.2 continues

Author, Year, Country of study	Study type	Study Sample	Main results
Mostad IL et al,2004,Norway	Intervention study	19 diabetic patients having triglyceride >2.2 mmol/L	-energy from fat reduced from 39% to 22 %($p < 0.0001$),. Daytime blood glucose did not change.
Tapsell LC et al,2004,Australia	parallel randomized controlled trial comparing three dietary advice groups each with 30% energy as fat: low fat, modified low fat, and modified low fat inclusive of 30 g of walnuts per day.	58 patients	- Walnut group achieved a significantly increase in HDL cholesterol-to-total cholesterol ratio (P=0.049) and HDL (P=0.046) than the two other treatment groups. - 10% reduction in LDL cholesterol in the walnut group, reflecting a significant effect by group (P=0.032) and time (P=0.036).
Daly ME et al,2006,UK	Intervention study	102 obese subjects with poorly controlled Diabetes	Weight loss greater in the low-CHO (LC) group (-3.55 ± 0.63, mean ± sem) vs. -0.92 ± 0.40 kg, P = 0.001) and cholesterol : high-density lipoprotein (HDL) ratio improved (-0.48 ± 0.11 vs. -

		type 2	0.10 ± 0.10, P = 0.01).
H F Abdul-Rahim et al,2003,Palestine	Cross-sectional	549 women and 387 men	- Prevlance of obesity was 36.8% for rural women and 18.1% for men compared with 49.1 and 30.6% in urban women and men. -At the household level, the mean energy consumption from 25 selected food items was 3,310 kcal/consumption unit/day in the rural community compared to 3,474 kcal)/consumption unit/day in the urban community (*P*=0.021).

CHO: carbohydrate

FBS: fasting blood sugar

HbA1C: hemoglobin A1C

2.4 Food frequency questionnaire as a tool for nutritional assessment.

Many types of dietary assessment methods were used to assess the diet of diabetic patients, such as 24 hours recall and food frequency questionnaires (FFQ). However, FFQ was found to be a more accurate tool for such objectives. Studies in table (2.1) and (2.2) showed that most reviewed studies that have used FFQ in diabetes type 2 diet assessments.

The food frequency questionnaire (FFQ) is a retrospective tool that asks the patient to complete a survey about food intake over a specific time period, and includes a food list, consumption frequency, and proportion sizes if it is semi quantitative. FFQ can provide qualitative and quantitative information about intake, and it has become the method of choice for dietary assessment, so it is used widely in observational epidemiological studies of diet and dietary assessment consisting of check lists for different foods and food categories. In the Health Professionals Follow-Up Study which is one of the biggest studies, is have used FFQ to examine dietary fat and meat intake in relation to risk of diabetes type 2. Prospectively followed 42,504 male participants who were aged 40-75 years and free of diagnosed diabetes, cardiovascular disease, and cancer in 1986 (Van Dam et al., 2002). Diet was assessed by a validated food frequency questionnaire and updated in 1990 and 1994. During 12 years of follow-up, they had 1,321 incident cases of diabetes type 2 . Intakes of total fat (multivariate RR for extreme quintiles 1.27, CI 1.04-1.55, P for trend=0.02) and saturated fat (1.34, 1.09-1.66, P for trend=0.01) were associated with a higher risk of diabetes type 2. However, these associations disappeared after additional adjustment for BMI (total fat RR 0.97, CI 0.79-1.18; saturated fat 0.97, 0.79-1.20). Intakes of oleic acid, trans-fat, long-chain n-3 fat, and alpha-linolenic acid were not associated with diabetes risk after multivariate adjustment. Linoleic acid was associated with a lower risk of diabetes type 2 in men <65 years of age (RR 0.74, CI 0.60-0.92, P for trend=0.01) and in men with a BMI <25 kg/m(2) (0.53, 0.33-0.85, P for trend=0.006) but not in older and obese men. Frequent consumption of processed meat was associated with a higher risk for diabetes type 2 (RR 1.46, CI 1.14-1.86 for > or = 5/week vs. <1/month, P for trend <0.0001). Total and saturated fat intake were associated with a higher risk of diabetes type 2 , but these associations were not

independent of BMI. Frequent consumption of processed meats may increase risk of diabetes type 2(Van Dam et al. 2002).

Another study used FFQ to investigate whether quantity or quality of dietary fat predicts coronary heart disease (CHD) events in middle-aged type 2 diabetic subjects. The dietary habits of 366 type 2 diabetic men and 295 women, aged 45-64 years and free from CHD, were assessed with a 53-item food frequency questionnaire. They were followed up for 7 years. Men in the highest tertile of the polyunsaturated/saturated fat (P/S) ratio (>0.28) had a significantly lower risk for CHD death than men in the two *l*owest tertiles (5.0 vs. 14.2%, P = 0.009). The risk for all CHD events was 14.2 vs. 23.2%, respectively (P = 0.044). P/S ratio did not predict CHD events in women. In Cox multiple regression analyses taking into account other cardiovascular risk factors, the highest P/S ratio tertile was associated with the lowest rate of CHD death in men (P = 0.048). Low P/S ratio in men predicted future CHD events in type 2 diabetic subjects independently of conventional CHD risk factors{Soinio, 2003 (Komiyama et al.2002).

2.5 HbA1C as a predictor for glycemic control in diabetes type2.

Poor glycemic control, places diabetic patients at high risk of diabetic complications. HbA1c is one of parameters that are used to monitor blood glucose .It is a blood test that measures the amount of glycated hemoglobin in the bloodstream over a 120-day period. Glycated hemoglobin is produced when excess glucose attaches itself to hemoglobin (red blood cells). A high percentage of glycated hemoglobin indicates problems with long-term blood sugar control. Instead of measuring blood sugar at one specific point in time, HbA1c test provides "big picture" of average blood sugar control over a period of several months. Several studies were done to compare the different ways of achieving tight glycemic control in diabetes mellitus. One of the major studies was the United Kingdom Prospective Diabetes Study (UKPDS) in which patients were randomly assigned to either intensive therapy with a sulfonylurea or insulin or to conventional treatment with diet; drugs were added if there were hyperglycemic symptoms or if the fasting blood glucose concentration was greater than 270 mg/dL (15 mmol/L). Intensive therapy was associated with a 12 percent reduction in the development of any diabetes-related endpoint (P = 0.03); it was

estimated that 19.6 patients would have to be treated to prevent any single endpoint in one patient at 10 years (figure 2.1).

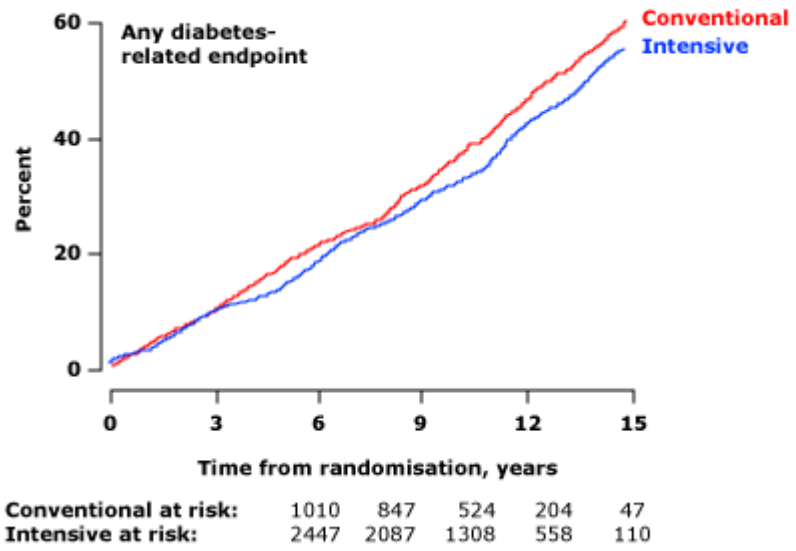

Figure (2.1); Efficacy of intensive glycemic control in diabetes type 2(Villegas et al,2007).

Another cross-sectional study in Thailand 2007, aimed to measure the prevalence of patient adherence to treatment regimens and factors affecting glycemic control among Diabetes type 2 patients. 243 diabetes patients seeking care at a tertiary hospital diabetic clinic in Bangkok were interviewed. HbA1c was used as an index of glycemic control. The proportions of cases with good adherence to physical exercise and diet regimen were 31.7% and 54.3%, respectively. About 46.5% reported receiving good social support for diabetes from his/her family. The median of HbA1c was 8% (normal range 4.7-6.3%). Approximately 33.3% achieved good glycemic control (HbAlc < or =7%), while 50.2% had poor control (HbAlc >8%).

However, epidemiological studies in table (2.1) and table (2.2) used HbA1c test as a predictor for controlling diabetes type 2 by different life style modification and be a test to study the response for different food composition in diet such as in Sargard intervention Randomized study in 2005 in USA.

2.6 Summary:

In this chapter, the epidemiology and trends of nutrition and diabetes type 2 was described. Glycemic control as a HbA1C measurement and food frequency questionnaire as a tool for diet assessment was also presented. After revision and analyzing these previous studies, this study conceptual model and study methodology were developed

Chapter 3

Conceptual Frame Work

3.1 Introduction

This chapter presents definitions of diabetes mellitus, causes, diagnosis, treatment and factors associated with diabetes type 2 controls, i.e. the components of the conceptual framework. Demographic factors, diabetes history, nutritional history and patient's perception for his/her weight, physical activity level and diet will be discussed. Furthermore, lifestyle factors and food contents using the Diabetes food guide pyramid is shown with its relation with diabetes type 2 controls.

3.2 Diabetes definition:

Diabetes has been recognized since ancient times as a wasting disease that is associated with frequent eating, urination and weight loss, despite frequent eating (Halabi,1996). The term Diabetes Mellitus describes a metabolic disorder of multiple etiologies. Davidson defined diabetes as a syndrome with metabolic, vascular, and neuropathy component that are interrelated. The metabolic syndrome is characterized by alteration in carbohydrate, fat, and protein metabolism secondary due to absence of insulin secretion or ineffective insulin actions (Davidson, 1991).

According to the World Health Organization (WHO) 2008, diabetes and its types can be defined as follows (WHO web site, 2008):

Diabetes mellitus is a chronic disease caused by inherited and/or acquired deficiency in production of insulin by the pancreas, or by the ineffectiveness of the insulin produced. Such a deficiency results in increased concentrations of glucose in the blood, which in turn damage many of the body's systems, in particular the blood vessels and nerves.

Type 1 diabetes (formerly known as insulin-dependent) in which the pancreas fails to produce the insulin which is essential for survival. This form develops most frequently in children and adolescents, but is being increasingly noted later in life.

Type 2 diabetes (formerly named non-insulin-dependent) which results from the body's inability to respond properly to the action of insulin produced by the pancreas. Type 2 diabetes is much more common and accounts for around 90% of all diabetes

cases worldwide. It occurs most frequently in adults, but is being noted increasingly in adolescents as well.

Impaired glucose tolerance (IGT) and impaired fasting glycaemia (IFG) refer to levels of blood glucose concentration above the normal range, but below those, which are diagnostic for diabetes. Subjects with IGT and/or IFG are at substantially higher risk of developing diabetes and cardiovascular disease than those with normal glucose tolerance.

3.3 The etiological classification of Diabetes mellitus

Diabetes mellitus is a syndrome characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both. An actual etiology classification suggested by the American Diabetes Association Table (3.1) summarizes these types and its classification (Nordwall, 2006).

Table(3.1): Etiological classification of diabetes mellitus

I Type 1 diabetes mellitus (beta cell destruction, leading to insulin deficiency) a. Immune mediated b. Idiopathic
II Type 2 diabetes mellitus (different grades of insulin resistance with different grades of relative insulin deficiency)
III Other specific types a. Genetic defects of beta cell function (e.g MODY Maturity Onset Diabetes of the Young) b. Genetic defects in insulin action c. Diseases of exocrine pancreas (e.g. pancreatitis, cystic fibrosis) d. Endocrinopathies (e.g. Cushing's syndrome) e. Drug- or chemical- induced (e.g. corticosteroids) f. Infections (e.g. congenital rubella) g. Uncommon form of immune-mediated diabetes mellitus h. Genetic syndromes associated with diabetes mellitus
IV Gestational diabetes mellitus

Source: Adapted from Maria Nordwall master thesis, Linköping University, 2006

3.4 Diabetes diagnosis:

The American Diabetes association criteria for diagnosis of diabetes include symptoms of diabetes and causal plasma glucose>200 mg/dl (11.1 mmol /L). Causal is defined as any time of day without regard to time since last meal. The classic symptoms of diabetes include polyurea , polydipsia , and unexplained weight loss. The American Diabetes Association (ADA) recommends cutoff value for the diagnosis and classification of diabetes and for plasma glucose level indicative of diabetes mellitus. The recommended cutoff point for diagnosis of diabetes is now a fasting plasma glucose level of 126 mg/dl (7.0mmol/L), versus the traditional value of 140mg/dl (7.8 mmol/L) (ADA, 2003, peter, 2003). According to the World Health Organization (WHO; 1980 and revised 1985, 1999) certain criteria have been developed to define patients having blood sugar higher than the expected levels of blood level of sugar. Table (3.2) summarizes these criteria.

Table (3.2) : diagnostic criteria for diabetes mellitus

Diabetes Mellitus	**Glucose Concentration(mmol/L)**		
	Whole blood venous	**Venouscapillary venous**	
Fasting	**>6.1**	**> 6.1**	**>7.0**
2 hr after 75 oral glucose load	**>10.0**	**>11.1**	**>11.1**

Source: The World Health Organization (WHO,1999).

3.5 Control of diabetes Type 2

Diagram 3.1 shows the study conceptual framework and its elements that will be discussed in details in the coming sections. According to this diagram, many factors are playing a role in controlling diabetes among patients having type 2. These factors were the concern of this study, and the diagram below is presenting the study conceptual framework. According to this diagram, the study results will be analyzed.

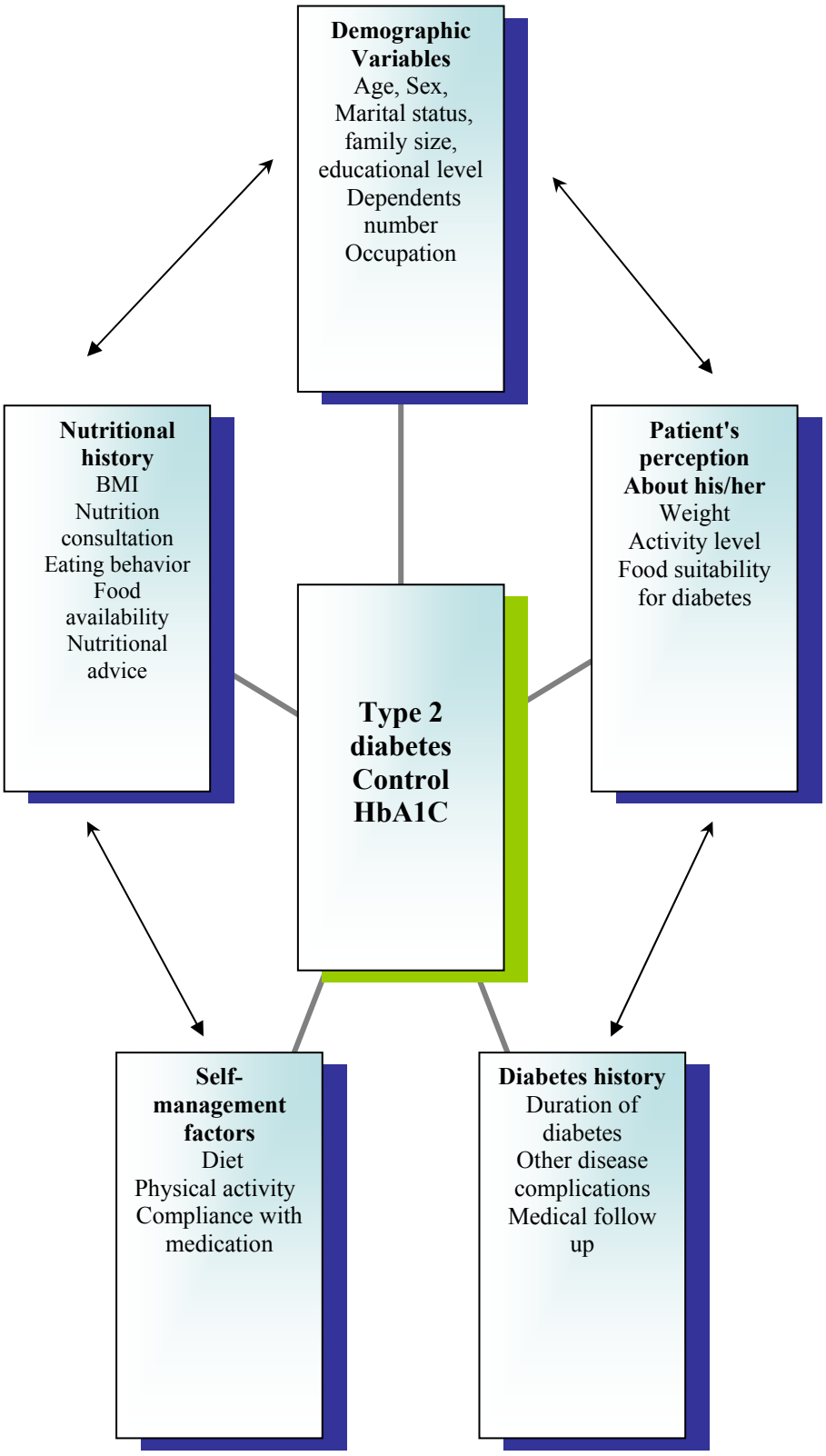

Diagram (3.1): The study conceptual framework

3.6. Diabetes and socio - demographic risk factor

The literature discussed two of type 2 diabetes risk factors: the irreversible and the modifiable risk factors. The process to controlling this risk factor had been shown in depth by intervention and cohort epidemiological studies (Zimmet et al, 2004)

Incidence and prevalence of type 2 diabetes are apparently different in diverse ethnicity and between male and female. In USA, the prevalence of type 2 diabetes is 6% among the Caucasians, but in the African Americans and Asian Americans it is estimated to be 10%, in Hispanics 15%, and in certain Native American communities 20% to 50%)(Ruchi Mathur,2008). This emphasized what was found studies that showed that the prevalence of diabetes type 2 varied among the different social classes, where the low social class showed more incidence and prevalence of type 2 diabetes (Martin et al,2007).

Regarding age, studies show that for each decade after age 40 years, regardless of weight, there is an increase in the incidence of diabetes. The prevalence of diabetes in persons 65 to 74 years of age is nearly 20% (Amuna et al ,2008) . Whilst, type 2 diabetes occurs mostly in individuals over 30 years old and the incidence increases with age, alarming number of patients with type 2 diabetes can be seen among teenagers. In fact, type 2 diabetes is now more common than type 1 diabetes in childhood. Most of these cases are a direct result of poor eating habits, higher body weight, and lack of exercise Ruchi Mathur, 2008).

Moreover, there are other risk factors of an importance and showed a significant role in the incidence and prevalence of type 2, i.e. obesity (James,2001). A direct relationship between the degree of obesity and the risk of developing type 2 diabetes was shown by various studies which were very true in children as well as adults. It is estimated that the chance to develop diabetes doubles for every 20% increase over desirable body weight (Amuna, 2008) .This is due to an interaction between genetic and environmental factors. These include: metabolic characteristics; physical inactivity; habitual energy intake in relation to expenditure and macronutrient composition of the diet.

Several studies indicate that waist circumference or waist-to-hip ratio may be a better indicator of the risk of developing diabetes than BMI. Such data suggest that the distribution of body fat is an important determinant of risk as these measures reflect abdominal or visceral obesity (Kahan et al ,2000) .In Japanese American men, for example, the intra-abdominal fat, as measured from CAT scans, was the best anthropometric predictor of diabetes incidence. The Nurses Health Study suggests that for populations of European descent risk of type 2 diabetes increases even within the normal BMI range and that a BMI of 21 kg/m2might be an optimum level.

The association of obesity with type 2 diabetes has been recognized for decades, and the major basis for this link is the ability of obesity to engender insulin resistance(Kahan et al. 2000). Although many details of the mechanisms by which the enlarged adipose tissue mass that defines obesity causes systemic insulin resistance remain unknown. Insulin resistance in obesity and type 2 diabetes is manifested by decreased insulin-stimulated glucose transport and metabolism in adipocytes and skeletal muscle and by impaired suppression of hepatic glucose output (Reaven,1995).

Advances over the last decade have expanded our understanding of the role of adipocytes in biology, and this has begun to provide mechanistic insights into the causal relationship between obesity and diabetes. It is now clear that adipocytes function as endocrine glands with wide-reaching effects on other organs including the brain. The release of a wide variety of molecules including hormones such as leptin, cytokines such as TNF-α, and substrates such as FFAs allows the adipose organ to play a major regulatory role in energy balance and glucose homeostasis (Kahan et al, 2000).

3.7 Types of interventions to control type 2 diabetes:

Two approaches for controlling type 2 diabetes have been identified thoroughly in literature. The behavioral interventions approach which includes changes in diet and increasing in physical activity. The other approach is the pharmacological intervention approach that depends on the utilization of pharmaceutical agents to improve glucose tolerance and insulin sensitivity (Zimmet, 1999).

The major goal in treating diabetes is to minimize any elevation of blood sugar (glucose) without causing abnormally low levels of blood sugar. Type 2 diabetes is treated first with weight reduction, a diabetic diet, and exercise. When these measures fail to control the elevated blood sugars, oral medications are used. If oral medications are still insufficient, treatment with insulin is considered (Ruchi Mathur, 2008).

Obviously, various treatments modes are needed to treat people with diabetes which complement each other and should be tailored according to individual patient needs and concentrated in these three lines: Diet (nutritional advice), exercise and pharmacological treatments (Palestinian Guidelines for diagnosis and management Diabetes Mellitus, 2003, MOH).

3.7.1 Diabetes and diet (nutritional advice)

Adherence to a diabetic diet is an important aspect of controlling elevated blood sugar in patients with diabetes. The American Diabetes Association (ADA) has provided guidelines for a diabetic diet. The ADA diet is a balanced, nutritious diet that is low in fat, cholesterol, and simple sugars. The total daily calories are evenly divided into three meals, in addition to weight reduction and exercise which are important treatments for diabetes. Weight reduction and exercise increase the body's sensitivity to insulin, thus helping to control blood sugar elevations. The importance of nutritional recommendations for subjects with diabetes has been known as major issue in treatment of the disease. The target of dietary recommendations is prevention and treatment of diabetes through improving glycemic control and lipid profile and optimizing the blood pressure, as high risk of microvascular abnormalities and cardiovascular diseases in diabetic subjects is linked to increased postprandial glucose response(Toeller et al ,1996).

Dietary management is a cornerstone to controlling type 2 diabetes with goals which is summarized by eating a balanced diet, having regular meals, achieving and maintaining a desirable body weight, and last but not least is to provide adequate nutrition for health and growth (the Canadian diabetes association, 2005, diabetes prevention program, PPD,1999).

The World Health Organization (WHO) recommended a balanced diet include a combination of carbohydrates, fats, proteins and fibers. WHO also recommended to eat from Carbohydrates 50-60% of DCI (daily caloric intake) mainly from complex carbohydrates (starchy fiber-rich diet), and Fats 30% of DCI (saturated fat 10%, poly-unsaturated 10%, Mono-unsaturated 10%) and cholesterol<300 mg/day, also proteins 12-20% of DCI plant and animal sources, along with Salt < 6gm/day and less than 3 gm/day for people with hypertension and diabetes(WHO site ,2008).

3.7.2 Food guide Pyramid:

It is a practical tool used to estimate the type and quantity of food, which can be eaten according to different food groups (see Annex 1). According to this pyramid the Diabetes Food pyramid was developed and will be presented in the following session.

3.7.3 The Diabetes Food Pyramid:

In 2005 the United States Department of Agriculture (USDA) released a new food guidance system replacing the former Food Guide Pyramid. The new system, called "My Pyramid," provides a set of tools based on caloric requirements to help individual make healthy food choices. The Diabetes Food Pyramid divides food into six groups. These groups or sections on the pyramid vary in size. The largest group: grains, beans, and starchy vegetables, is on the bottom. The smallest group fats, sweets, and alcohol is at the top of the pyramid (American Diabetes Association, 2008).

The Diabetes Pyramid gives a range of servings. The minimum number of servings in each group about 1600 calories and the upper end of the range; it would be about 2800 calories. Most women would eat at the lower end of the range and many men would eat in the middle to high end of the range if they are very active. The exact

number of servings depends on one need, his/her diabetes goals, calorie and nutrition needs, patient lifestyle, and the foods patient likes to eat. The number of serving patient should eat is divided among the meals and snacks which will he/she eat each day. The Diabetes Food Pyramid is based on carbohydrate and protein content instead of classification as a food. To have about the same carbohydrate content in each serving, the portion sizes are a little different compare to USAD recommendations. For example: potatoes and other starchy vegetables can find in the grains, beans and starchy vegetables group instead of the vegetables group. Cheese is in the meat group instead of the milk group. A serving of pasta or rice is 1/3 cup in the Diabetes Food Pyramid and ½ cup in the USDA pyramid. Fruit juice is ½ cup in the Diabetes Food Pyramid and ¾ cup in the USDA pyramid. The difference is to make the carbohydrate about the same in all the servings listed (Ruchi Mathur, 2008).

Following is a description of each group and the recommended range of servings of each group (see Annex2, Annex 3). This pyramid "the Diabetes Food pyramid" will be used in the analysis of the Food frequency questionnaire of this study.

In the following sections, the 6 food groups in the diabetes pyramid are presented.

3.7.3.1 Grains and Starches:

At the base of the pyramid are bread, cereal, rice, and pasta. These foods contain mostly carbohydrates. The foods in this group are made mostly of grains, such as wheat, rye, and oats. Starchy vegetables like potatoes, peas, and corn also belong to this group, along with dry beans such as black-eyed peas and pinto beans. Patients can choose 6-11 servings per day according to his/her daily requirements. However starchy vegetables and beans are in this group because they have about as much carbohydrate in one serving as a slice of bread. So, it should count as carbohydrates for meal plan (The American diabetes Association,2008).

3.7.3.2 Vegetables:

Patient can choose at least 3-5 servings per day ,all vegetables are naturally low in fat and good choices to include often in meals or have them as a low calorie snack. Vegetables are full of vitamins, minerals and fiber. This group includes spinach,

chicory, sorrel, Swiss chard, broccoli, cabbage, bok choy, brussels sprouts, cauliflower, kale, carrots, tomatoes, cucumbers, and lettuce. Starchy vegetables such as potatoes, corn, peas, and lima beans are counted in the starch and grain group for diabetes meal planning.

3.7.3.3 Fruit:

The next layer of the pyramid is fruits, which also contain carbohydrates. They have plenty of vitamins, minerals, and fiber. This group includes blackberries, cantaloupe, strawberries, oranges, apples, bananas, peaches, pears, apricots, and grapes. Patients can choose 2-4 servings per day.

3.7.3.4 Milk:

Milk products contain a lot of protein and calcium as well as many other vitamins. It is recommend that patient choose non-fat or low-fat dairy products for the great taste and nutrition without the saturated fat. Patient can choose 2-3 servings per day.

3.7.3.5 Meat and Meat Substitutes:

The meat group includes beef, chicken, turkey, fish, eggs, tofu, dried beans, cheese, cottage cheese and peanut butter. Meat and meat substitutes are great sources of protein and many vitamins and minerals. Patients can choose 4-6 oz per day divided between meals.

It is recommend that patient choose from lean meats, poultry and fish and cut all the isible fat ofmeat. Keep portion sizes small. Three ounces is about the size of a deck of cards. Only 4-6 ounces for the whole day needed.

3.7.3.6 Fats, Sweets, and Alcohol:

Things like potato chips, candy, cookies, cakes, crackers, and fried foods contain a lot of fat or sugar. They aren't as nutritious as vegetables or grains. Serving sizes can include: ½ cup ice cream, 1 small cupcake or muffin and 2 small cookies.

3.7.4 Food availability

Type 2 diabetic patients are generally aware of the link between diet and health, but there is concern that foods which need to be included in the diet for it to meet current recommendations may be difficult to find and expensive (Barrat ,2003).

Low-income patients do not successfully follow dietary recommendations to eat more whole grains and less fat and added sugar. The food environment may have a significant impact on the choice by low-income consumers to eat healthier foods, as both the availability and price of healthier food items may limit their ability to eat a healthier diet.

In Market-basket surveys were conducted in 25 stores in Los Angeles and Sacramento. Stores were selected from neighborhoods that were varied by income and surveyed three times from September 2003 to June 2004. The average cost of a standard market basket (based on the U.S. Department of Agriculture's Thrifty Food Plan [TFP]) and a healthier market basket was calculated from these prices and compared using a standard t-test to determine if they were significantly different from each other (Jetter et al, 2003).

In neighborhoods served by smaller grocery stores, access to whole-grain products, low-fat cheeses, and ground meat with <10% fat is limited. Among all items that were unavailable, 64% were in small grocery stores. For the 2-week shopping list, the average TFP market-basket cost was $194, and the healthier market-basket cost was $230. The average cost of the healthier market basket was more expensive by $36 due to higher costs of whole grains, lean ground beef, and skinless poultry. The higher cost of the healthier basket is equal to about 35% to 40% of low-income consumers' food budgets of $2410 a year (Jetter et al, 2003).

In Conclusion, the lack of availability in small grocery stores located in low-income neighborhoods, and the higher cost of the healthier market basket may be a deterrent to eating healthier among very low-income consumers (Jetter et al, 2003).

3.8 Self management of diabetes

3.8.1 Pharmacological treatment of type 2 diabetes and patient's compliance:

Many patients who have type 2 diabetes mellitus (DM) require several different Medications. Although these agents can substantially reduce diabetes-related morbidity and mortality, the extent of treatment benefits may be limited by a lack of treatment Adherence (rajesh et al,2003).

Unfortunately, little information is available on treatment adherence in patients with type 2 DM. Available data indicate substantial opportunity for improving clinical outcomes through improved treatment adherence. Factors that appear to influence adherence include the patient's comprehension of the treatment regimen and its benefits, adverse effects, medication costs, and regimen complexity, as well as the patient's emotional well-being. Outcomes research emphasizes the importance of effective patient—provider communication in overcoming some of the barriers to adherence.

A retrospective cohort study in the Tayside region of Scotland (population approx. 400 000), participants were residents of Tayside from 1 January 1993 until 31 December 1995 with at least 12 months of prescriptions of oral hypoglycaemic drugs (OHDs) showed that the main outcome measures were adherence to indices for sulphonylureas and metformin separately, adjusting for prescribing while hospitalized. Results also showed that of the total 2920 subjects identified, adequate adherence (≥ 90%) was found in 31% of those prescribed sulphonylureas alone, and in 34% of those prescribed metformin alone. There were significant linear trends of poorer adherence with each increase in the daily number of tablets taken ($p = 0.001$) and increase in co-medication ($p = 0.0001$) for sulphonylureas alone after adjustment for other factors. In conclusions, in the community only one in three with Type 2 diabetes had adequate adherence to OHDs. One tablet per day administration was associated with greater adherence than multiple tablets. Poor adherence is a major obstacle to the benefit of complex drug regimens in the treatment of Type 2 diabetes (Donnan et al, 2002)

When starting treatments of type 2 diabetic patient, the aim is to achieve treatment goals for glycemic control according to the table (3.4):

Table (3.3): Glycemic control parameters:

parameters	Acceptable control	Poor control
Target fasting or pre-prandial plasma glucose mg/dl	90-130	>150
2-hour post prandial plasma glucose mg/dl	140-180	>180
Total serum cholesterol	200-220	>220
HDL-cholesterol	>35	<35
LDL-cholesterol	100-130	>130
HbA1c	6-8%	>8%
Blood pressure mmHg	<140/90	>140/90

Source: adapted from Palestinian Guidelines for diagnosis and management Diabetes Mellitus, 2003, MOH.

In subject with type 2 diabetes, both defects of insulin secretion and insulin resistance contribute to the development of hyperglycemia. However, the major goal of treatments is optimize blood glucose control but non-pharmacological measures like lifestyle changes usually fails to achieve proper glycemic control alone. Therefore, most patients with type 2 diabetes require therapy by oral agents and sometimes insulin during the course of the disease (Palestinian Guidelines for diagnosis and management Diabetes Mellitus, 2003, MOH).

Oral antidiabetic agents used to treat type 2 diabetes (Palestinian Guidelines for diagnosis and management Diabetes Mellitus, 2003, MOH)

1. Insulin secretagogues(stimulators of insulin secretion by cells)

    a. Sulphonylureas(glibenclamide, gliclazide, glipizide, glimepiride).

    b. Non- Sulphonylureas insulin secretagogues (repaglinide, nateglinide)

2. Insulin sensitizers (increase insulin sensitivity)

a. Biguanide (Metformin)

b. Thiazolidinediones (rosiglitazone, pioglitazone)

3. Inhibitors of carbohydrates absorption (alpa-glucosidase inhibitors, acarbose and miglitol)

Insulin therapy initiated with type 2 diabetes:

a. Adding intermediate- acting insulin to oral hypoglycemic agents.

b. Split-mixed insulin

c. Plain insulin if needed.

3.8.2 Physical activity and type 2 diabetes:

Physical activity is often recommended for patients with type 2 diabetes to improve physical conditioning and glycemic control. High-quality evidence on the importance of exercise and fitness in diabetes was lacking until recent years. The last American Diabetes Association (ADA) technical review of exercise and type 2 diabetes was published in 1990 put a base for this subject (Sigal et al., 2004).

Exercise results in a shift in fuel usage by the working muscle from primarily nonesterified fatty acids (NEFAs) to a blend of NEF As, glucose, and muscle glycogen. Muscle glycogen is the chief source of energy during the early stages of strenuous exercise, while with increasing exercise duration the contribution of circulating glucose and particularly NEFAs become more important as muscle glycogen gradually depletes(Sigal et al., 2004). The origin of circulating glucose also shifts from hepatic glycogenolysis to gluconeogenesis. With increasing exercise intensity the balance of substrate usage shifts to greater carbohydrate oxidation. Although the metabolic response to exercise is influenced by numerous factors (e.g., nutrition, age, type of exercise, and physical condition), the most important factors affecting fuel utilization are genRecent that was, and a number of large cohort studies, provide strong evidence for the value of physical activity in reducing the incidence of type 2 diabetes (Sigal et al., 2004).

However, the Da Qing IGT and Diabetes Study (Pan XR et al, 1997) was the first randomized trial evaluating lifestyle interventions for the prevention of type 2 diabetes.

Also, in the Malmo study (Eriksson et al, 1998, Eriksson et al,2001 , a nonrandomized trial, 161 people with IGT who participated in a diet-and-exercise intervention were compared after 6 years with 56 individuals with IGT who)were offered the same intervention and declined. The cumulative 6-year incidence of type 2 diabetes was 11% in the intervention group and 21% in the control group (Eriksson et al,1991). After 12 years of follow-up in the Malmo study, overall mortality among IGT subjects was 6.5 per 1,000 person-years in the lifestyle intervention group, less than one-half of the 14.0 per 1,000 person-years in the IGT/no lifestyle intervention (Eriksson et al, 1998). Large cohort studies (Helmrich et al,1991, Lynch et al,1996) have consistently found that higher levels of physical activity and/or cardiorespiratory fitness were associated with reduced risk of developing type 2 diabetes. This was true in most studies, regardless of the presence or absence of additional risk factors for diabetes such as hypertension, parental history of diabetes, and obesity. Comparable magnitudes of risk reduction were seen with walking compared with more vigorous activity when total energy expenditures are similar (Tuomilehto et al, 2001).

There is firm and consistent evidence that programs of increased physical activity and modest weight loss reduce the incidence of type 2 diabetes in individuals with IGT. The two strongest studies, the Finnish Diabetes Prevention Study (Tuomilehto et al ,2001)and the U.S. DPP (PPD,2002), do not permit one to determine the relative importance of physical activity versus diet.

Exercise is considered an important to control type 2 diabetes, with a propriety exercise guidelines, people with diabetes can exercise safely (Palestinian Guidelines for diagnosis and management Diabetes Mellitus, 2003, MOH), however before starting an exercise program, patients should be evaluated in relation to:

1. Glycemic control.
2. Complications such as hypertension, coronary artery disease (CDS), retinopathy and hypoglycemic unawareness (e.g. beta blockers may mask hypoglycemic reaction).

3. If age>45 years electrocardiogram (ECG) and a stress test should be performed.

Only well-controlled individuals with diabetes should undertake exercise because it may aggravate both hypoglycemia and hyperglycemia and the duration of exercise should not be more than 20-60 minutes and from 3-5 times per week. Exercise should be adjusted to the capacity and interest of the individual person. Mild exercise short duration may require little change in the daily routine, other than extra carbohydrates. More also, Prolonged exercise lasting 45-60 minutes and intense exercise may require an alteration in the insulin dose ideally combined with frequent blood monitoring (Palestinian diabetes guide lines, MOH, 2003).

3.9 Patient's perception about diabetes and food

Family behaviors and attitudes can support or challenge a patient's psychosocial adaptation to illness and subsequently a patient's confidence, intent, and willingness in this population to implement disease-management strategies (Nicoletten et. al., 2005).

Patient's perception plays an important role to control type 2 diabetes. Diet and exercise are the cornerstones of treatment for persons with type 2 diabetes mellitus, yet patients find these areas to be the most difficult to change. Considerable research has indicated that barriers to diet and exercise are critical influences determining adherence to diet and exercise plans and obtaining a desirable glycemic control (Shultz et al, 2001). Data shows that patients who have a positive perception toward diet and physical activity achieved good results in managing their weight and BMI which directly affect glycemic control (Lemon et al., 2006) and the better patients' estimation of their own health, the higher this estimation the lower HbA1c (Eriksson, 2000). However, in one study to promoting health for type 2 diabetes by their nurse and physicians find that when provide services for diabetic patients in intervention group such as nutrition consultation, exercise consultation, and regular follow up that let to express a good sense toward their health and a positive perception which lead to achieve desirable goals in this group rather than other (Taylor et al.,2005). Studies also showed that negative perception toward health, diet, and exercise can lead to a

bad or undesirable health behavior, which drop in the pool of glycemic control and having high values from HbA1c (Lawton et. al, 2005).

3.10 Hemoglobin A1c (HbA1c)

In the body, sugar sticks particularly to proteins. The red blood cells that circulate in the body live for about three months before they die off. When sugar sticks to these cells, it gives us an idea of how much sugar is around for the preceding three months. In most labs, the normal range is 4-5.9 %. In poorly controlled diabetes, its 8.0% or above, and in well controlled patients it's less than 7.0% (optimal is <6.5%). The benefits of measuring HbA1c is that it gives a more reasonable and stable view of what is happening over the course of time (three months) (Monro, 2002).

While there are no guidelines to use HbA1c as a screening tool, it gives a physician a good idea that someone is diabetic if the value is elevated. Right now, it is used as a standard tool to determine blood sugar control in patients known to have diabetes.

Table (3.4): HbA1c categories and Mean blood sugar (mg/dl):

HbA1c(%)	Mean blood sugar (mg/dl)
6	135
7	170
8	205
9	240
10	275
11	310
12	345

Source: adapted from The American Diabetes Association, 2008

The American Diabetes Association currently recommends an HbA1c goal of less than 7.0%. Other groups such as the American Association of Clinical Endocrinologists feel that hemoglobin HbA1c of < 6.5% should be the goal (The American Diabetes Association web site, 2008).

Of interest, studies have shown that there is about a 10% decrease in relative risk for micro-vascular disease for every 1 % reduction in HbA1c. So, if a patient starts off with an HbA1c of 10.7 and drops to 8.2, they have managed to decrease their risk of micro-vascular complications by about 20%. The closer to normal the HbA1c, the lower the absolute risk for micro-vascular complications. Data also suggests that the risk of macro-vascular disease decreases by about 24% for every 1% reduction in HbA1c values (Ruchi Mathur, 2008).

It should be mentioned here that there are a number of conditions in which n hemoglobin HbA1c value may not be accurate. For example, with significant anemia, the red blood cell count is low, and thus the hemoglobin HbA1c is falsely low as is similarly in cases of sickle cell disease and other hemoglobinopathies (Ruchi Mathur, 2008).

3.11 Summary

In summary, the literature showed the importance of several risk factors i.e.: obesity physical activity, diet, medication and patient's perception on the diabetic patients' glycemic control. These factors were used to build this study conceptual framework and its food frequency questionnaire. This chapter will be the base for analysis in the coming results chapter and the study results discussion and conclusion.

Chapter Four

Study Methodology

4.1 Introduction

4.2 Bethlehem Socio-demographic and geographic area description

4.3 Dheisheh Camp Socio-demographic and geographic area description

4.4 Study population

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- 4.7.1 The interview Questionnaire
- 4.7.2 Questionnaire piloting and validation
- 4.7.3 The objective testing

4.8 Field work preparation and data collection

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4.10 Methods of data analysis

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4.12 Summary

4.1 Introduction

This study assesses the nutritional status of type 2 diabetic patients at the Dheisheh camp in Bethlehem district. In this chapter research methodology is presented. The study geographical area, study population, study design, and sampling method are presented in details. Study tools and the objective testing measurements that were used to collect the data, in addition methods of statistical analysis are described.

4.2 Bethlehem Socio-demographic and geographic area description

Bethlehem District is located in the south part of west bank, extends from Jerusalem in the north to Hebron District in the south and from dead sea area in the east to Israeli settlements in the west in occupied Palestinian land in 1948 (see Annex 4) (UNRWA, 2008).

The demographic trends in Bethlehem District, like other districts in West Bank, have been closely related to political situation. According to the population statistics estimated by the Palestinian Central Bureau of Statistics (PCBS), the mid year total population of 2005 was around 174,654 individuals who consists 4.6% of the population in the Palestinian territories. Of this population, 47,833 individuals are students which consist of 27.4% from Bethlehem residents. The Population lives in city-urban areas, which shapes 34.4% of district individuals, rural with 57.6%, and refugee camps (8.0%). The large part of these refuges lives in three camps: Dheisheh camp, Al-'Aza camp, and Aida camp (PCBS, 2005).

Bethlehem District is surrounded by Israeli settlements and the discrimination Wall, and three Israeli checkpoints. The main economic activity in Bethlehem District is tourism which affected by political situation particularly during last Intifada. Unemployment rate enlarged in the District to 117.5% in 2004 compared with the rate in year 2000, and this rate was 12.4% during the first quarters in 2005 (13.3% males and 5.2% in females) (PCBS, 2005). The average family expenditure in the district was affected by the Intifada and was decreased by 17.4% in 2004 compared to 2001. In 2005 year, the average family expenses was 436 JD, only 161 JD on food in 2004, of which around 40% is expended on meat and chicken (See table 4.1) (PCBS 2005).

The percent of family under poverty line in the district was 30.4% in 2003, and the average family expenditure in the district is less than the national level (PCBS, 2005).

Table (4.1): The average family expenses in month in Bethlehem District on food groups by Jordanian Dinners (JD)

Food groups	**Bethlehem District**	**Palestinian territories**
Bread	28.7	31.5
Meats & Chicken	42.7	48.1
Fish and sea products	2.5	3.9
Dairy foods and eggs	17.2	17.0
Oil and fat	4.3	6.9
Fruits and nuts	13.7	17.4
Vegetables and Beans	23.3	26.7
Sugar and sweat products	8.7	11.2
Non Alcoholic drinks	6.0	8.6
Other foods	7.7	10.3
Ready meals/take away	6.3	11.0
Total(JD)	161.0	192.6

Adapted from Palestinian Central Bureau of Statistics (PCBS), 2005.

4.3 Dheisheh Camp Socio-demographic and geographic area description

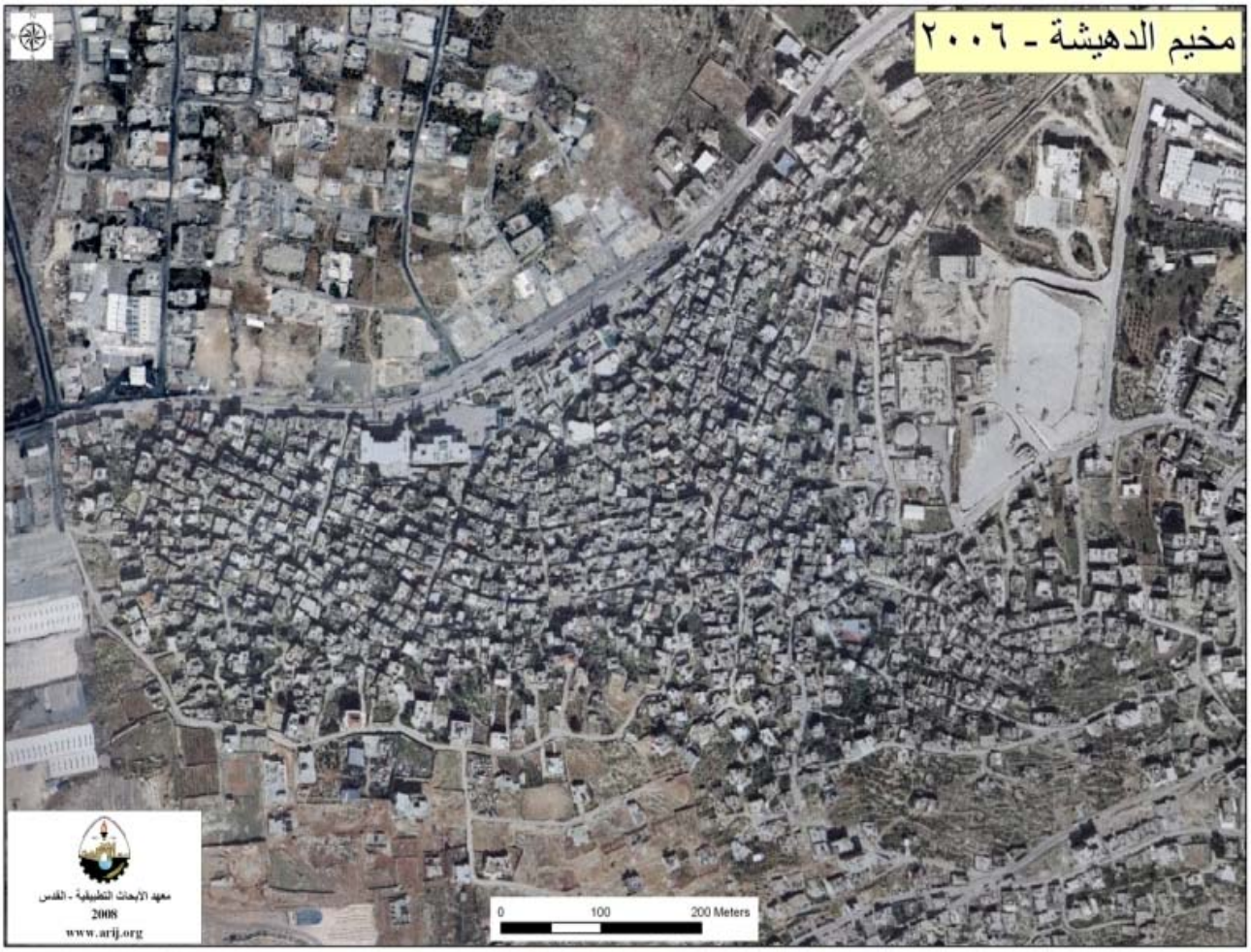
Dheisheh is one of a 59 Palestinian refugee camps dispersed throughout the West Bank, Gaza Strip, Jordan, Lebanon, and Syria. This camp is located in Bethlehem district, and is built on less than one square kilometer of land (see Map 1). The camp population size was 9,680 individuals in 2007 (Palestinian Central of Bureau, 2008).

Medical services, social services and education at Dheisheh camp, as any other Palestinian refugee camp, runs by UNRWA. Other Non-governmental organization provides some other health services which are not provided by the UNRWA focusing on primary level of prevention such as health and physical education (UNRWA annual report, 2005). In addition, there are some medical centers working part time in the camp providing emergency treatments for camp residents who experience an

urgent health situation or trauma in evening period of the day.

One of the NGOs centers that are working in the field of health is Ibdaa Center. This center provides primary level health services mainly for diabetic patients such as education programs through the "Ibdaa Diabetic Club" This diabetic program provides counseling, in parallel to a physical health program that the diabetic patients can benefit from to control their diabetes. Other services are provided in this center such as the ophthalmology clinic that helps patients with ophthalmic problems to have a weekly medical follow up and glasses which given for whom in need. Additionally, there is a mental health counseling clinic (Ibdaa Center, 2008).

Map (1): Dheisheh Refugee Camp View, a Picture for the Camp:



Source: Applied Research Institute-Jerusalem, 2008

4.4 Study population

Sample frame for this study contains all diabetic patients in UNRWA clinic at Dheisheh Refugee Camp, containing type 1 and type 2 diabetes for patients who distributed through all age categories from inside and outside the camp.

In year 2004, Ibdaa center planned a project that includes the diabetes club. The "Ibdaa Diabetic club" was one of Ibdaa Center active parts which provide services for diabetic patients focusing on primary level of prevention. Therefore, a list of all patients registered at the UNRWA clinic in the camp was obtained. Ibdaa health team

prepared a list of all patients in the clinic including their names, addresses, telephone numbers, and also diagnoses. There were 567 patients in year 2003 who were registered in the UNRWA clinic. Those patients were residing either in or outside the camp and also were either having diabetes type 1 or type 2 diabetes and impaired glucose tolerance (UNRWA clinic, Dheisheh refugee camp, 2004). This list was the base for a house –to- house survey that helped Ibdaa Health research team to evaluate diabetes cases in Dheisheh refugee camp in order to invite them to share in Ibdaa diabetic club activities in the future. The survey was only done in the camp, therefore, any diabetic patient living outside the camp were not included in the survey.

In the house to house survey the diabetes prevalence was 4% in the camp in 2004 (Ibdaa Center, 2005). There was 161 diabetic patients in the time of survey, 39.8% were males while 60.2 % were females. Out of these, 152 were having diabetes type 2.

4.5 Inclusion-exclusion criteria

In the diabetes club in Ibdaa center, the registered members were 365 diabetic patients, type 1 and type 2 by end of September 2007. This list was the sample frame for this study. Since our study was concerned with patients type 2 residing in the Dheisheh Refugee camp, the following criteria was used to include or exclude out the patients for this study from the 365 patients list obtained from Ibdaa club.

1. Patients should be type 2 diabetes; therefore any other type was excluded from this study list.

2. Patients should be a resident at Dheisheh Refugee Camp.

3. Patients should be receiving their regular medical follow up at UNRWA clinic at Dheisheh Camp, so patients living in the camp but receive their follow up outside the camp were excluded.

4. Patients should be in the age group 40-75 years.

5. Patients should not have a severe complication which can affect their cognitive ability to i.e. Cerebro Vascular Accident (CVA), mental illness, and Dementia.

There were 202 patients with type 2 diabetes in Ibdaa Diabetic club but not all fit the inclusion and exclusion criteria. Of these 48 patients were excluded for the following reasons:

There were 28 patients received their treatments at UNRWA clinic but living out side the Camp.

1. There were 12 patients under or above the required age of the study.
2. There were 6 patients with severe complications although living at the camp.
3. There were 2 patients receiving their regular medical follow up at governmental services.

Therefore, the study sample was 154 diabetic patients type 2 residing at the Dheisheh camp.

4.6 Study design and study sample

A cross-sectional study has been used. This design was chosen to meet the objectives of the study, specifically to determine nutritional intake of type 2 diabetes at Dheisheh refugee Camp.

According to the Ibdaa Diabetic Club files which are based on UNRWA clinic files and this study inclusion-exclusion criteria, there was 154 type 2 patients. Out of these patients 104 participated in the study. Of the 154 patients, 3 patients were hospitalized, 6 patients were out side the country, 9 patients were not presented in their houses for 3 visiting attempts and 3 calling trial, 2 patients died, 6 patients left the camp, and 4 patients refused to participate in the study .

4.7 Study tools and equipment

A nutrition history questionnaire and food frequency questionnaire (FFQ) were used to collect the need information for this study. Also weight and height measurements and blood HbA1C were done.

4.7.1 The interview Questionnaire

Previously validated questionnaires were used to develop the study questionnaire (Al-

khdoor, 2006, Abu Mousa, 1998, Husseine, 2000). A validated Food Frequency Questionnaire (FFQ) was used to collect information on food and food groups and was built on questionnaires published by validated bodies such as the USDA (United States diabetes association (USDA, 2007, Danit Shahar et al., 2003, ANHI, 2007). Some of the FFQ items were local recipes. This was done after consultation with local nutrition experts. The Study Questionnaire was divided into two sections (see annex 5):

A. **Section one:** Background**,** medical history, nutrition history and patients perception. This section consists of 41 questions according to the following:

1. Patient's demographic data such as age, sex, marital status, educational level, dependency, family number, working status, income source and occupation.
2. Disease prognosis, which include the history of disease including duration of disease, follow up with health care service, follow up with health care providers, glucose monitoring, medications, and finally clinical status.
3. Self-management, which includes disease management through diet, exercise, and by medical follow up.
4. Nutritional history, which includes questions about patient's weight and weight changes, eating behavior, food availability.
5. The last part was concerned with patient's perception about the different food items in the FFQ questionnaire.

B. **The second section: food frequency questionnaire (FFQ):** it consisted of 81 food items, divided on seven groups: i.e. milk and milk products group, fruit group, vegetables group, meats and meat substitutes group, sweets and fat groups, fast food group and finally orient local dishes group. Patients were asked about the frequency of eating the items during a day, a week, one month, three months and one year. All answers were relevant to last year of the survey timing. For each of the 81 elements, an estimated portion for serving (in grams or piece) was specified. Therefore, this FFQ was considered to be a semi- quantitative questionnaire. This semi-quantification was built upon the USDA diabetes food pyramid and the Israeli nutrition estimation, in addition to the Palestinian local food estimations for food items exchanges (ANHI, 2007, USAD, 2007, The Nurse Health Survey, 1980) (See

annex 5).

4.7.2. Questionnaire piloting and validation

The main aim of the pilot study was to test the study instrument (the questionnaire) clarity and wording and to determine the ability of the study method to examine the study objectives.

After the development of the questionnaire in Arabic language, the questionnaire was piloted at two settings, i.e. Beit Jala Hospital and Ibdaa diabetic club. Ten patients of type 2 diabetes were selected; 6 from Beit Jala Hospital, and 4 from Ibdaa diabetic Club. The interview was held with patients after explaining to them the aim of this pilot and the study aim. As a result of the pilot study, there were some necessary modifications on some questions as found by the pilot results.

For questionnaire validation, the contents of the questionnaire were discussed with 4 experts in diabetes, epidemiology, and nutrition, to ensure that the core content is valid and reflects the study aim and objectives.

4.7.3 The objective testing; height, weight and HbA1C measurements

a. HbA1C: Measurement of HbA1c was done using the fast Ion-Exchange Resin Separation method produced by Human Company which has a Batch no. 10658. Normal and abnormal control was run with each set of analysis to ensure internal quality control.

During a separated two days patients came to club and samples were drawn. Three laboratory technicians took the blood samples by vein-puncture and samples were collected in tubes with EDTA anticoagulant. Blood samples were sent immediately to the laboratory for HbA1c measurements (Palestinian Guidelines, MOH, 2003, Al-Ihsan Laboratory Standards).

b. Patient's weight: Patients were weighted once before filling the questionnaire by the researcher using a metric scale. Each patient weighted with his/her clothes on and also with shoes on, an electronic weight balance device, SECA 634 Bariatric Scale has an 800lb/360kg capacity with 0.2lb/100g resolution and powerful scale has a 23 x

34 x 2 non-slip platform with powered by six AAA batteries or the optional Seca 4490000009 AC adapter, calibrated to 00 scales prior to each weighing attempt was used (NexTag 1999-2009)

c. Patient's height: The height of patient was measured once before filling the questionnaire by the researcher using a metric scale. Patient's height was taken with his/her shoes off. A measuring strip meter was used to measure the height of patients. The meter strip attached for the wall hall and each patients stand up straight with his/her back to the wall near to the meter.

4.8 Field work preparation and data collection

Preparation of the field work, including the selection of study sample, mapping of the camp, preparation of the questionnaire copies and instruments, i.e. the weighing balance and the measuring meter in addition to the coordination for HbA1c testing with Al-Ihsan Center at Bethlehem city was all done at Ibdaa Diabetic Club.

The study team was three employees from Ibdaa diabetic club and one of the registered patients in the Ibdaa club. This team was trained before starting the survey on how to contact the patients and inviting them to join the study. Also, the team was responsible to coordinate with the study researcher in setting the patients appointments to have the interviews and blood testing.

When the study started, patients in the final list were contacted and were explained the study and its aim. Patients were contacted either by telephone for whom that have a telephone service or manually by written invitation forwarded for target patients containing location and time of the interview.

The field work started at October 2007 at Ibdaa Diabetic club for 2 weeks. The 154 type 2 diabetic patients, males and females, who were members at the Ibdaa Diabetic Club, were all invited to participate by filling out the study questionnaire and to have weight, height and HbA1C measurements. Out of these 154 patients, 6 patients could not come to the club, since they had physical or social situation preventing them from leaving their houses, as having a small child or being disabled. Those 6 patients were visited at home by the researcher with one member from Ibdaa Diabetic club.

The interview was person-to person interview. Each patient needed 40-60 minutes to be interviewed according to his/her response on the questions. In each day on average 8 patients were interviewed. Samples for the various types of medications were used by researcher to let patients identify their treatment accurately when they were asked questions related to their medications.

By the end of October, only 104 patients responded and participated in the study, but only 87 patients accepted to do HbA1C testing. All the 87 patients came on specific dates for blood drawing. Three laboratory technicians, in addition to the study researcher, collected the blood samples, and samples were transferred with ice box to Al-Ihsan laboratory.

4.9 Ethical Consideration

The study was authorized by Al-Quds University graduate studies council and the faculty of public health research committee. Permission to conduct the study in Ibdaa Diabetic Club at Dheisheh Refugee Camp was obtained from the Club Administration Approval from Ibdaa diabetic Club Administration was achieved prior starting the study. Ibdaa Diabetic Club team was informed about the study and its objectives and methodology, so their acceptance to host the study in their halls was done.

All patients were informed about the study and was explained about all its details, aims, objectives, benefit and were asked to sign a consent form. The consent form was attached to the questionnaire stated that all the information provided by the patients will be used only for research purposes and all will be confidential. Also, they could withdraw from the study any time they want (see annex 6).

4.10 Data analysis

The collected data was coded manually then entered, cleaned and analyzed by using the Statistical Package for Social Sciences (SPSS version 12) (The Apache software foundation, USA, 2000). For quality assurance, the frequency for 104 patients done and compared with selected data questionnaire to ensure accuracy of data entry.

Data analysis was divided into three parts:

Part 1: includes the descriptive analysis for the study population and food groups. Frequencies were calculated for all variables and presented as percentages

Part 2: the univariate analysis was presented showing the association between HbA1c and the studied determinants with the demographic variables, diabetes history, self management factors and nutritional history. Frequencies and Person Chi-square was calculated and a p-value < 0.05 was considered significant.

Part 3: This part included the food frequency questionnaire analysis. Assessment of food intake and its nutrient value calculated using food frequency questionnaire based mainly on Mayo-clinic nutritional values. Frequencies of the 6 groups were shown. After transforming the data which is not normally distributed using the natural logarithm, the geometric mean, median, standard deviation and the 3 tertiles were calculated for the total consumption of carbohydrate, total fat and total protein intake and the total caloric intake were calculated. The association between the various determinants for the consumption of the tertiles of the total fat, total protein, total fat consumption and the total caloric intake were presented using Person Chi-square. Also patient's perception of certain food item as carbohydrate source and total CHO intake consumption and the association of the various variables and the consumption of total carbohydrate, fat, protein and caloric intake were presented too, using Person Chi-square

Part 4: The linear regression equations between HbA1c and the total consumption of total carbohydrate, total fat and total protein intake and the total caloric intake are presented. Also, T-test was used to examine the difference between HbA1c categories; i.e. HbA1c $\leq$and HbA1c > 7, with the continuous levels total carbohydrate,

total fat and total protein intake and the total caloric intake are presented. Finally, a logistic regression model was developed, and the adjusted odds ratios (AOR) with 95% confidence intervals (95% CI) are shown.

The food frequency questionnaire.

The World Health Organization (WHO) recommended a balanced diet that includes a combination of carbohydrates, fats, proteins and fibers (of daily caloric intake, DCI: carbohydrates 50-60% mainly from complex carbohydrates or starchy fiber-rich diet; fats 30%, proteins 12-20% either plant or animal sources for people diabetes(WHO site, 2008).

We based the content of the food frequency questionnaire on the American Diabetes Association and American Dietetic Association (USDA) for the diabetic patients on which several institutes built on their food list. Therefore, the analyses of the food frequency questionnaire used several resources depending on the food items we included in the questionnaire. The first resource we used was the "Choose Your Foods: Exchange Lists for Diabetes, which is the basis of a meal planning system that was modified by the Mayo Foundation for Medical Education and Research (MFMER). It is based on USDA food lists and nutrient values. This was designed primarily for people who have diabetes and others who must follow special diets. The exchange lists were built upon the principles of good nutrition that apply to everyone (Mayo Foundation for Medical Education and Research (MFMER), 2008).

The Myoclinic food exchange list and its nutrient values (see mayoclinic web site, 2008): (exchange), calories, carbohydrates (CHO), proteins (Pro), and fats is as presented in table(4.2). This table is the base for the analysis of the food items contents that will be presented in the results chapter.

Table (4.2): Nutritional Values of different food groups depends on Myoclinic Food Exchange List:

Food group	exchange (Serving)	*CHO (grams)	Protein (gram)	Fat (grams)	Calories (kcal)
Grains and starches	1	15	3	1	80
Milk and milk products	1				
	Fat-free or low-fat milk and yogurt products	12	8	0-3	100
	Reduced-fat milk and yogurt products	12	8	5	120
	Whole milk and yogurt products	12	8	8	160
Fruits	1	15	0	0	60
Vegetables	1	5	2	0	25
Meats and meat substitutes	1 Lean meat Medium-fat meat High-fat meat	0 0 0	7 7 7	0-3 4-7 ≥8	45 75 100
Fats, Sweets, and Alcohol	1	0	0	5	45
Orient dishes	1	Depends on dish food composition			

***carbohydrates**, Adapted from myoclinic web site (www.myoclinic.com, 2008)

As a result to presence of some oriental sweats and dishes that was not found on the Myoclinic food exchange list, other validated references were used. Nestle food company was used as a reference for Makloubeh with chicken, Lamb Stuffed Vine Leaves (warek dawali), and Stuffed Baby Zucchini with Tomato Sauce (kusa mahshi) nutrient values (Nestle web site, 2008). McDonalds fast food company lists nutrient values were used as a reference for the hamburger sandwich (whopper sandwich) (McDonalds web site, 2008). The others: Palestinian Mansaf, Palestinian Baklava, Palestinian Kunafa, Basterma (Mortadella) sandwich, Shawerma sandwich, and falafel sandwich nutrient values were used to analyzed based on nutritional values that presented on reciepezaaz web site and which is built on the USDA food lists and its contents (reciepezaaz, 2008). However, coca cola and the other juice beverages nutrient values reference were the Palestinian products labels, in which each serving is 330 ml with 44 calories/100 ml. In addition, for coffee and tea contents, and since people added almost 1 spoon of sugar for drinking a cup of coffee or tea, the opinion of a local nutritionist was considered for calculating its nutrient value (see annex 7).

B- Glycated hemoglobin categories (HbA1c): the operational definition that we used in this was either equal or less than 7 units or above

C- **Body mass index categorized:** BMI: weight in kilogram divided by the height in meter square

D- **Food groups**

- **Grains and starches**: includes Kmaj bread, White bread, Dark or whole grain bread, Potato, fried potatoes, corn, Frika /prghoul, mftoul, and Rice or pasta.
- **Vegetables**: includes Cabbage, cauliflower, Carrots, Spinach or other greens, Beans, Tomatoes, cucumber, vegetable salad without oil, and pickled vegetables not including olives.
- **Fruits**: includes Oranges, Peaches and apricots, Bananas, apple, grapes, watermelon, Yellow melon, and dates.
- **Milk and milk products**: Skim or low fat milk, Whole milk, Low fat yoghurt, whole fat yoghurt, whole fat yoghurt cream.
- **Meat and meat substitutes**: includes Chicken without skin, Chicken with

skin, crow's meat/sheep's meat, Fish, Eggs, Hummous, Dried beans.

- **Sweet, fats, and Alcohol**: includes Chocolate, Candy without chocolate, Honey and jam, margarine, Butter, Olives oil, Corn oil, olives, Avocado, including avocado salad, Nuts, Ice cream,(Coca Cola, Pepsi , other cola),(Fruit- flavored punch or non- carbonated beverage),Tabozeena drink, Coffee with sugar, Tea with sugar, Cake, Plain cookies including biscuits and uncoated cookies, Potato, or corn chips, Kinafah, Bqlawa, Murtadella sandwich, hamburgers sandwich, Falafel sandwich , Pizza, Shawirma sandwich, Hard/white cheese plain or as part of a dish.
- **Oriental dishes**: includes Palestinian Maklobah, Palestinian Mansaf, , Lamb Stuffed Vine Leaves (warak –dawali) and Stuffed Baby Zucchini with Tomato Sauce (Kusa mahshi).

Data of the 81 items were then grouped according to the above food groups and the 4 nutrient values; i.e. carbohydrates, proteins, fats, and calorie were then calculated.

At the beginning we analyzed the data using the quartile for each group, but due to the small numbers in each category, we decided to categorize it into greater or equal the median and above the median. This was done to simplify the analysis to such type of data. However, we divided the data into 3 tertiles (33^{rd} and 66^{th} percentiles) for analysis.

In order to analyze study data, some necessary steps taken in analyses process:

The FFQ alternatives (how often do you eat the following items) 9 categories were summed into 6 subcategories as shown in table

(4.3). This categorizing was done due to the fact that very few numbers reported having either 4-6 times and 2-3 times daily which we considered it as on average 3 times daily. Similarly, we summed the responses of once daily and 5-6 weekly as once daily.

Table (4.3): categorizing the FFQ data:

Original data categories (9 categories)	The new categories (6 categories)
1: ≥6 times daily	6: ≥6 times daily
2 : 4-6 times daily	3: 3 times daily
3: 2-3 times daily	
4: once daily	1: once daily
5: 5-6 times weekly	
6: 2-4 times weekly	0.43: every other day
7: once weekly	0.14: once weekly
8: 1-3 times monthly	0: nearly nothing
9: nearly nothing	

4.11 Limitation of the study

The constraints and limitation of the study were mainly along the procedure of the study preparation as well as identifying our sample. A summary of the limitations is presented as follow:

1 Since there is no computer system in the club a lot of time was spent in finding patients who meeting our inclusion criteria.
2 The approval from Ibdaa Diabetic Club for the study to be held in its services was late, that delay the field work for October in 2007after Ramadan month and Eid Al-feter feast vacation.
3 The study was in need to financial support through its process. Several attempts was done to search out fund, unfortunately it was not given.

During field work, some difficulties hindered from having a good sample and a high response rate:

- Several patients registered themselves as residence in Dheisheh refugee camp, although they were living outside the refugee camp.

- Several female patients, their names were mentioned related to their husband name, else were.
- Several patients could not come to center, and visiting them at their houses took a lot of arrangements and was not possible for others.
- Several patients denied having diabetes.
- Some patients were registered but were found to be dead.
- Incomplete information in patient's file like address or telephone number,
- Some patients were hospitalized during the survey or sick, and so could not fill the questionnaire.
- Questionnaire very detailed and takes time.

4.12 Summary

This study is cross sectional, tends to assess diet in relation to type 2 diabetes. It is comprised of two levels, one include questionnaire and objective testing. Food frequency questionnaire was used as essential part in this study. All study participants were having type 2 diabetes and living at Dheisheh refugee camp in Bethlehem, and their ages were 40-75 years. Analysis of the FFQ was done using the diabetes food pyramid. Carbohydrate, protein, fat ad total caloric content were calculated for all the 81 food items in the FFQ. Univariate, multivariate analysis was done to study the determinants for the glycemic control among the study population. The results of this data analysis will be presented in chapter 5.

Chapter 5

Results

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5.3.4 Association between HbA1c results and nutritional history of study population

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5.1 Introduction

In the chapter, the results are presented in 4 parts. The first part illustrates the diabetic patient's socio-demographic, diabetes history, patient's self-management, medical follow up, and patient's nutritional history as reported by patients themselves in the interview. The second part presents the univariate analysis between the various determinants reported in the questionnaire by the patients and the patients Glycemic control level, i.e. HbA1c results. The third part and forth part presents the food frequency questionnaire analysis and its association with HbA1C.

5. 2 Part 1: Results

5.2.1 Study population socio-demographic characteristics

In the study, only 30.8% of the study population was males (n=32) and the majority of patients were females 69.2% (see figure 5.1). The mean age of the groups was 54.6 (± standard deviation, SD 8.45) and almost 40.4% of patients were in the age group 50-59 years (see figure 5.2) with nearly close results to other category in 40-49 years. Of the study population 56% were living in families of less or equal 6 members (see figure 5.3) .However, 65.4% of the population complete 12 years or less of schooling (see figure 5.4). Only 33.7% (n=35) of the study population get their income through their families the income source of their families (see figure 5.5), and 91.3% were living in families of less or equal 11 persons of whom only one person is responsible to support the family financially (see figure 5.6). Only 21.2% of the study population was working (see figure 5.7). Patient's (n=63) categorize themselves as semiprofessionals (5.8%), clerks (9.6%), workers (24.0%), housewives (60.6%), while none of them considered themselves as professional (see figure 5.7).

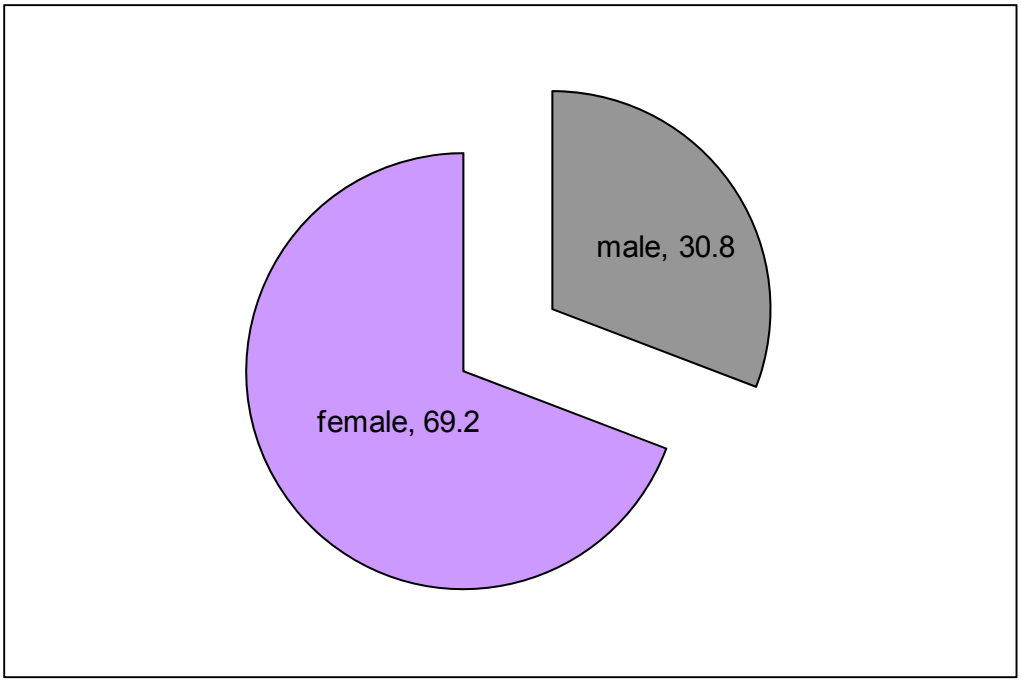


Figure 5.1: Distribution of study population by gender

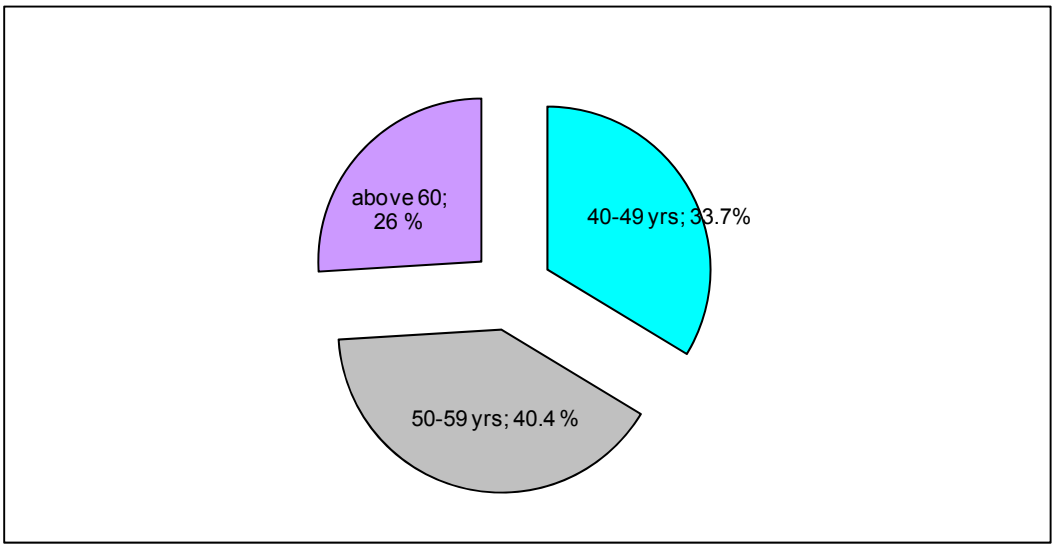


Figure 5.2: Distribution of study population by age

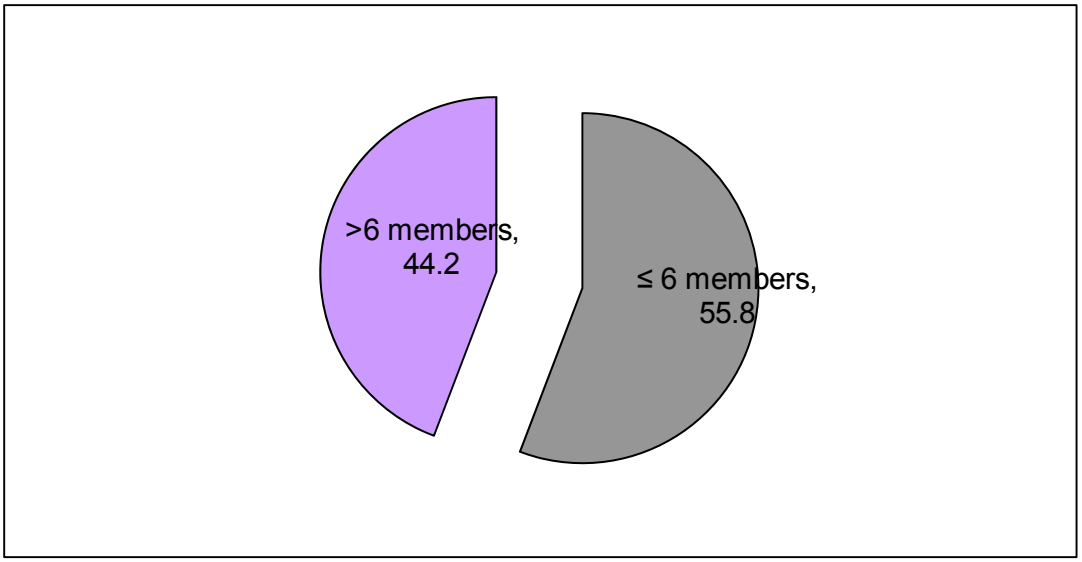


Figure 5.3: Distribution of study population by family size

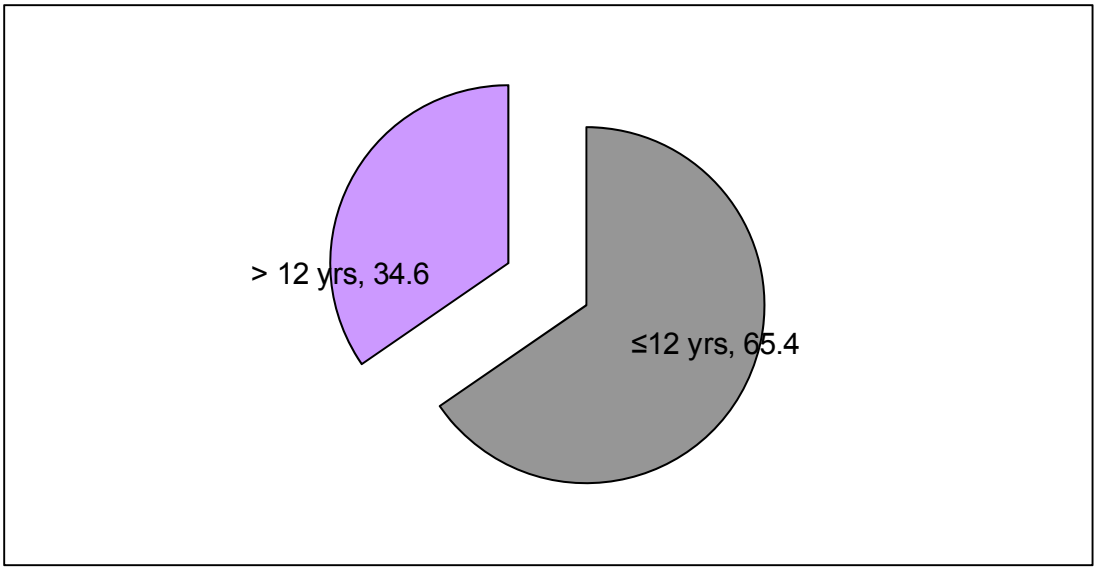


Figure 5.4: Distribution of study population by educational level

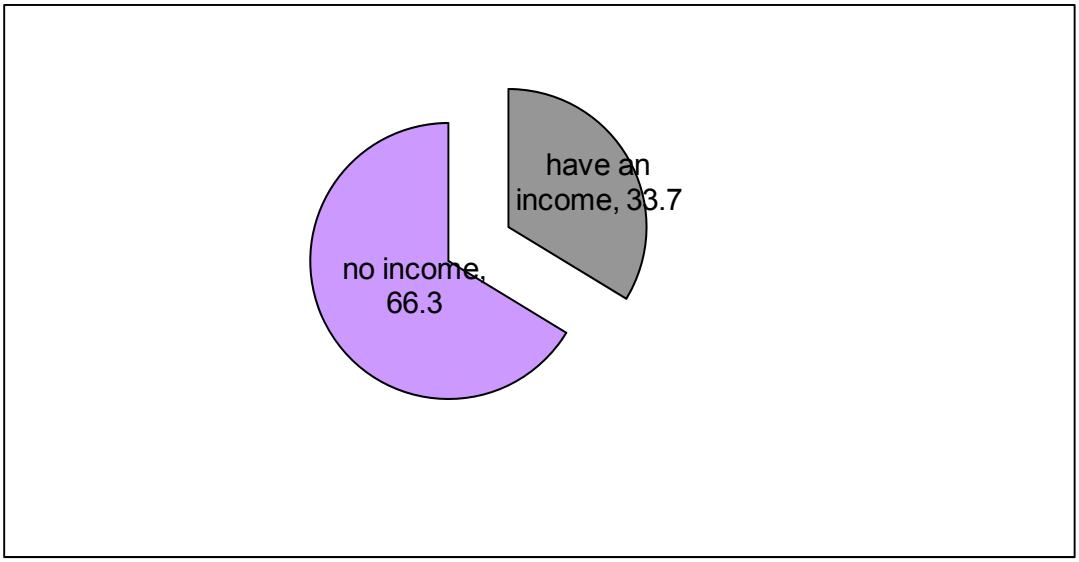


Figure 5.5: Distribution of study population according to patient as family income source.

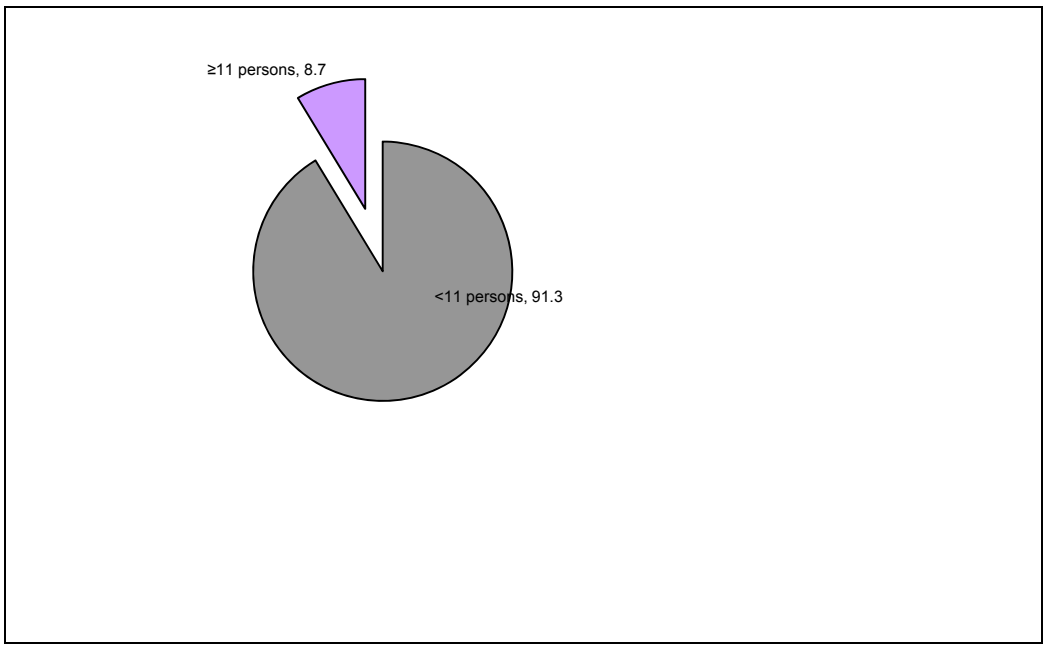


Figure 5.6: Distribution of study population according to dependant's numbers.

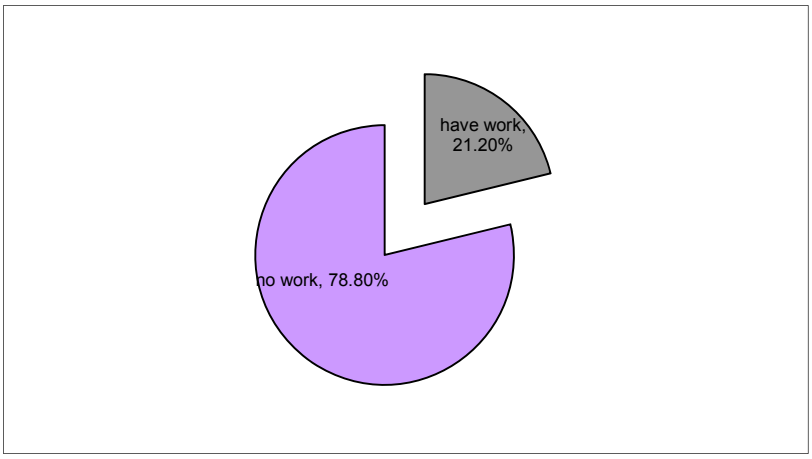


Figure 5.7: Distribution of study population according to working status.

5.2.2 Diabetes history among study population as reported by patients themselves:

As shown in figure 5.8, the duration of diabetes illness varied between 1-27 years with an average of 7.5 years (standard deviation, SD, 5.48). As shown in figure figure 5.8, most of the study populations received medical follow up by general practitioner 92.3% and only 4.8% by specialized doctor (n=5). About half of the patients (55.8%) had gluco-meters machine at their home (n=58), and 70.2% showed a high last fast blood sugar measurement.

As shown in figure 5.9, patients used different diabetes medication and 87.5% were using anti-hyperglycemic drug.

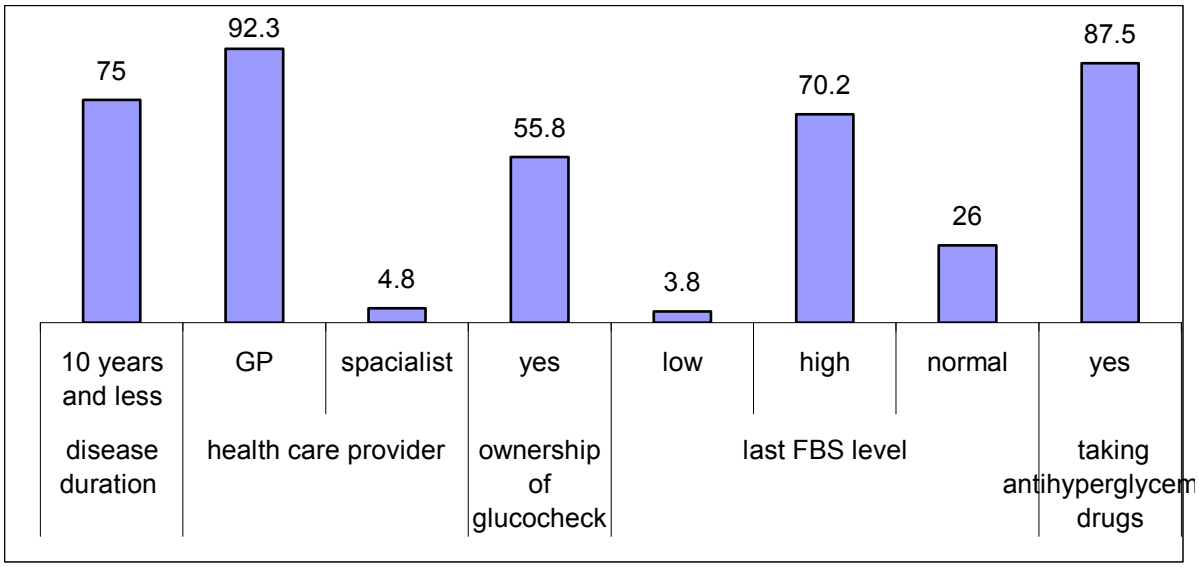


Figure 5.8: Distribution of diabetes history among study population.

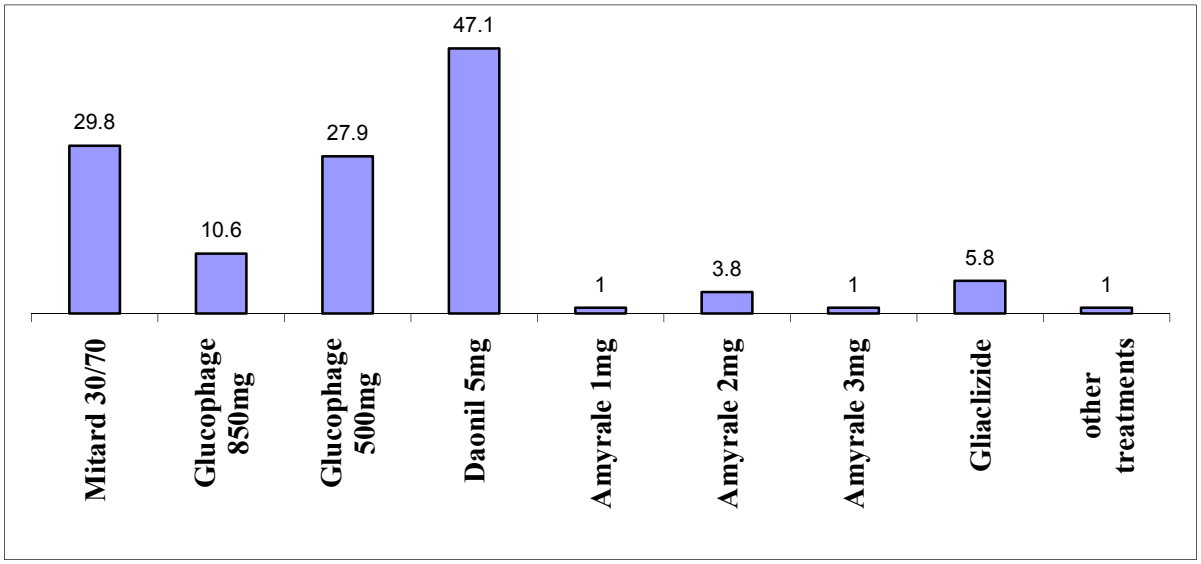


Figure 5.9: Distribution of study population according to their using of antiglycemic drugs.

5.2.3 Related Complications among study population as reported by patients themselves:

Interestingly, 53.8% of study population were diagnosed as hypertension patients (HTN) (n=56), of whom only 7.1% followed a diet regime as a treatment option, while 89.3% taking antihypertensive drugs. Moreover, 6.7% having kidney problems, 27.9% have cardiac problems, but the most have ophthalmic complications with 61.5% and neurology with 58.7% (see figure 5.10).

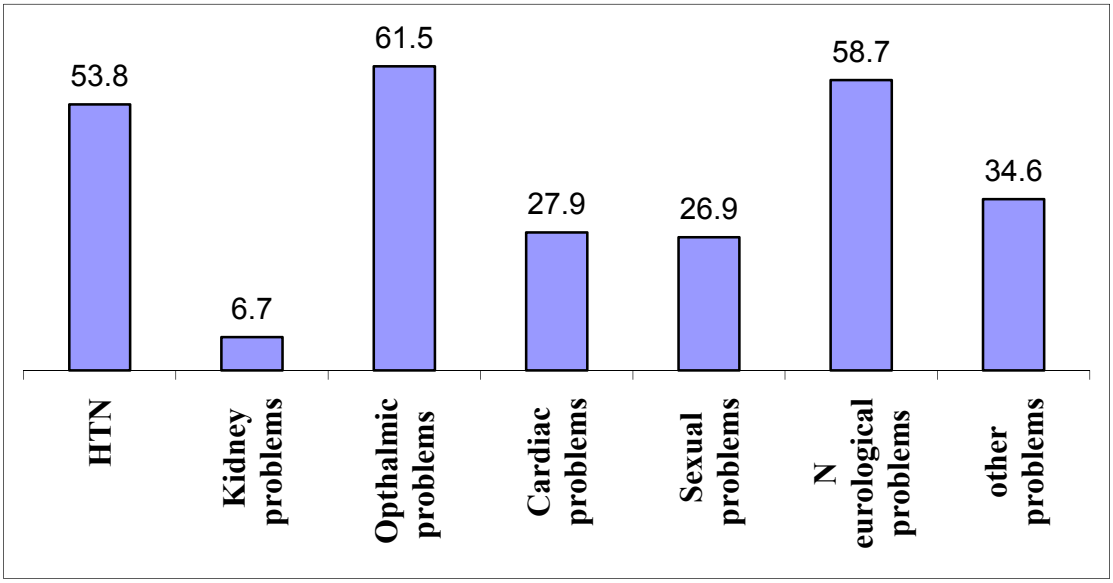


Figure 5.10: Distribution of Related Complications among study population

5.2.4 Study population self-management Factors.

We calculated the body mass index (BMI) for each patient as reported in the questionnaire. As shown in figure 5.11, 54.8% were obese (BMI> 30) and 26.9% were overweight. Only 45.2% of the study population practiced one type of sport (see figure 5.11) and the majority used to walk (see figure 5.12). However, about 60% had an increased weight, which they relate to their diabetes (see figure 5.11).

Of the study population, 83.7% (n=87) did HbA1c testing in which only 25.3% had value less than 7%. As shown in figure 5.13, 87.5% of study population reported that

they were taking their medication as prescribed by doctor, 87.5% said they keep doing blood sugar regularly, while 86.5% keep doctor visit and follow instructions they were given. However, 62.5% of study population did not follow diet program and similarly 59.6% did not participated in any physical activity and about 60% attended lectures or workshop about diabetes, or/and searching for specialized doctor.

Interestingly, 42.3% of population perceived their health as good or very good .and 69.2% had a positive perception to consult nutritionist to take advice. On the other hand, 57.7% perceived themselves as having sedentary lifestyle (low physical activity) and 48.1% perceived them selves as obese, and 48.1% perceived as normal (see figure 5.14).

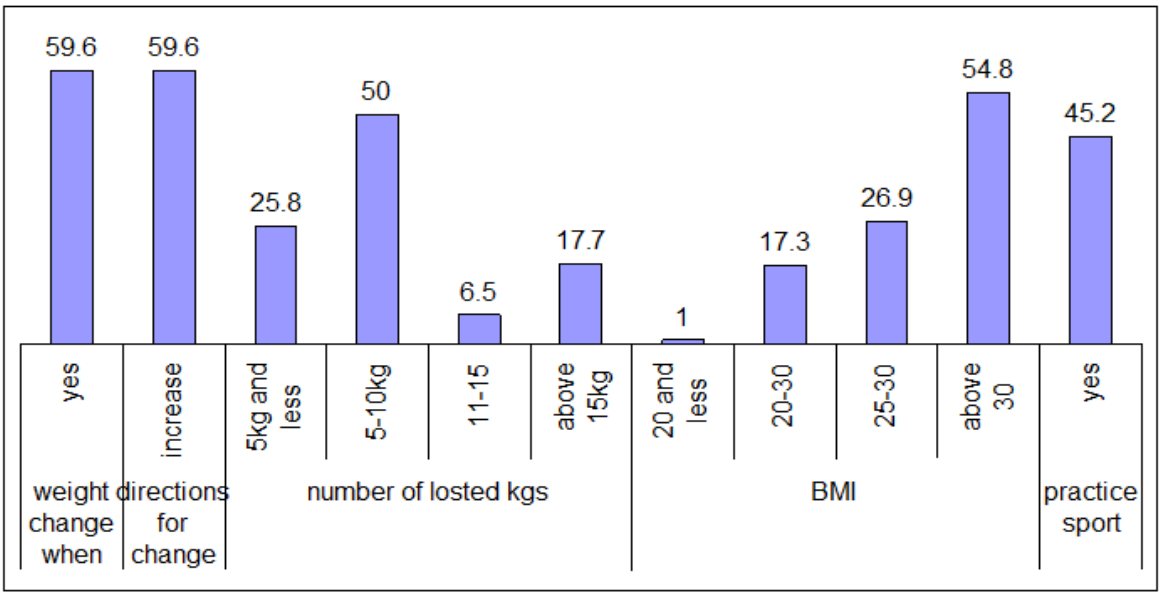


Figure 5.11: Distribution of weight changes, BMI, and practice sport among study population.

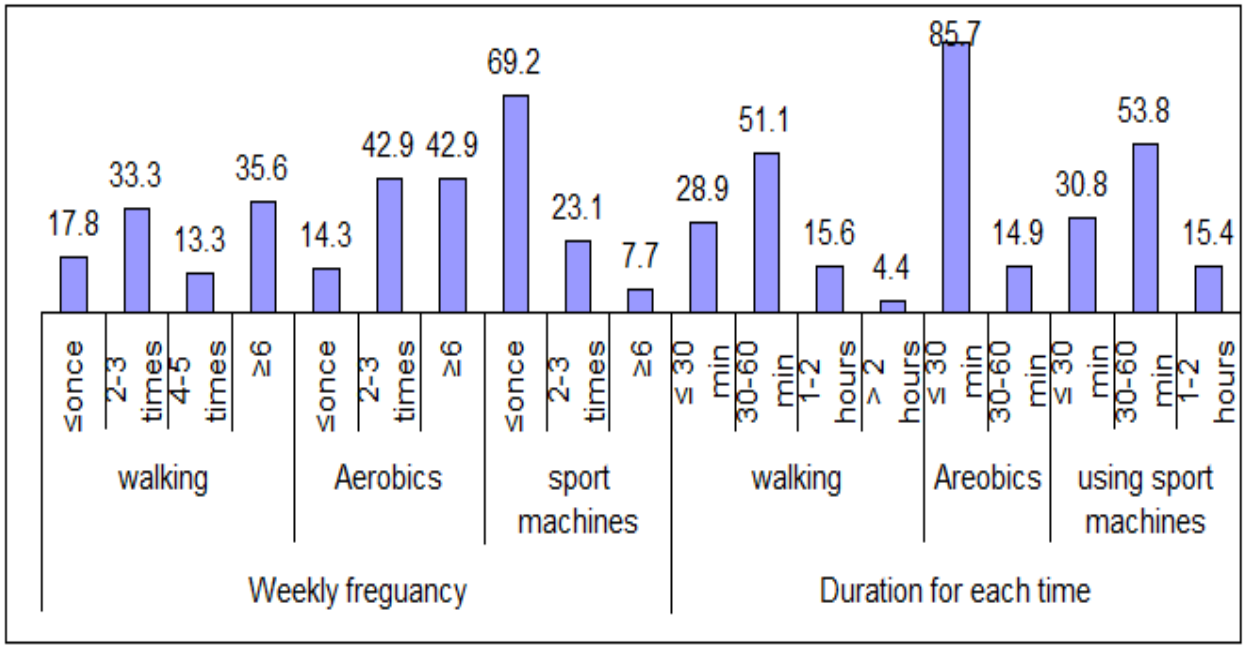


Figure 5.12: Distribution of study population according to practice sport.

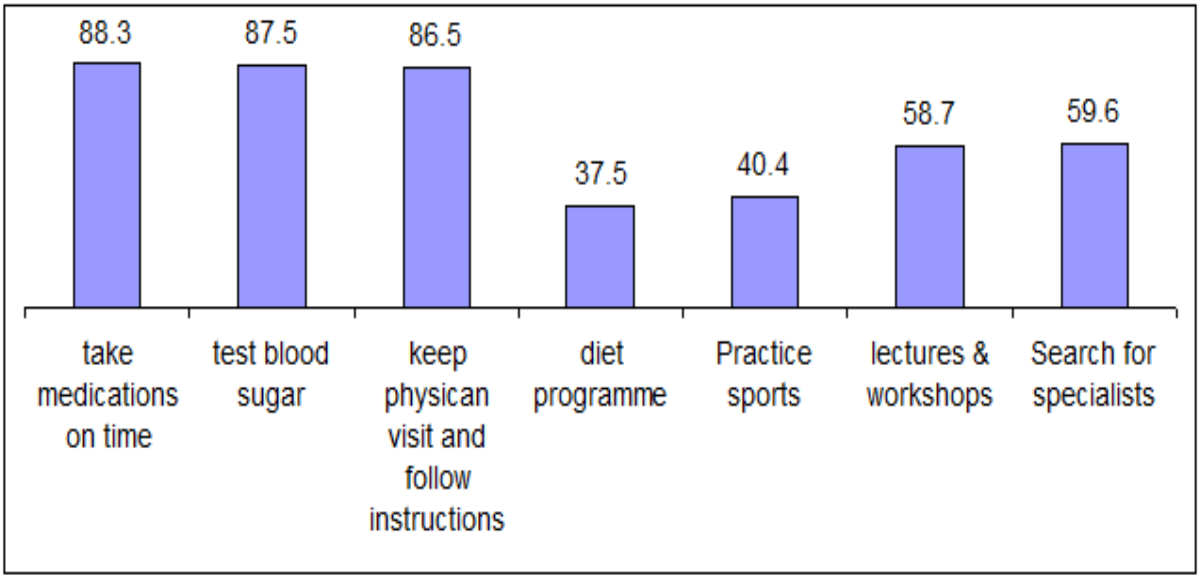


Figure 5.13: Distribution of self-management factors among study population.

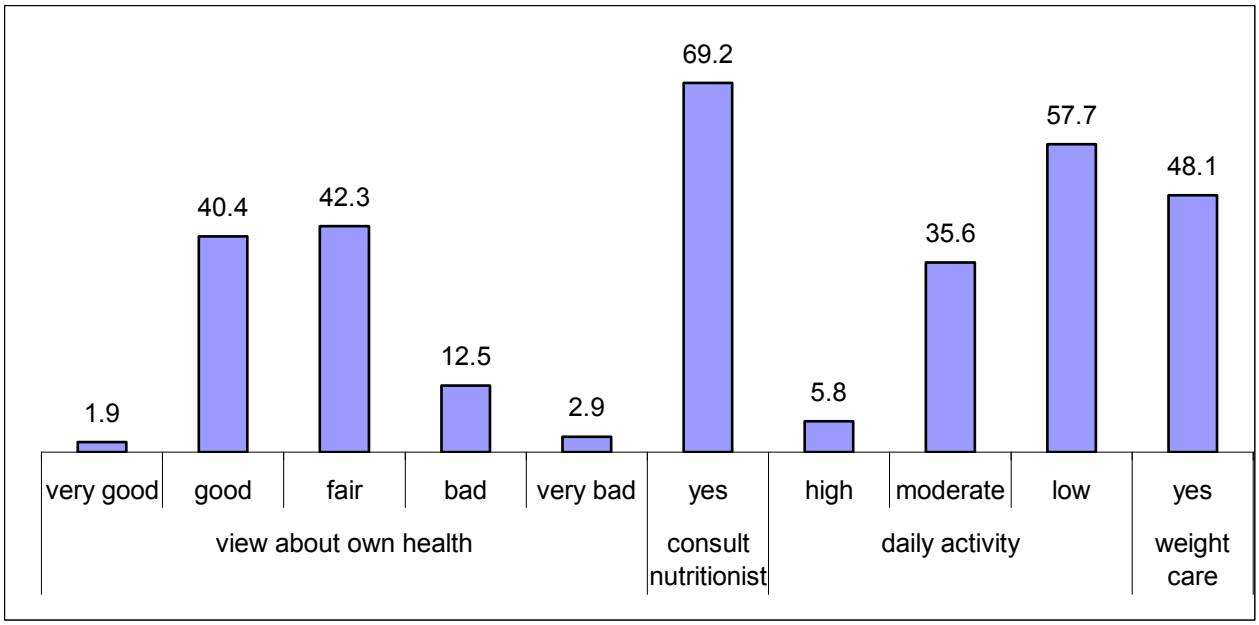


Figure 5.14: Distribution of study population according to their perceptions on health, nutritional advice, daily activity level, and weight.

5.2.5 Nutritional history among study population as reported by patients themselves:

Of the study population, 57.7% had regular eating behavior and 13.5% of population did not care any more to their eating pattern. Also, 39.4% reported an unavailability of food for their diabetes, while 51.9% reported the availability of such foods sometimes. Of the study population 62.5% (n=65) did not consult with any nutritionist in their lives, and 56.4% from 39 patients who consulted with a nutritionist followed the instructions (see figure 5.15).

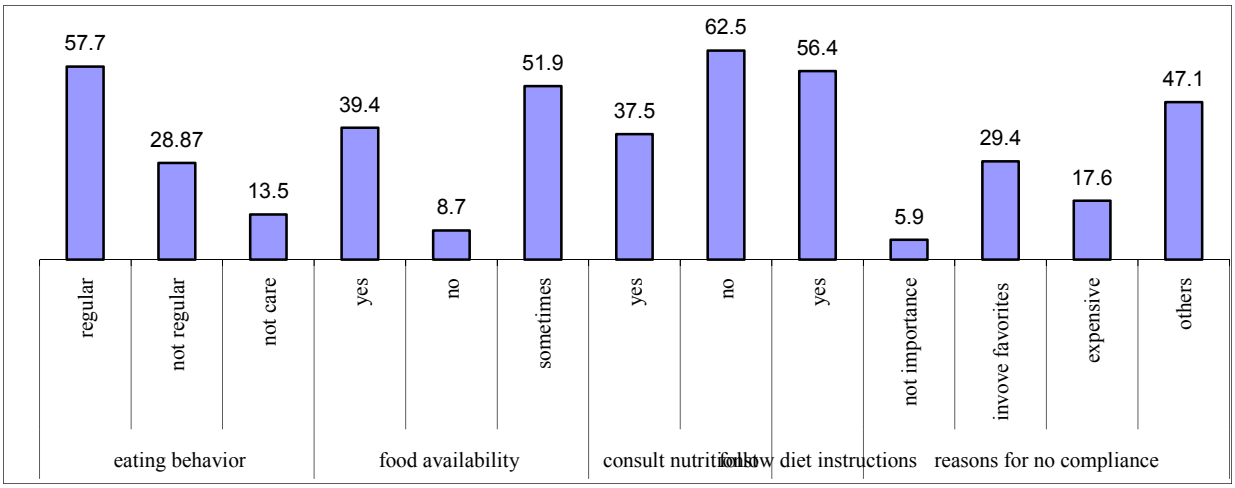


Figure 5.15: Study population nutritional assessment condition.

5.3 Part 2: Results

5.3.1 Association between HbA1c results and study population demographic variables.

The mean level of HbA1C in this study was 8.27 (SD ±1.62, range 5.30-13.2). Of the study population 83.7 % (n=87) underwent HbA1c testing, of whom 25.3% (n=22) had levels <7. Association between HbA1c values and the various demographic factors were studied, i.e. gender, age, educational level, working status, family size, and dependant's number are presented in table 5.1, of whom none showed a significant association with HbA1c levels.

Table (5.1): Relationship between HbA1c with the various demographic variables in Dheisheh Refugee Camp.

Variable	**HbA1c≤ 7** **N= 22**	**HbA1c>7** **N=65**	**P value**
	n(%)	**n(%)**	
Gender			.150
Male	9(40.9%)	17(26.2%)	
Female	13(59.1%)	48(73.8%)	
Age			.459
40-49 yrs	5(22.7%)	23(35.4%)	
50-59 yrs	10(45.5%)	28(43.1%)	
>60 years	7(31.8%)	14(21.5%)	
Family size			.097
≤6 persons	14(63.6%)	29(44.6%)	
> 6 persons	8(36.4%)	36(55.4%)	
Educational level			.488
0- 9 yrs	15(68.2%)	42(64.6%)	
10-16 yrs	7(31.8%)	23(35.4%)	
Independency			.386
Yes	6(27.3%)	22(33.8%)	
No	16(72.2%)	43(66.2%)	
Dependants			.325
≤ 11 members	19(86.4%)	60(92.3%)	
> 11 members	3(13.6%)	5(7.7%)	
Working status			.562
Working	4 (18.2%)	13(20.0%)	
Not working	18(81.8%)	52(80.0%)	

5.3.2 Association between HbA1c results and diabetes history.

Table 5.2 showed the association between HbA1c and the patients' diabetes history factors; i.e. disease duration, health care provider, last Fasting blood sugar level (FBS), and receiving anti-glycemic drugs. None of these variables showed a significant association with HbA1c levels.

Table (5.2): Relationship between HbA1c results with various diabetes history variables for the 87 patients in Dheisheh Refugee Camp.

Variable	**HbA1c≤ 7** **N= 22**	**HbA1c>7** **N=65**	**P value**
	n(%)	**n(%)**	
Disease duration			.447
1-10 years	16(72.7%)	50(76.9%)	
Above 10 years	6(27.3%)	15(23.1%)	
Health Care Provider			.852
GP	21(95.5%)	59(90.8%)	
Specialist*	1(4.5%)	4(6.2%)	
Last FBS level			0.071
High	2(54.5%)	1(76.9%)	
Normal	12(36.4%)	50(21.5%)	
Low	8(9.1%)	14(1.5%)	
Receiving antiglycemic drugs(AGD)			.488
Yes	19(86.4%)	58(89.2%)	
No	3(13.6%)	7(10.8%)	

* One followed by nurse and one reported unknown.

5.3.3 Association between HbA1c results and study population self-management factors.

Association between HbA1c and study population self-management indictors; i.e. weight changes, BMI, number of kilograms gained or lost, and practicing sport. In addition to several patients self -management techniques and patient's perception toward his/her health, nutritional advice, physical activity level, and toward his/her weight (see table 5.3, table 5.4). None of these variables showed a significant association with HbA1c levels.

Table (5.3): Relationship between HbA1c results with weight change, BMI, number of kilograms gain or lost, and practice sport for the 87 patients in Dheisheh Refugee Camp.

Variable	**HbA1c≤ 7** **N= 22**	**HbA1c>7** **N=65**	**P value**
	n(%)	**n(%)**	
Weight change			
Yes	11(50.0%)	38 (58.5%)	.32
No	11(50.0%)	27 (41.5%)	
BMI			
< 25	3 (14.3)	11 (18%)	.58
26-30	6 (28.6%)	11 (18%)	
> 30	12 (57.1%)	39(63.9%)	
Number of kilograms change			0.98
≤5kg	2(18.2%)	8(21.1%)	
5-15kg	7(63.6%)	23 (60.5%)	
>15kg	2(18.2%)	7(18.4%)	
Practice sport			
yes	10(45.5%)	25(38.5%)	.369
no	12(54.5%)	40(61.5%)	
Type of sport			

Walking (yes/No)	(10) 45.5%	(28) 43.1%	0.52
Aerobics (yes/No)	(2) 9.1%	(4) 6.2%	0.42
Machine (yes/No)	(2) 9.1%	(9) 3.8%	0.44

Table (5.4): Relationship between HbA1c results with various self-management factors for the 87 patients in Dheisheh Refugee Camp.

Variable	**HbA1c≤ 7** **N= 22**	**HbA1c>7** **N=65**	**P value**
	n(%)	**n(%)**	
Doing BS			
Yes	19(86.4%)	59 (90.8%)	.408
No	3(13.6%)	6 (9.2%)	
Keep physician visit			.675
Yes	20(90.9%)	59 (90.8%)	
No	2(9.1%)	6 (9.2%)	
Keep diet program			.436
Yes	7(31.8%)	24 (36.9%)	
No	15(68.2%)	41 (63.1%)	
Practice sport or physical activity level			.369
Yes	10(45.5%)	29 (38.5%)	
No	12(54.5%)	36 (61.5%)	
Share in lectures and workshop			.564
Yes	14(63.6%)	42(64.6%)	
No	8(36.4%)	23 (35.4%)	
Search for specialist			.209
Yes	16(72.7%)	39 (60.0%)	
No	6(27.3%)	26 (40.0%)	

Table (5.5): Relationship between HbA1c results with patient's perception for the 87 patients in Dheisheh Refugee Camp.

Variable	**HbA1c≤ 7** **N= 22**	**HbA1c>7** **N=65**	**P value**
	n(%)	**n(%)**	
Patient's Health perception			.411
Very good	1(4.5%)	1(1.5%)	
Good	5(22.7%)	27(41.5%)	
Fair	13(59.1%)	26(40.0%)	
Bad	2(9.1%)	9(13.8%)	
Very bad	1(4.5%)	2(3.1%)	
Patient's perception about nutritionist consultation			.613
Yes	17(77.3%)	45 (69.2%)	
No	5(22.7%)	18(27.7%)	
Unknown	--	2 (3.1%)	
Patient's perception about his/her daily activity level			.437
High	--	4 (6.2%)	
Moderate	7(31.8%)	26 (40.0%)	
Low	15(68.2%)	34(52.3%)	
others	--	1 (1.5%)	
Perception about weight			.491
Obese	11(50.0%)	31 (47.7%)	
Normal	11(50.0%)	30 (47.1%)	
unknown	--	4 (6.2%)	

5.3.4 Association between HbA1c results and nutritional history of study population.

Nutritional history considered a corner stone in this study; issues like eating behavior, food availability, and nutrition consultation were studied with HbA1c. A significant difference was found between the frequency of nutritional advice with HbA1c ($P<0.05$, see table 5.6).

Table (5.6): Relationship between HbA1c results with nutritional history variables for the 87 patients in Dheisheh Refugee Camp.

Variable	**HbA1c≤ 7** **N= 22**	**HbA1c>7** **N=65**	**P value**
	n(%)	**n(%)**	
Eating behavior			.102
Regular	16(72.7%)	35 (53.8%)	
Irregular	2(9.1%)	21(32.3%)	
Not care	4(18.2%)	9 (13.8%)	
Food availability			.194
Yes	11(50.0%)	22 (33.8%)	
No	3(13.6%)	5 (7.7%)	
sometimes	8(36.4%)	38 (58.5%)	
Nutrition consultation			**.003**
Yes	3(13.6%)	32 (49.2%)	
No	19(86.4%)	33 (50.8%)	

Part 4: Food frequency assessment

5.4.1 Assessment of food intake and its nutrient value using the food frequency questionnaire (FFQ)

Only 69 food items out of 81 items were analyzed. Based on the diabetes food pyramid that was discussed in chapter 3, seven groups were formed. These groups are: the grains and starches group (9 items), the vegetables group (9 items), the fruits group (8 items), the milk and milk products group (6 items), the meat and meat substitutes group (7 items), the fats and sweets and alcohol group (26 item), and the oriental dishes group (4 items). In the following figures (figures 5.16, 5.17, 5.18, 5.19, 5.20, 5.21, 5.22) the frequency of consumptions of these groups are presented. These groups were the base for calculating the total consumption of each group as grams per day and the total calories' consumption.

These figures showed that percent of responses for grains and starches was high in category of 1-3 times monthly with 22.4 (see figure 5.16), while vegetables was high in categories of once daily with 25.3 (see figure 5.18).while fruits was higher in 2-4 times weekly with 22.2 (see figure 5.18), milk, meat and fat and sweets groups showed very low consumption which was showed as "nearly nothing" with values of 44.7%, 40.5%, and 62% respectively. While data for oriental dishes group show high response rate in category of 1-3 times monthly with 49.3 (see figures 5.19, 5.20, 5.21, 5.22).

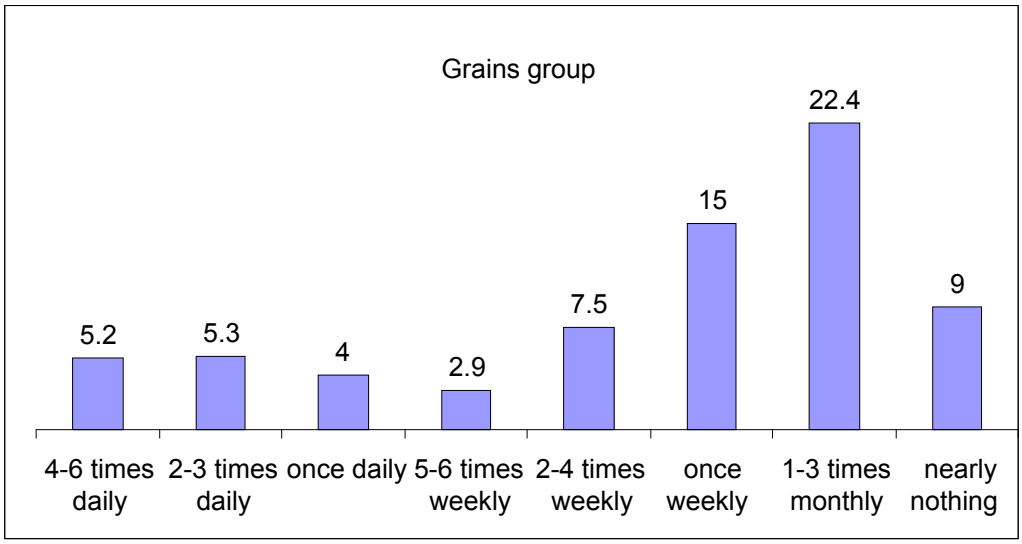


Figure (5.16): Distribution of intake of grains group.

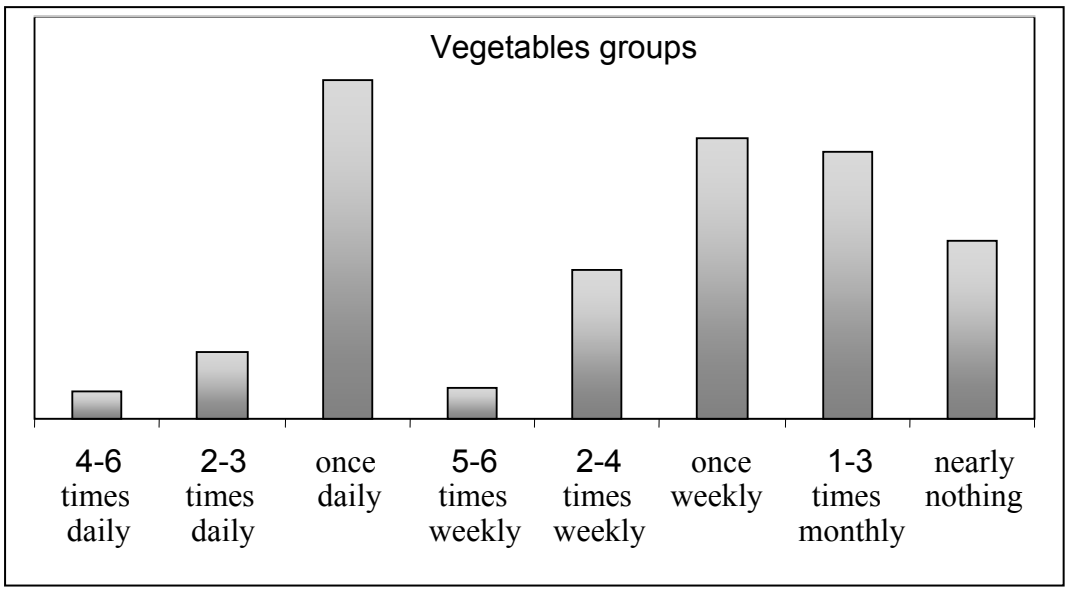


Figure (5.17): Distribution of intake of Vegetables group.

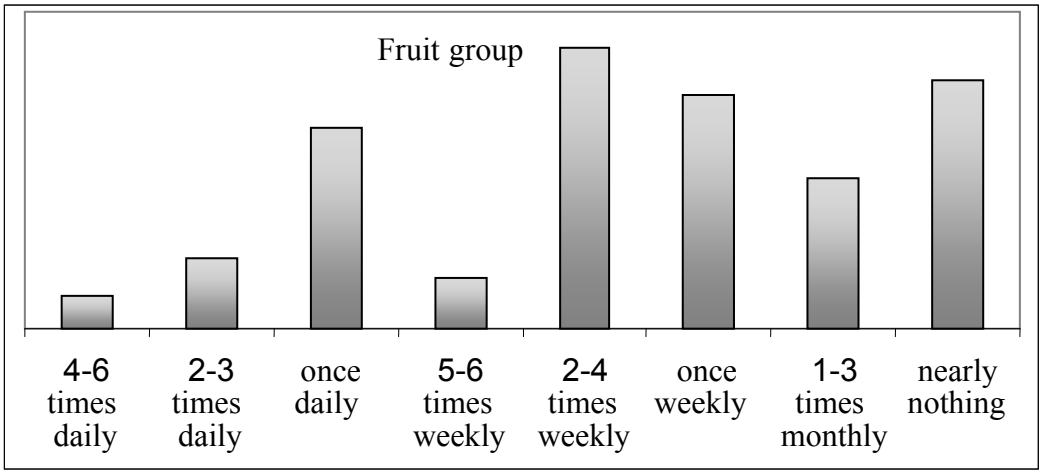


Figure (5.18): Distribution of intake of Fruits group.

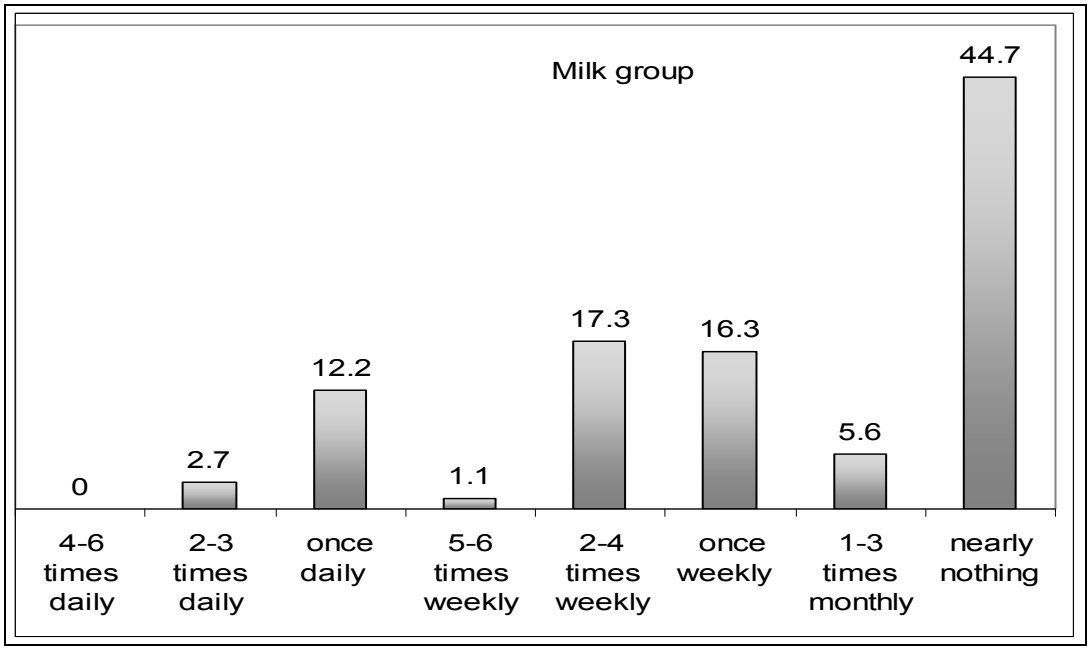


Figure (5.19): Distribution of intake of Milk and Milk products group.

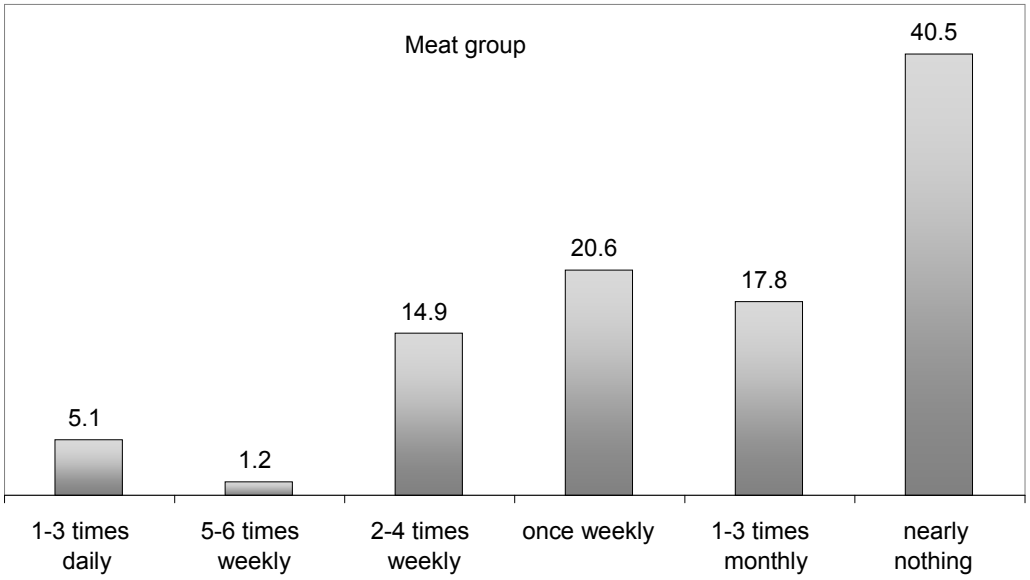


Figure (5.20): Distribution of intake of Meat and Meat substitutes group.

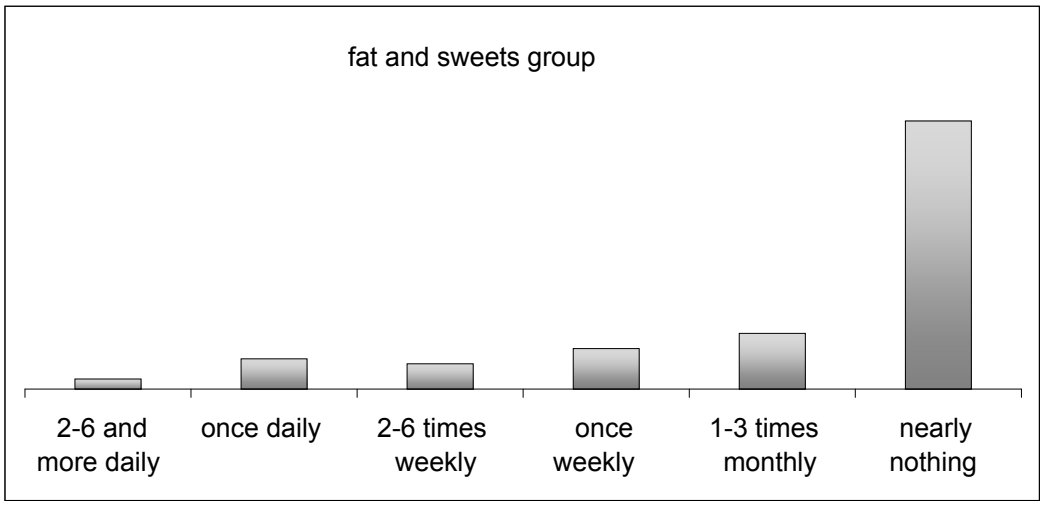


Figure (5.21): Distribution of intake of Fats and sweet group.

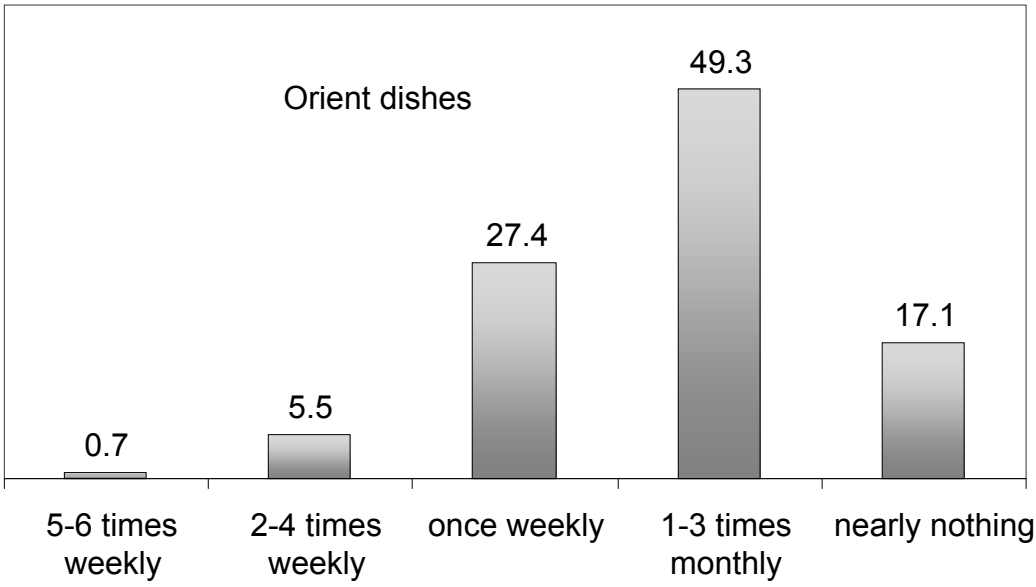


Figure (5.22): Distribution of intake of Orient dishes group.

5.4.2 Total consumption of carbohydrate, protein, fat, and calories

As shown in the questionnaire, each food element amount consumed was specified in each question element. Therefore, this semi-quantitative question enables us to calculate the total consumption amounts of carbohydrate, protein, fat and its calories intake. The geometric distribution of its consumption in grams per day and its calories are presented (see annex 8).

5.4.3 Determinants for consumption of carbohydrates, protein, fats, and the total caloric intake.

In this part of analysis the distribution of the total CHO, protein, fat and caloric content determinants will be presented.

5.4.3.1 Distribution of Total CHO, protein, fat and caloric intake

Data shows distribution of CHO consumption round the mean 231.6 g/day and distribution of consumption within 33td quartile with 172.9g/day and 66th quartile with 283.7g/day. That also seen for protein, fat, and calories consumption (see table 5.7). As see in the table very high caloric intake per day was seen by some patients,

although the mean intake was 1488 calories per day, which can be seen clearly in figure 5.24.

Table (5.7): Presents mean median, standard error, standard deviation and 33rd, 66th percentiles of the 104 patients' nutrients contents as shown by the FFQ.

	Carbohydrate g/day	Fat g/day	Protein g/day	Calories Kcal/day
Mean	231.6	42.7	52.7	1488
Minimum	86.8	11.5	22.0	557
Maximum	914.7	349	269	**7587**
Standard deviation	138.4	39.3	32.7	946
Standard error	013.6	03.8	03.2	093
median	225.1	42.0	52.4	1469
33 rd percentile	172.9	32.2	40.6	1054
66 th percentile	283.7	50.8	61.2	1865

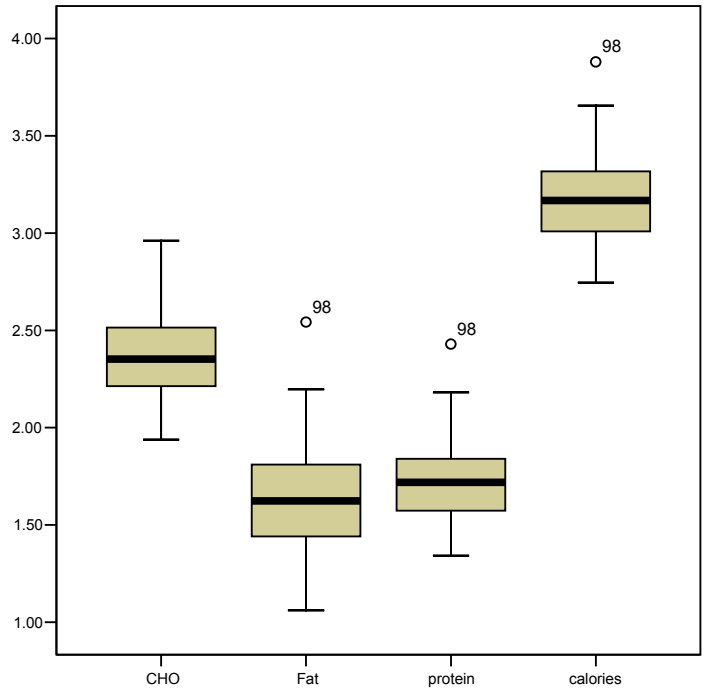


Figure (5.23): Geometric Distribution of the total consumptions per day

5.4.3.2 Patients perception of certain food item as carbohydrate source and total CHO intake consumption

Patients were asked about their perception about certain food elements, “In your opinion, can the diabetic patient eat any of these foods?” Tables (5.8, 5.9, 5.10, 5.11, 5.12, and 5.13) show the results of the patients’ perception towards certain food items, which show statistically significant different with patient’s perceptions for some Meat and Meat substitute with protein tertiles P value < 0.05 for Fish and patient’s perceptions for some Orient dishes and CHO tertiles for Mqlouba (upside-down) P value< than 0.05.While, there are no any statistically significant for others.

Table (5.8): The relationship between total consumption tertiles for Carbohydrates (CHO) with patient's perceptions for some Grains and starchy food items as reported by study population in Dheisheh Refugee Camp.

Perception about eating		**Carbohydrate**			
	Total N (%)	< 172 g/d n=34	172-284 g/d n=35	> 284 g/d n=35	P value
White bread					
Yes	76	23(67.6%)	25(71.4%)	28(80.0%)	.402
No	(73.1%)	11(32.4%)	10(28.6%)	6(17.1%)	
Did not Know	27(26.0%)	--	--	1(2.9%)	
	1(1.0%)				
Dark or whole grain bread					
Yes	99(95.2%)	34(100.0%)	32(91.4%)	33(94.3%)	.236
No	4(3.8%)	--	3(8.6%)	1(2.9%)	
Did not Know	1(1.0%)	--	--	1(2.9%)	
Potato					
Yes	69(66.3%)	23(67.6%)	23(65.7%)	23(65.7%)	.730
No	34(32.7%)	11(32.4%)	12(34.3%)	11(31.4%)	
Did not Know	1(1.0%)	--	--	1(2.9%)	
Local Kemaj bread					
Yes	54(51.9%)	14(41.2%)	16(45.7%)	24(68.6%)	.114
No	48(46.2%)	19(55.9%)	19(54.3%)	10(28.6%)	
Did not Know	2(1.9%)	1(2.9%)	--	1(2.9%)	
Rice or Pasta					
Yes	75(72.1%)	26(76.5%)	21(60.0%)	28(80.0%)	.138
No	29(27.9%)	8(23.5%)	14(40.0%)	7(20.0%)	

Table (5.9): The relationship between total consumption tertiles for Fat with patient's perceptions for some Milk and Milk products food items as reported by study population in Dheisheh Refugee Camp.

Perception about eating		**Fat**			
	Total N (%)	< 32.2g/day n=33	32.2-50.8g/day n=36	>59.8g/day n=35	P value
Low fat milk					
Yes	99(95.2%)	32(97.0%)	33(91.7%)	34(97.1%)	
No	3(2.9%)	1(3.0%)	1(2.8%)	1(2.9%)	0.426
Did not Know	2(1.9%)	--	2 (5.6%)	--	
Whole fat milk					
Yes	20(19.2%)	4(12.1%)	8(22.2%)	8(22.9%)	
No	82(78.8%)	29(87.9%)	27(75.0%)	26(74.3%)	0.608
Did not Know	2(1.9%)	--	1(2.8%)	1(2.9%)	
Low fat yogurt					
Yes	102(98.1%)	32(97.0%)	36(100.0%)	34(97.1%)	
No	2(1.9%)	1(3.0%)	--	1(2.9%)	0.582
Did not Know	--	--	--	--	

Table (5.10): The relationship between total consumption tertiles for Proteins with patient's perceptions for some Meat and Meat substitute's food items as reported by study population in Dheisheh Refugee Camp.

Perception about eating		**Proteins**			
	Total N (%)	<40.6g/day n=35	40.6-61.2g/day n=34	>61.2g/day n=35	P value
Chicken without skin					
Yes	99(95.2%)	33(94.3%)	32(94.1%)	34(97.1%)	0.803
No	5(4.8%)	2 (5.7%)	2(5.9%)	1(2.9%)	
Chicken with skin					
Yes	16(15.4%)	4(11.4%)	5(14.7%)	7(20.0%)	0.605
No	88(84.6%)	31(88.6%)	29(85.3%)	28(80.0%)	
Crow's/sheep meat					
Yes	93(89.4%)	34(97.1%)	29(85.3%)	30(85.7%)	0.189
No	11(10.6%)	1(2.9%)	5(14.7%)	5(14.3%)	
Fish					
Yes	101(97.1%)	35(100.0%)	34(100.0%)	32(91.4%)	**0.048**
No	3(2.9%)	--	--	3(8.6%)	
Eggs					
Yes	92(88.5%)	30(85.7%)	30(88.2%)	32(91.4%)	0.755
No	12(11.5%)	5(14.3%)	4(11.8%)	3(8.6%)	

Table (5.11): The relationship between total consumption tertiles for Calories daily intake with patient's perceptions for some Sweet and fats food items as reported by study population in Dheisheh Refugee Camp.

Perception about eating		**Calories**			
	Total N (%)	<1054g/day n=34	1054-1865g/day n=35	>1865g/day n=35	P value
Chocolate					
Yes	20(19.2%)	7(20.6%)	4(11.4%)	9(25.7%)	0.307
No	84(80.8%)	27(79.4%)	31(88.6%)	26(74.3%)	
Honey					
Yes	36(34.6%)	15(44.1%)	8(22.9%)	13(37.1%)	0.285
No	65(62.5%)	19(55.9%)	25(71.4%)	21(60.0%)	
Did not Know	3(2.9%)	--	2(5.7%)	1(2.9%)	
Olive oil					
Yes	99(95.2%)	33(97.1%)	33(94.3%)	33(94.3%)	0.825
No	5(4.8%)	1(2.9%)	2(5.7%)	2(5.7%)	
Corn oil					
Yes	82(78.8%)	27(79.4%)	26(74.3%)	29(82.9%)	0.575
No	19(18.3%)	5(14.7%)	8(22.9%)	6(17.1%)	
Did not Know	3(2.9%)	2(5.9%)	1(2.9%)	--	
Tabozena juice					
Yes	15(14.4%)	3(8.8%)	2(5.7%)	10(28.6%)	**0.068**
No	86982.7%)	30(88.2%)	32(91.4%)	24(68.6%)	
Did not Know	3(2.9%)	1(2.9%)	1(2.9%)	1(2.9%)	
Tea with sugar					
Yes	17(16.35)	4(11.8%)	4(11.4%)	9(25.7%)	0.342
No	85(81.7%)	30(88.2%)	30(85.7%)	25(71.4%)	
Did not Know	2(1.9%)	--	1(2.9%)	1(2.9%)	

Butter					
Yes	16(15.4%)	6(17.6%)	2(5.7%)	8(22.9%)	0.277
No	86(82.7%)	28(82.4%)	32(91.4%)	26(74.3%)	
Did not Know	2(1.9%)	--	1(2.9%)	1(2.9%)	
Biscuit					
Yes	35(33.7%)	10(29.4%)	11(31.4%)	14(40.0%)	0.504
No	65(62.5%)	24(70.6%)	22(62.9%)	19(54.3%)	
Did not Know	4(3.8%)	--	2(5.7%)	2(5.7%)	

Table (5.12): The relationship between total consumption tertiles for Carbohydrates (CHO) with patient's perceptions for some Orient dishes as reported by study population in Dheisheh Refugee Camp.

Perception about eating		**Carbohydrates**			
	Total N (%)	< 172 g/d n=34	172-284 g/d n=35	> 284 g/d n=35	P value
Mqlouba (upside-down)					
Yes	84(80.8%)	26(76.5%)	3(8.8%)	32(91.4%)	**0.041**
No	15(14.4%)	5(14.7%)	9(25.7%)	1(2.9%)	
Did not Know	5(4.8%)	3(8.8%)	--	2(5.7%)	
Dawaly (grapes leaflets					
Yes	86(82.7%)	28(82.4%)	28(80.0%)	30(85.7%)	0.457
No	15(14.4%)	5(14.7%)	7(20.0%)	3(8.6%)	
Did not Know	3(2.9%)	1(2.9%)	--	2(5.7%)	

Table (5.13): The relationship between total consumption tertiles for Calories intake with patient's perceptions for some Fruits as reported by study population in Dheisheh Refugee Camp.

Perception about eating		**Calories**			
	Total N (%)	<1054g/day n=34	1054-1865g/day n=35	>1865g/day n=35	P value
Apple					
Yes	102(98.1%)	33(97.1%)	35(100.0%)	34(97.1%)	0.596
No	2(1.9%)	1(2.9%)	--	1(2.9%	
Bananas					
Yes	97(93.3%)	30(88.2%)	33(94.3%)	34(97.1%)	0.322
No	7(6.7%)	4(11.8%)	2(5.7%)	1(2.9%)	
Grapes					
Yes	95(91.3%)	29(85.3%)	33(94.3%)	33(94.3%)	0.310
No	9(8.7%)	5(14.7%)	2(5.7%)	2(5.7%)	
Watermelon					
Yes	92(88.5%)	28(82.4%)	31(88.6%)	33(94.3%)	0.300
No	12(11.5%)	6(17.6%)	4(11.4%)	2(5.7%)	

5.4.3.2 Association of the various variables and the consumption of total carbohydrate, fat, protein and caloric intake

Relationship between CHO, protein, fat and calories intake and the various demographic characteristics were studied. Results show that protein consumption and the dependants number at the family was not significantly associated ($p = 0.08$) (see table 5.14), while a value a border p-value of 0.057 was seen between fat consumption and the number of dependants in the family (see table 5.18).

The relationship between total consumption of CHO, protein, fat and calories intake with various health indicators and follow up of diabetes among the study population are presented in table (5.15) and (5.19). However, none of these associations were statistically significant.

The relationships between total consumption of CHO, protein, fat and calories intake with the nutritional indictors of diabetes among the study population were studied. A significant association was seen between CHO, protein and fat consumption with keeping a diet program ($p < 0.05$), also a significant association between nutritional consultation and calories intake, was seen (table 5.16 and table 5.20).

Conversely, the association between total consumption of CHO, protein, fat, and calories intake with patient's perception about their health and nutrition were highlighted in tables (5.17) and (5.21) but no statistical associations were found.

Table (5.14): The correlation between total consumption of CHO and protein intake with various demographic variables among the study population in Dheisheh Refugee Camp.

	Carbohydrate				**Protein**			
	< 172 g/d n=33	172-284 g/d n=33	> 284 g/d n=31	P value	< 41 g/d n=35	41-61 g/d n=34	> 61 g/d n=35	P value
Gender								
Male	9(26.5%)	12(34.3%)	11(31.4%)	.777	11(31.4%)	7(20.6%)	14(40.0%)	.216
Female	25(73.5%)	23(65.7%)	24(68.6%)		24(68.6%)	27(79.4%)	21(60.0%)	
Age								
40-49 yrs	9(26.5%)	13(37.1%)	13(37.1%)	.487	9(25.7%)	13(38.2%)	13(37.1%)	.712
50-59 yrs	15(44.1%)	16(45.7%)	11(31.4%		16(45.7%)	14(41.2%)	12(34.3%)	
>60 years	10(29.4%)	6(17.1%)	11(31.4%		10(28.6%)	7(20.6%)	10(28.6%)	
Family size								
≤6 persons	20(58.8%)	16(45.7%)	16(45.7%)	.455	21(60.0%)	16(47.1%)	15(42.9%)	.328
> 6 persons	14(41.2%)	19(54.3%)	19(54.3%)		14(40.0%)	18(52.9%)	20(57.1%)	
Educational level								
0- 9 yrs	23(67.6%)	21(60.0%)	24(68.6%)	.711	25(71.4%)	24(70.6%)	19(54.3%)	.237
10-16 yrs	11(32.4%)	14(40.0%)	11(31.4%)		10(28.6%)	10(29.4%)	16(45.7%)	
Independency								
Yes	11(32.4%)	13(37.1%)	11(31.4%)	.863	12(34.3%)	9(26.5%)	14(40.0%)	.491
No	23(67.6%)	22(62.9%)	24(68.6%)		23(65.7%)	25(73.5%)	21(60.0%)	
Dependants								
≤ 11 members	30(88.2%)	32(91.4%)	33(94.3%)	.671	29(82.9%)	32(94.1%)	34(97.1%)	**.082**
> 11 members	4(11.8%)	3(8.6%)	2(5.7%)		6(17.1%)	2(5.9%)	1(2.9%)	
Working status								
Working	6(17.6%)	10(28.6%)	6(17.1%)	.418	8(22.9%)	7(20.6%)	7(20.0%)	.953
Not working	28(82.4%)	25(71.4%)	29(82.9%)		27(77.1%)	27(79.4%)	28(80.0%)	

Table (5.15): The association between total consumption of CHO and protein intake with various health indicators and follow up of diabetes among the study population in Dheisheh Refugee Camp.

	Carbohydrate				Protein			
	< 172 g/d n=33	172-284 g/d n=33	> 284 g/d n=31	P value	< 41 g/d n=35	41-61 g/d n=34	> 61 g/d n=35	P value
BMI								
<25	6(17.6%)	6(17.1%)	7(20.0%)	.836	5(14.3%)	6(17.6%)	8(22.9%)	.445
25-30	7(20.6%)	10(28.6%)	11(31.4%)		7(20.0%)	9(26.5%)	12(34.3%)	
>30	21(61.8%)	19(54.3%)	17(48.6%)		23(65.7%)	19(55.9%)	15(42.9%)	
Number of kg/ds change								
≤5kg	6(31.6%)	7(30.4%)	3(15.0%)	.296	5(23.8%)	6(35.3%)	5(20.8%)	.444
5-15kg	10(52.6%)	10(43.5%)	15(75.0%)		10(47.6%)	952.9%)	16(66.7%)	
>15kg	3(15.7%)	6(26.1%)	2(10.0%)		6(28.6%)	2(11.8%)	3(12.5%)	
Disease duration								
1-10 years	22(64.7%)	30(85.7%)	26(74.3%)	.130	23(65.7%)	29(85.3%)	26(74.3%)	.170
> 10 years	12(35.3%)	5(14.3%)	9(25.7%)		12(34.3%)	5(14.7%)	9(25.7%)	
Last FBS level								
Low	2(5.9%)	2(5.7%)	--	.255	2(5.7%)	2(5.9%)	--	.616
High	27(79.4%)	23(65.7%)	23(65.7%)		25(71.4%)	24(70.6%)	24(68.6%)	
normal	5(14.7%)	10(28.6%)	12(34.3%)		8(22.9%)	8(23.5%)	11(31.4%)	
Doing BS								
Yes	30(88.2%)	29(82.9%)	32(91.4%)	.549	31(88.6%)	30(88.2%)	30(85.7%)	.925
No	4(11.8%)	6(17.1%)	3(8.6%)		4(11.4%)	4(11.8%)	5(14.3%)	
Receiving antiglycemic drugs(AGD)								
Yes	29(85.3%)	30(85.7%)	32(91.4%)	.688	30(85.7%)	30(88.2%)	31(88.6%)	.925
No	5(14.7%)	5(14.3%)	3(8.6%)		5(14.3%)	4(11.8%)	4(11.4%)	
Keep physician visit								
Yes	28(82.4%)	32(91.4%)	30(85.7%)	.535	29(82.9%)	31(91.2%)	30(85.7%)	.590
No	6(17.6%)	3(8.6%)	5(14.3%)		6(17.1%)	3(8.8%)	514.3%)	
Practice sport or physical activity level?								
Yes	14(41.2%)	11(31.4%)	17(48.6%)	.341	18(51.4%)	12(35.3%)	12(34.3%)	.262
No	20(58.8%)	24(68.6%)	18(51.4%)		17(48.6%)	22(64.7%)	23(65.7%)	

Table (5.16): The association between total consumption of CHO and protein intake with the nutritional indictors of diabetes among the study population in Dheisheh Refugee Camp.

	Carbohydrate				**Protein**			
	< 172 g/d n=33	172-284 g/d n=33	> 284 g/d n=31	P value	< 41 g/d n=35	41-61 g/d n=34	> 61 g/d n=35	P value
Share in lectures or workshop								
Yes	18(52.9%)	21(60.0%)	22(62.9%)	.691	22(62.9%)	19(55.9%)	20(57.1%)	.821
No	16(47.1%)	14(40.0%)	13(37.1%)		13(37.1%)	15(44.1%)	15(42.9%)	
Keep diet prog/d								
Yes	19(55.9%)	11(31.4%)	9(25.7%)	**.023**	17(48.6%)	16(47.1%)	6(17.1%)	**.009**
No	15(44.1%	24(68.6%)	26(74.3%)		18(51.4%)	18(52.9%)	29(82.9%)	
Eating behavior								
Regular	22(64.7%)	18(51.4%)	20(57.1%)	.539	24(68.6%)	19(55.9%)	17(48.6%)	.549
Irregular	10(29.4%)	10(28.6%)	10(28.6%)		8(22.9%)	10(29.4%)	12(34.3%)	
Not care	2(5.9%)	7(20.0%)	5(14.3%)		3(8.6%)	5(14.7%)	6(17.1%)	
Food availability								
Yes	13(38.2%)	10(28.6%)	18(51.4%)	.276	11(31.4%)	11(32.4%)	19(54.3%)	.149
No	2(5.9%)	5(14.3%)	2(5.7%)		3(8.6%)	5(14.7%)	1(2.9%)	
sometimes	19(55.9%)	10(57.1%)	15(42.9%)		21(60.0%)	18(52.9%)	15(42.9%)	
Nutrition consultation								
Yes	9(26.5%)	15(42.9%)	15(42.9%)	.270	9(25.7%)	14(41.2%)	16(45.7%)	.194
No	25(73.5%)	20(57.1%)	20(57.1%)		26(74.3%)	20(58.8%)	19(54.3%)	

Table (5.17): The association between total consumption of CHO and protein intake with patient's perception about their health and nutrition among the study population in Dheisheh Refugee Camp.

	Carbohydrate				**Protein**			
	< 172 g/d n=34	172-284 g/d n=35	> 284 g/d n=35	P value	< 41 g/d n=35	41-61 g/d n=34	> 61 g/d n=35	P value
own Health								
Very good	--	--	2(5.7%)	.405	-	--	2(5.7%)	
Good	14(41.2%)	14(40.0%)	14(40.0%)		14(40.0%)	18(52.9%)	10(28.6%)	
Fair	14(41.2%)	18(51.4%)	12(34.3%)		15(42.9%)	13(38.2%)	16(45.7%)	.289
Bad	4(11.8%)	3(8.6%)	6(17.1%)		4(11.4%)	3(8.8%)	6(17.1%)	
Very bad	2(5.9%)	--	1(2.9%)		2(5.7%)	--	1(2.9%)	
nutritionist consultation								
Yes	27(79.4%)	23(65.7%)	22(62.8		27(77.1%)	24(70.6%)	21(60.0%)	
No	6(17.6%)	10(28.6%)	%)	.544	7(20.0%)	9(26.5%)	12(34.3%)	.633
Unknown	1(2.9%)	2(5.7%)	12(34.3%)		1(2.9%)	1(2.9%)	2(5.7%)	
			1(2.9%)					
Self activity level								
High	2(5.9%)	--	4(11.4%)	**.098**	1(2.9%)	1(2.9%)	4(11.4%)	.395
Moderate	8(23.5%)	13(37.1%)	16(45.7%)		11(31.4%)	12(35.3%)	14(40.0%)	
Low	24(70.6%)	2160.0%)	15(42.9%)		23(65.7%)	20(58.8%)	17(48.6%)	
others	--	1(2.9%)	--		--	1(2.9%)	--	
Perception about weight								
Obese	19(55.9%)	19(54.3%)	12(34.3%)	.387	20(57.1%)	15(44.1%)	1542.9%)	.715
Normal	14(41.2%)	15(42.9%)	21(60.0%)		14(40.0%)	18(52.9%)	18(51.4%)	
unknown	1(2.9%)	1(2.9%)	2(5.7%)		1(2.9%)	1(2.9%)	2(5.7%)	

Table (5.18): The association between total consumption of fat and calorie intake with demographic variables among the study population in Dheisheh Refugee Camp.

	Fats				**Calories**			
	< 32 g/d n=33	32-51 g/d n=36	> 51 g/d n=35	P value	< 1054 n=34	1054-1865 n=35	> 1865 n=35	P value
Gender								
Male	8(24.2%)	11(30.6%)	13(37.1%	.515	10(29.4%)	11(31.4%)	11(31.4%)	.978
Female	25(75.7%)	25(69.4%)	22(62.9%		24(70.6%)	24(68.6%)	24(68.6%)	
Age								
40-49 yrs	7(21.2%)	18(50.0%)	10(28.6%)	**.066**	10(29.4%)	13(37.1%)	12(34.3%)	.792
50-59 yrs	18(54.5%)	11(30.6%)	13(37.1%)		15(44.1%)	15(42.9%)	12(34.3%)	
>60 years	8(24.2%)	7(19.4%)	12(34.3%)		9(26.5%)	7(20.0%)	11(31.4%)	
Family size								
≤6 persons	19(57.6%)	16(44.4%)	17(48.6%)	.540	21(61.8%)	16(45.7%)	15(42.9%)	.240
> 6 persons	14(42.4%)	20(55.6%)	18(51.4%)		13(38.2%)	19(54.3%)	20(57.1%)	
Educational level								
0- 9 yrs								
10-16 yrs	25(75.7%)	24(66.7%)	19(54.3%)	.174	23(67.6%)	23(65.7%)	22(62.9%)	.915
	8(24.2%)	12(33.3%)	16(45.7%)		11(32.4%)	12(34.3%)	13(37.1%)	
Independency								
Yes	10(30.3%)	13(36.1%)	12(34.3%)	.874	10(29.4%)	13(37.1%)	12(34.3%)	.790
No	23(69.7%)	23(63.9%)	23(65.7%)		24(70.6%)	22(62.9%)	23(65.7%)	
Dependants								
≤ 11 members	27(81.8%)	34(94.4%)	34(97.1%)	**.057**	29(85.3%)	33(94.3%)	33(94.3%)	.310
> 11 members	6(18.2%)	2(5.6%)	1(2.9%)		5(14.7%)	2(5.7%)	2(5.7%)	
Working status								
Working								
Not working	9(27.3%)	8(22.2%)	5(14.3%)	.416	7(20.6%)	9(25.7%)	6(17.1%)	.677
	24(72.7%)	28(77.8%)	30(85.7%)		27(79.4%)	26(74.3%)	29(82.9%)	

Table (5.19): The association between total consumption of fat and calorie intake with health status and follow up indicators among the study population in Dheisheh Refugee Camp.

	Fats				**Calories (kcal)**			
	< 32 g/d n=33	32-51 g/d n=36	> 51 g/d n=35	P value	< 1054 n=34	1054-1865 n=35	> 1865 n=35	P value
BMI								
<25	5(15.2%)	6(16.7%)	8(22.9%)	.307	6(17.6%)	6(17.1%)	7(20.0%)	.621
25-30	7(21.2%)	8(22.2%)	13(37.1%)		6(17.6%)	11(31.4%)	11(31.4%)	
>30	21(63.6%)	22(61.1%)	14(40.0%)		22(64.7%)	18(51.4%)	17(48.6%)	
Number of kilog/ds change								
≤5kg	3(15.7%)	9(45.0%)	4(17.4%)	**.076**	6(31.6%)	7(31.8%)	3(14.3%)	.365
5-15kg	10(52.6%)	9(45.0%)	16(69.6%)		8(42.1%)	12(54.5%)	15(71.4%)	
>15kg	6(31.6%)	2(10.0%)	3(13.0%)		5(26.3%)	3(13.6%)	3(14.3%)	
Disease duration								
1-10 years	22(66.7%)	30(83.3%)	26(74.3%)	.277	24(70.6%)	29(82.9%)	25(71.4%)	.418
> 10 years	11(33.3%)	6(16.7%)	9(25.7%)		10(29.4%)	6(17.1%)	10(28.6%)	
Last FBS level								
Low	2(6.1%)	1(2.8%)	1(2.9%)	.896	2(5.9%)	2(5.7%)	--	.443
High	24(72.7%)	25(69.4%)	24(68.6%)		26(76.5%)	23(65.7%)	24(68.6%)	
normal	7(21.2%)	10(27.8%)	10(28.6%)		6(17.6%)	10(28.6%)	11(31.4%)	
Doing BS								
Yes	30(90.9%)	30(83.3%)	31(88.6%)	.619	30(88.2%)	29(82.9%)	32(91.4%)	.549
No	3(9.1%)	6(16.7%)	4(11.4%)		4(11.8%)	6(17.1%0	3(8.6%)	
Receiving antiglycemic drugs(AGD)								
Yes	28(84.8%)	32(88.9%)	31(88.6%)	.855	30(88.2%)	28(80.0%)	33(94.3%)	.193

No	5(15.2%)	4(11.1%)	4(11.4%)		4(11.8%)	7(20.0%)	2(5.7%)	
Weight change								
Yes	19(57.6%)	20(55.6%)	23(65.7%)	.656	19(55.9%)	22(62.9%)	21(60.0%)	.839
No	14(42.4%)	16(44.4%)	12(34.3%)		15(44.1%)	13(37.1%)	14(40.0%)	
Keep physician visit								
Yes	29(87.9%)	31(86.1%)	3085.7%)	.962	29(85.3%)	31(88.6%)	30(85.7%)	.909
No	4(12.1%)	5(13.9%)	5(14.3%)		5(14.7%)	4(11.4%)	5(14.3%)	
Practice sport or physical activity								
Yes	15(45.5%)	15(41.7%)	12(34.3%)	.632	17(50.0%)	10(28.6%)	15(42.9%)	.181
No	18(54.5%)	21(58.3%)	23(65.7%)		17(50.0%)	25(71.4%)	20(57.1%)	

Table (5.20): The association between total consumption of fat and calories intake with the nutritional indictors of diabetes among the study population in Dheisheh Refugee Camp.

	Fats (gram /day)				**Calories (kcal)**			
	< 32 g/d n=33	32-51 g/d n=36	> 51 g/d n=35	P value	< 1054 n=34	1054-1865 n=35	> 1865 n=35	P value
Keep diet prog/d								
Yes	21(63.6%)	9(25.0%)	9(25.7%)	**.001**	16(47.1%)	14(40.0%)	9(25.7%)	.174
No	12(36.4%)	27(75.0%)	26(74.3%)		18(52.9%)	21(60.0%)	26(74.3%)	
Share in lectures and workshop								
Yes	20(60.6%)	22(61.1%)	19(54.3%)	.812	22(64.7%)	17(48.6%)	22(62.9%)	.327
No	13(39.4%)	14(38.9%)	16(45.7%)		12(35.3%)	1851.4%)	13(37.1%)	
Search for specialist								
Yes	16(48.5%)	24(66.7%)	22(62.9%)	.273	18(52.9%)	21(60.0%)	23(65.7%)	.557
No	17(51.5%)	12(33.3%)	13(37.1%)		16(47.1%)	14(40.0%)	12(34.3%)	
Eating behavior								
Regular	25(75.7%)	17(47.2%	18(51.4%)	**.086**	22(64.7%)	18(51.4%)	20(57.1%)	.810
Irregular	7(21.2%)	13(36.1%	10(28.6%)		9(26.5%)	11(31.4%)	10(28.6%)	
Not care	1(3.0%)	6(16.7%	7(20.0%)		3(8.8%0	6(17.1%)	5(14.3%)	
Food availability								
Yes	8(24.2%)	16(44.4%)	17(48.6%)	.105	12(35.3%)	12(34.3%)	17(48.6%)	.742
No	2(6.1%)	5(13.9%)	2(5.7%)		3(8.8%)	3(8.6%)	3(8.6%)	
sometimes	23(69.7%)	15(41.7%)	16(45.7%)		19(55.9%)	20(57.1%)	15(42.9%)	
Nutrition consultation								
Yes	10(30.3%)	14(38.9%)	15(42.9%)	.552	7(20.6%)	18(51.4%)	14(40.0%)	.028
No	23(69.7%)	22(61.1%)	20(57.1%)		27(79.4%)	17(48.6%)	21(60.0%)	

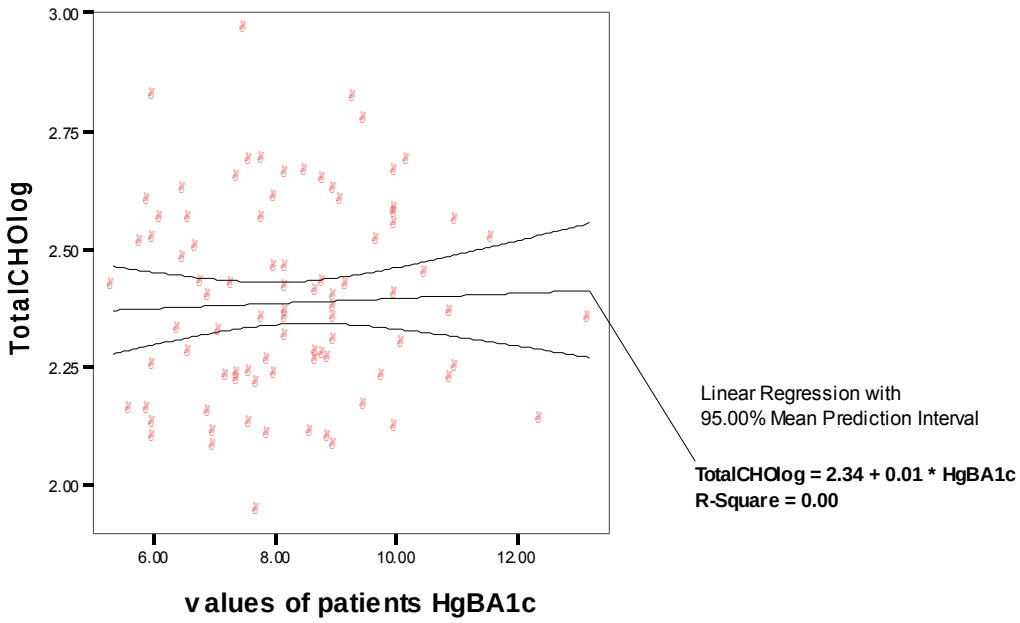
Table (5.21): The association between total consumption of fat and calories intake with patients perception about their own health and nutrition among the study population in Dheisheh Refugee Camp.

	Fat (gram/day)				Calories (kcal)			
	< 32 g/d n=33	32-51 g/d n=36	> 51 g/d n=35	P value	< 1054 n=34	1054-1865 n=35	> 1865 n=35	P value
own Health								
Very good	--	--	2(5.7%)	0.191	--	--	--	.286
Good	10(30.3%)	19(52.8%)	13(37.1%)		12(35.3%)	18(51.4%)	2(5.7%)	
Fair	18(54.5%)	11(30.6%)	15(42.9%)		15(44.1%)	15(42.9%)	12(34.3%)	
Bad	3(9.1%)	5(13.9%)	5(14.3%)		5(14.7%)	2(5.7%)	14(40.0%)	
Very bad	2(6.1%)	1(2.8%)	--		2(5.9%)	--	6(17.1%)	
nutritionist consultation								
Yes	25(75.7%)	23(63.9%)	24(68.6%)	.847	26(76.5%)	24(68.6%)	22(62.9%)	.704
No	7(21.2%)	11(30.6%)	10(28.6%)		7(20.6%)	9(25.7%)	12(34.3%)	
Unknown	1(3.0%)	2(5.6%)	1(2.9%)		1(2.9%0	2(5.7%0	1(2.9%)	
Self activity level								
High	1(3.0%)	1(2.8%)	4(11.4%)	.505	1(2.9%)	1(2.9%)	4(11.4%)	.232
Moderate	12(36.4%)	14(38.9%)	11(31.4%)		9(26.5%)	13(37.1%)	15(42.9%)	
Low	20(60.6%)	21(58.3%)	19(54.3%)		24(70.6%)	20(57.1%)	16(45.7%)	
others	--	--	1(2.9%)		--	1(2.9%)	--	
Perception about weight								
Obese	15(45.5%)	22(61.1%)	13(37.1%)	.296	21(61.8%)	17(48.6%)	12(34.3%)	.250
Normal	16(48.5%)	13(36.1%)	21(60.0%)		12(35.3%)	17(48.6%)	21(60.0%)	
unknown	2(6.1%)	1(2.8%)	1(2.9%)		1(2.9%)	1(2.9%)	2(5.7%)	

Part 5: Associations between food intake and the glycemic control

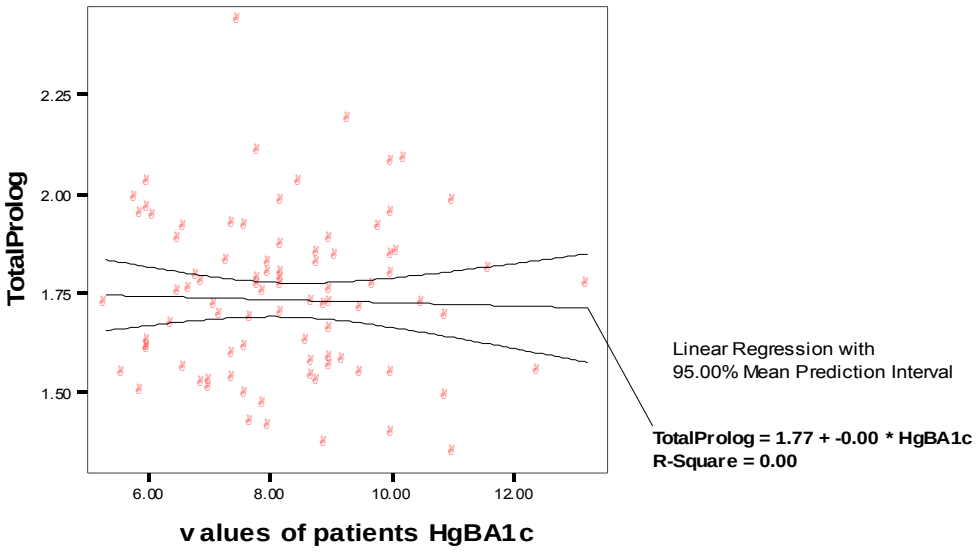
5.5.1 Linear regression between HA1C and total consumption of CHO, fat, protein and caloric intake

The following figure 5.24 (A-D) shows the linear regression between the logarithm of total carbohydrate, total protein and total fat intake gram per day and total caloric intake. However, all figures linear equations showed non-significant associations with HbA1C.



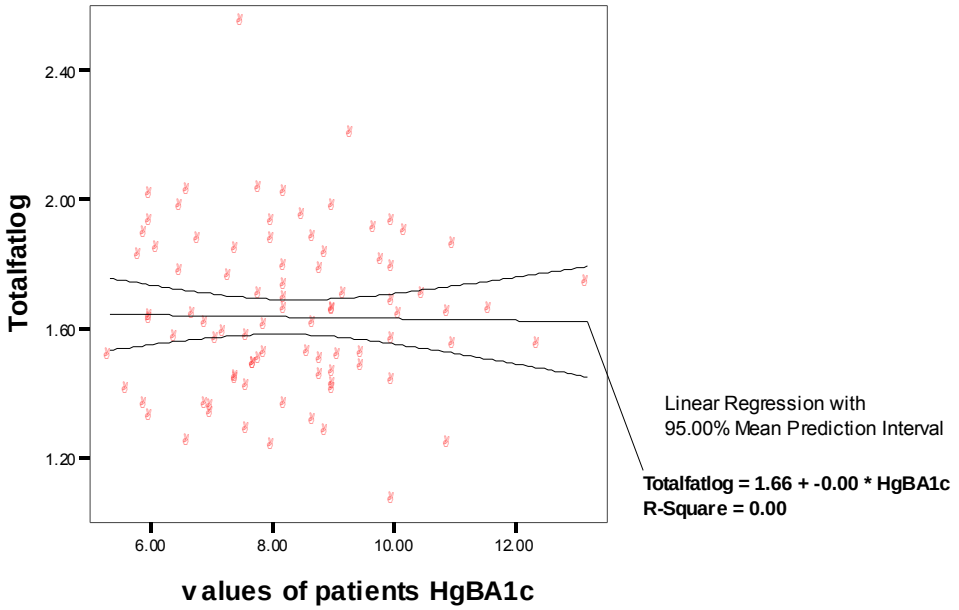
(A)

Figure 5.24 (A): represent linear regression model with 95% mean prediction interval of total Carbohydrates intake with HbA1c values for the 87 type 2 diabetic patients in Dheisheh Refugee Camp.



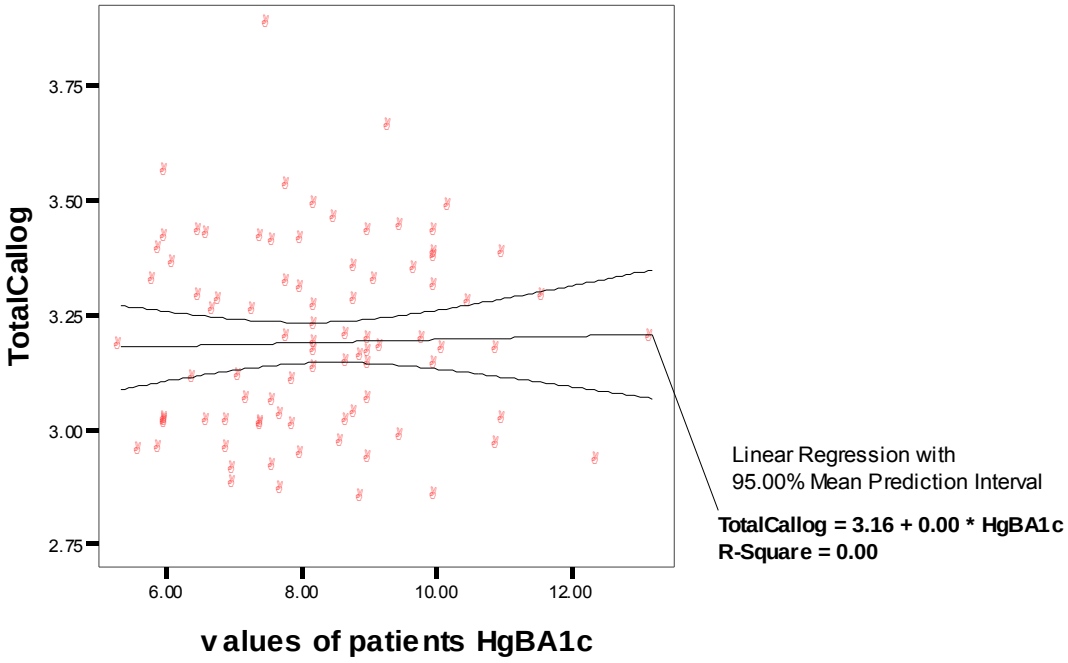
(B)

Figure 5.24 (B): represent linear regression model with 95% mean prediction interval of total Protein intake with HbA1c values for the 87 type 2 diabetic patients in Dheisheh Refugee Camp.



(C)

Figure 5.24 (C): represent linear regression model with 95% mean prediction interval of total Fat intake with HbA1c values for the 87 type 2 diabetic patients in Dheisheh Refugee Camp.



(D)

Figure 5.24 (D): represent linear regression model with 95% mean prediction interval of total Calories intake with HbA1c values for the 87 type 2 diabetic patients in Dheisheh Refugee Camp.

5.5.2 Comparing means between HbA1C and total consumptions of CHO, fat, protein and total caloric intake

When comparing between the levels of HbA1c ≤ 7 and > 7 with the geometric means of total carbohydrate, total protein, total fat, and total caloric intake consumption by day. The independent sample t-test results showed no significant difference among those with high or low levels of HbA1C (table 5.22).

5.5.3 Association between HbA1C and the tertile of total CHO, fat, protein and caloric intake

Table 5.23 shows the association between HbA1C categories and the tertiles of the various total components intake. However, no significant differences were seen.

5.5.4 Multivariate analysis

Table 5.24 presents the logistic regression model for HbA1C. Age, gender, dependents number, disease duration , body mass index , in addition to the total fat, protein, carbohydrate and total caloric intake tertiles. As seen in the table, none of the variables showed any significant adjusted odds ratio with HbA1c

Table (5.22): Independent Samples T-Test between the levels of HbA1c ≤ 7 and > 7 with the means of total carbohydrate, total protein, total fat, and total caloric intake consumption by day.

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
total carbohydrate	.134	.715	-.524	85	**0.60**	-0.026	.05131	-0.128	0.075
Total fat intake	.438	.510	-.010	85	**0.99**	-0.0006	.06175	-0.123	0.122
total protein	.049	.825	-.108	85	**0.91**	-0.0053	.04930	-0.103	0.092
total caloric	.707	.403	-.640	85	**0.52**	-0.0323	.05059	-0.132	0.068

Table (5.23): Association between HbA1c levels and total consumption of CHO, protein, fats and calories intake as reported by the 87 patients in Dheisheh Refugee Camp.

Variable	HbA1c≤7	HbA1c>7	Total	P value
Carbohydrate				
< 172 g/d	31.8	26.2	27.6	0.49
172-284 g/d	27.3	41.5	37.9	
> 284 g/d	40.9	32.3	34.5	
Protein				
< 41 g/d	36.4	30.8	32.2	0.83
41-61 g/d	31.8	30.8	31.0	
> 61 g/d	31.8	38.5	36.8	
Fats				
< 32 g/d	36.4	32.3	33.3	0.62
32-51 g/d	22.7	33.8	31.0	
> 51 g/d	40.9	33.8	35.6	
Calories				
< 1054 Kal	22.7	15.4	17.2	0.65
1054-1865 Kal	40.9	50.8	48.3	
> 1865 Kal	36.4	33.8	34.5	

.

Table (5.24): Logistic regression model for age, gender, dependents number, disease duration, body mass index, and nutritional intakes per day, i.e. total CHO, fat, protein, and total caloric intake tertiles with HbA1c for 87 patients in Dheisheh Refugee Camp.

	N	Odds ratio	Lower (N=22)	Upper (N=65)
Gender				
- Female	**61**	8.07	0.76	85
- Male	**26**	1.00		
Age				
40-49 years (Ref.)	**28**	1.00		
50-59 years	**38**	1.07	0.24	4.66
60 years and above	**21**	0.56	0.10	2.91
Educational level				
Less or equal 12 years (Ref.)	**57**	1.00		
More than 12 years	**30**	0.72	0.16	3.12
Dependant's number				
Less than 11 (Ref.)	**79**	1.00		
11 and more	**8**	1.27	0.15	10
Disease duration				
10 years and less (Ref.)	**66**	1.00		
More than 10 years	**21**	1.02	0.21	4.89
BMI				
- < 25 (Ref.)	**14**	1.00		
- 26-30	**22**	0.24	0.02	1.95
- > 30	**51**	0.21	0.02	1.90
Fats				
- < 32 g/d	**27**	2.05	0.18	22
- 32-51 g/d	**29**	2.65	0.37	18
- > 51 g/d (Ref.)	**31**	1.00		
Carbohydrate				
- < 172 g/d	**24**	22	0.33	1504
- 172-284 g/d	**32**	7.53	0.25	220
- > 284 g/d (Ref.)	**31**	1.0		
Protein				
- < 41 g/d	**28**	0.74	0.01	42
- 41-61 g/d	**27**	0.08	0.005	1.12
- > 61 g/d (Ref.)	**32**	1.00		
Calories				
- < 1054 Kal	**25**	0.02	0.00	3.58
- 1054-1865 Kal	**30**	1.97	0.06	56
- > 1865 Kal (Ref.)	**32**	1.00		

5.6 Summary:

The analysis of data was performed, and significant association found between some variables. However, the analysis of food contents that presented in FFQ was the main fraction. Yet, the results will be presented in the discussion chapter.

Chapter Six

Discussion and conclusion

6.1 Introduction

6.2 Socio-Demographic Variables

6.3 Diabetes history, Obesity, and self management and diabetes

6.3.1 Diabetes history

6.3.2 Obesity

6.3.3 Physical activity or exercise

6.3.4 Self management

6.5 Nutritional history among study population

6.5.1 Food availability

6.5.2 Daily consumption of carbohydrate, protein, fat, and calories

6.5.3 Association of the various variables and the consumption of total Carbohydrate, fat, protein and caloric intake

6.5.4 Perception of food items consumption and the amount of CHO, fat, protein intake

6.5.5 Consultation with dietitian

6.6 Evaluation of objective testing (HbA1c) among the study population

6.6.1 Association between HbA1c values and various demographic factors

6.6.2 Evaluation of Objective testing (HbA1c) and diabetes history

6.6.3 HbA1c and obesity, exercise

6.6.4 HbA1c and self-management factors

6.6.5 HbA1c and the consumption of CHO, fat, protein and caloric intake

6.7 Study bias and limitations

6.8 Conclusion

6.9 Recommendations

6.1 Introduction

This is the first study in Palestine that investigated the association between diabetes type 2 and the food contents of these patients. This study provides a baseline for further studies to improve diabetes health care and nutrition life style, which affect directly diabetes complication prevention and delay its effect.

The response rate of the study was 67.5%. The total number of type2 diabetic patients who Fit inclusion and exclusion criteria and registered in Ibdaa Diabetic Club was 154 of whom only 104 participated in the study. Only 87 patients did HbA1c testing.

The Diabetes Food Pyramid was the base for food analysis and groups categorization in the study for different food items.

In this chapter, the main study findings are presented and discussed. In the last part of this chapter, the study conclusion and recommendations will be presented.

6.2 Socio-Demographic Variables:

Age, sex, marital status, occupation and working status, dependant's number, family size, and educational level were the main socio-demographic factors in the study conceptual model.

The mean age of the study group was 54.6 years (standard deviation (SD) 8.45). Several studies used the same age group; however, other study was concerned with wider diabetic patient's age groups, i.e. greater than 20 years (Albarran et al.2006). Yet, this study finds that type 2 diabetes increasingly with age mainly in age group 50-59 years. Results from the National Health and Nutrition Examination Survey (NHANES III), 1988-1994, find increased in the prevalence of diagnosed diabetes in 1988-1994, it was estimated to be 5.1% for U.S. adults ≥ 20 years of age (10.2 million people when extrapolated to the 1997 U.S. population), which was justified by the increased prevalence of obesity and sedentary lifestyle (Harris et al,1998). However, another study in India showed that diabetes and impaired glucose tolerance showed increasing trend with age. Subjects under 40 years of age had a higher prevalence of impaired glucose tolerance than diabetes (12.8 % versus 4.6 %, $p < 0.0001$). Diabetes showed a positive and independent association with age (Ramachandran et al, 2001).

In the USA that was done between years 1976 and 1980 showed that the total rates of diabetes increased with age, from 2.0% at age 20-44 years to 17.7% at age 65-74 yr (Harris et al, 1987). In Saudi Arabia, we found a high prevalence of type 2 diabetes among middle-aged women, which could be attributed to a high incidence of obesity (Abdul-Ghani et al, 2005). In Sudan, a study in Siga found crude prevalence of DM and IGT were 8.3 % (men 9.9 %; women 7.5 %) and 7.9 % (men 4.1 %; women 9.7 %), respectively (Elbagir et al, 1998).

Though, the prevalence of diabetes mellitus is known to be increasing rapidly worldwide, but few population-based surveys have been undertaken in Africa or the Middle East. According to local epidemiological studies in Libya, the prevalence for known diabetic patients aged over 20 years was 3.8%. As 50% of type 2 diabetic patients are unaware of their diabetes "undiagnosed", the actual prevalence is probably higher. In the town of Tajoura, the west part of Libya; 7.9% of all adult members of 1094 randomly selected families (2996 persons aged between 20 and 75 years) had diabetes. In Benghazi, in the eastern part of Libya, screening of randomly selected group of 868 subjects revealed that about 23% above age of 20 years were glucose intolerant, two-thirds had diabetes and the rest had impaired glucose tolerance. From these two Libyan cohorts, we estimate the adult diabetic population in Libya to be at least 300,000 at present (Bakoush et al, 2006).

Our results showed that women in Dheisheh Refugee camp had diabetes more than men (men 30.8%, n=32 versus women 69.2%, n= 72). Similar studies showed that females had a greater risk to develop type 2 diabetes compared to males (Gale and Gillespie, 2001). Also, similar findings were found in studies done in Oman, Egypt, Saudi Arabia, Tunisia, (Mohamed et al., 2005 and Punnose et al.2002 and El-Hazmi et al, 2008 Bouguerra et al, 2006). However, in other studies in the USA (NHANES III survey), no difference in the rates between males and females were found (Harris et al, 1998). In Saudi Arabia, a total of 25,337 Saudis (11,713 males (46.2%) and 13, 624 females (53.8%)) were screened for diabetes mellitus and impaired glucose tolerance using WHO criteria for diagnosis. The prevalence of insulin-dependent diabetes mellitus, non-insulin-dependent diabetes mellitus and impaired glucose tolerance in the total Saudi male population was 0.23%, 5.63% and 0.50%

respectively, and in the total Saudi female population was 0.30%, 4.53% and 0.72% respectively (El-Hazmi et al,2008).

A cross-sectional health study providing a large nationally representative sample of the Tunisian population including 3729 adults, Step-wise logistic regression showed age of more than 40 years,The overall diabetes prevalence was 9.9% (9.5% in men and 10.1 in women) giving age-adjusted prevalence of diabetes of 8.5% (7.3% in men and 9.6% in women) (Bouguerra et al,2006).In sudan, a study in segi shows that advanced age were associated with higher rates of diabetes(Elbagir et al,1998).While in Sudia Arabia, Recently published surveys indicate that nearly one Saudi Arabian in five beyond the age of 30 has diabetes mellitus (Alzaid ,1997). Indeed, emerging figures from neighboring Arab countries such as Egypt and Jordan reveal the same alarming trend (Alzaid, 1997). In Kuwait, type 2 diabetes increased to 28.82% and 24.92% in males and females respectively over the age of 60 years, while impaired glucose tolerance increased to 1.60% and 3.56 %(El-Hazmi et al, 2008).

In our study, results showed that 33.7% (n=35) of the study population main income source was their families, and 91.3% lived in families the head of it have financial responsibility for 11 persons or less. Only 21.2% of the study population was working at the time of the survey. However, patient's occupation regardless their working status or educational degree categorized for four categories; semiprofessional 5.8% , clerk and worker 9.6% , 24.0%, housewife 60.6% (n=63), while none of them was a professional who have chance to receive better medical care by specialized doctor else where and who also have good socioeconomic status. Our result show a high percent of unemployment among study population who have the capacity to work and these result connected with general situation in Dheisheh refugee Camp as presence of high percent of unemployment. Also, that result from the fact of presence of housewife which is more than the half of study population.

Our study shows 56% of the study population living in families consists of six members or less. Still, education and economic level have been shown to be powerful and unique predictors of health out come. Lower level of education was shown to be associated with poor health and higher levels of education are associated with better health.

Several studies investigated the association between education, income and occupation and type 2 diabetes and its management. In Alameda County Study by Kaplan in 2005, education, income, and occupation were found to be associated with increased diabetes risk in unadjusted models. In baseline adjustment models, <12 years of education showed an excess risk of 50% to develop diabetes compared with those with more years of education [hazard ratio (HR) = 1.5, 95% confidence interval (95% CI) 1.11–2.04]. But, income and occupation did not show any significantly association with the risk after adjustment. Further adjustment minimized the significance of all associations. Time-dependent effects were consistently elevated for low education and male blue-collar (non-professional) occupation, although associations were not significant after full adjustment (HR = 1.1, 95% CI 0.79–1.47 and HR = 1.3, 95% CI 0.91–1.89, respectively) (Kaplan et al, 2005).

6.3 Diabetes history, Obesity, self management and diabetes

Diabetes history considered an important element to build a plan for action to type 2 diabetes. Duration of diabetes, disease complications, and Medical follow up were studied. Moreover several self-management techniques also explored especially Physical activity, Compliance with medication, and diet which will discussed in depth later in this chapter. The importance of obesity role in developing type 2 diabetes not ignored, many of literatures worldwide and here in Palestine discussed it and finds results similar to our findings which highlighted in separate part.

6.3.1 Diabetes history

This study showed that the duration of diabetes illness varied between one to 27 years with a mean 7.6-year (SD, 5.48) which means a long period with disease and high chance to develop complications and paid costs related to this disease. Interestingly, 42.3% of population perceived their health as good or very good, may that related to the reality that many of patients living with diabetes since long time and adapt with it and their awareness' to study objectives.

However, the most of these patients were followed up by general practitioner (follow up by GPs was 92.3%) at the UNRWA clinic. Doctors at the UNRWA clinics play a very important and major role in the early diagnosis and follow up diabetic patients.

These GPs who do not have the needed specialty in the field of diabetes management and who do not have the enough and proper time for these patients are the core stone for the management and control of these patients. This study results are consistent with the study of done by Abu Mousa in Oman (1998) showed that 73.4% of the diabetic patients were diagnosed by general practitioners. In India, Rayappa et al. (Rayappa, 1999) found that 91% of the study population (type 1 and type 2 diabetic patients) initially visited a non specialist for the diagnosis of their diabetes. On the contrary, in the United Arab Emirates, Punnose et al., Showed all patients in his study had a diagnosis of diabetes mellitus at Al-Ain Hospital (Punnose et al, 2002). However, even most patients with type 2 diabetes mellitus receive care by family physicians; a retrospective medical chart review was in Newfoundland. The study population consisted of 55 male and 63 female patients with a mean age of 64 (range 29 to 88) years. 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. Data however, from study seem to suggest that family physicians are doing a good job of providing care for their patients with type 2 diabetes (Worral et al, 1997).

Of the study population, 53.8% had been diagnosed with hypertension (HTN) (n=56), of which 7.1% followed a diet regime as a treatment option, while 89.3% were prescribed antihypertensive drugs. Moreover, 6.7% reported having kidney problems, 27.9% have cardiac problems, and most of them reported having ophthalmic complications (61.5%) and 58.7% reported having neurology impairment.

A random sample of houses (452) of Emirati citizens living in Al Ain from 2455 adults (>18 yrs) share in the study, of which 10.2% reported having the diagnosis of DM. In patients with diagnosed DM, the prevalence rates for retinopathy, neuropathy, nephropathy, peripheral vascular disease and coronary heart disease were 54.2, 34.7, 40.8, 11.1 and 10.5%, respectively. A significant proportion of subjects with undiagnosed DM and pre-diabetes also had micro- and macro-vascular complications. The proportion of subjects with diagnosed DM who achieved internationally recognized targets for HbA1c (<7%), LDL-C (<2.6mmol/l) and blood pressure (<130/80mmHg) was 33.3, 30.8and42.1%, respectively (Saadi, et al, 2007).

Our study result was higher than those obtained in UAE, only for nephropathy which was less percentage. That maybe due to poor follow up and management for type 2 diabetes which patient at Dheisheh refugee camp received comparing to those in UAE which lead to better glycemic control.

In Yemen, a cross sectional study found that. More than 80% of the type II diabetics were over the age of 40, 35% being hyperlipidaemic, 22% being hypertensive and 18% obese. Sixty percent of IGT subjects were hyperlipidaemic and 20% were obese (Al-Habori et al,2004).

In Pakistan, the overall prevalence of microalbuminuria was 34%. Mean age of subjects was 53.1 years +/- 11.9 years, mean BMI was 25.8 +/- 4.1 and mean duration of diabetes was 8.8 +/- 5.21 years. Fifty seven percent were males and 43% females. Sixty two percent of the subjects had a systolic blood pressure > or = 130 mmHg. Forty five percent had a family history of diabetes and 5% had a family history of hypertension. Univariate analyses demonstrated significant associations between microalbuminuria and age, duration of diabetes, male gender, smoking status, microvascular and macrovascular complications, hypertension, high triglycerides, high serum LDL, low serum HDL, and high fasting and random blood sugars. When adjusted for the effects of other variables in the model, age, diastolic blood pressure, serum LDL and retinopathy were found to be significantly associated with microalbuminuria (Iqbal et al,2005).

Three hundred and seventy-five Saudi Arabian patients with type 2 diabetes were consecutively examined for peripheral neuropathy, foot ulcers, amputations and hypertension. All the 46–69-year-old patients (n=212) were compared to a corresponding Swedish group seen by the same physician .With a diabetes duration of 10 or more years the prevalence of neuropathy among the 375 Saudi Arabians was 38% (95% confidence intervals 30–45); hypertension 19% (13–25) current and past ulcers 4.7% (1.3–8); amputations below ankle 3.4% (0.5–6). In the selected 46–69-year-old group prevalence of hypertension (17%), ulcers (2.3%) and amputation (1%) was significantly lower in the Saudi Arabian than in the Swedish patients. The frequencies reported here are the first from the Arab Peninsula. The Saudi Arabian patients with type 2 diabetes have the same prevalence of distal neuropathy as other

ethnic groups. A low prevalence of hypertension is consistent with findings in expatriate and local Arab groups with type 2 diabetes. The low occurrence of ulcers and amputations may be explained by different styles of footwear (Nielsen et al,1998).

6.3.2 Obesity

Obesity (BMI> 30) was found among 54.8% of this study population and 26.9% were overweight. Almost 70–80% of type 2 diabetic patients were either overweight or obese.

Several studies showed that the prevalence of diabetes is 3.8 times higher in overweight than in normal weight individuals (Ricchardi et al., 2006). The incidence of adolescent NIDDM in Greater Cincinnati showed a 10 fold increased risk among obese compared to non obese. The mean of the age of those diabetic adolescent was 13.8 ± 1.9 years (±SD) and their body mass index at presentation was 37.7 ± 9.6 kg/m^2. The overall female/male ratio was 1.7, and female patients were seen 1 year earlier than male patients ($p < 0.01$). Male subjects had a higher body mass index than female subjects ($p < 0.05$)(PINHAS-HAMIEL et al., 1996).

The most comprehensive information about obesity in Europe, derives from data collected between 1983 and 1986 for the MONICA study(Kopelman ,2000) . On average, 15% of men and 22% of women were obese, with overweight also being more common among women than men. More than half the adult population between 35 and 65 years of age in Europe was either overweight or obese. In England and Wales the most recent health survey has confirmed an increase in the prevalence of obesity in adults from 6% in men and 8% in women in 1980 to 17% of men and 20% of women in 1997(Kopelman ,2000).

However, a valuable review discuss the impact of migration on the incidence and prevalence of obesity and type 2 diabetes mellitus in different ethnic groups and populations. It analyzes the determinants indicating an important role of environmental factors. A stepwise increase in the prevalence of obesity in Blacks along the path of migration (5% in Nigeria, 23% in Jamaica, and 39% in the United States). Furthermore, South Asian migrants, who are particularly predisposed to

develop insulin resistance and type 2 diabetes, showed nearly four times prevalence rates of type2 diabetes than rural sedate populations. Similar observations were also reported in intra country migrants and resettled indigenous populations. However, certain contradictory trends were also seen in some migrant communities and have been explained by various phenomena such as healthy migrant effect, “salmon bias”, and adherence to traditional diets (Misra et al, 2005).

In literatures, most studies supported the hypothesis that considers obesity as an important risk factor for the development of type 2 diabetes. This was explained by the fact that obese individuals demand for insulin is substantially augmented. When the beta cell cannot compensate for the increasing demand for insulin, impaired glucose tolerance occurs, which subsequently becomes overt diabetes, the risk of diabetes was 90 times higher when the body mass index increased from 24 to 39 (Abdul-Ghani et al,2005).

The above hypothesis was supported by several studies in the Arab countries, such as Egypt, Jordan, Saudi Arabia, Libya, Tunisia and Palestine (Abdul-Ghani et al, 2005 and Abdel Rahem et al, 2003 and Bakoush et al, 2006 and Bouguerra et al, 2006). In West bank and Gaza Strip,the prevalence of obesity was 36.8 and 18.1% in rural women and men, respectively, compared with 49.1 and 30.6% in urban women and men, respectively. The mean difference (s.e) in BMI levels was 1.6 (0.52) kg/m^2 between urban and rural women and 0.9 (0.46) kg/m^2 in men. At the household level, the mean energy consumption from 25 selected food items was 13.8 MJ (3310 kcal)/consumption unit/day in the rural community compared to 14.5 MJ (3474 kcal)/consumption unit/day in the urban community (P=0.021). BMI was positively associated with age in both men and women and with urban residence in women. BMI was negatively associated with smoking and physical activity in men and with educational level in women(Abdul-Rahim et al,2002).

A valuable study in Isreal found that prevalence rate that reported in is lower than that reported in other Arab communities in Israel, but it is comparable to the levels reported from western countries . However, the 7% prevalence rate reported from Australia and the United States includes both diagnosed and undiagnosed subjects (Abdul-Ghani et al, 2005).

Findings in Arab community in Israel show up those diabetic women are more obese than men. The average BMI was significantly higher for women compared to men. Indeed, the percentage of obese subjects was significantly higher among women than men (77.5%and 42% respectively). Central obesity has a key role in diabetes; the high rate of obesity observed among women may explain the excessive rate of diabetes among them. Moreover, consistent with other studies, the age of appearance of diabetes is directly related to the degree of obesity regardless of gender. Consequently, the prevalence of diabetes among women is especially high in the age group 45–65 years. Therefore, obesity was shown to have a dual effect in women: it is responsible not only for the high rate of diabetes but also for the disease's development at a young age. This observation has important clinical significance, since disease duration is an important risk factor for diabetes complications, and micro vascular complications in particular. Younger age of disease onset will result in longer duration of diabetes and higher risk for complications. A similar high prevalence rate of diabetes among women of Arab origin was also reported from another Arab community in southern Israel. The sedentary lifestyle of women as a consequence of housekeeping compared to men's work in jobs involving heavy physical labor may that one of exceplanation. Data shows that when BMI increase the onset age of disease decreased , If BMI<27,the age onset of disease 73.6 ± 4.29 yrs and 71.36 ± 3.2 in male and female respectively. While if BMI>38 the onset age 43.1 ± 7.07 and 41.06 ± 3.83 in male and female respectively (Abdul-Ghani et al, 2005).

As results, finding of this study corresponding with others. Explanations for high percentage of obesity across study population may relate to gender distribution since the majority of study population were females whom are obese and multipara with low physical activity. Other explanation may reflect the disease effect of type 2 diabetes.

6.3.3 Physical activity or exercise

Epidemiological evidence suggests that physical activity is also associated with a reduced risk of type 2 diabetes. Merely 45.2% of our study population reported practicing at least one type of sport activities. The majority used to walk but 59.6 % had an increase in their weight mainly due to the disease. Our study showed that the

diabetic patients with low HbA1c reported walking 45%, 9.4% aerobics and 9% machine and not any other kind of sport. While those with higher HbA1c showed similar percentages for walking, aerobics and using machines for sport.

The importance of exercise in the prevention of diabetes has been confirmed by various intervention studies:

A recent meta-analysis of 14 trials on the effect of exercise on diabetes control has

Shown that exercise training reduces HbA1c by about 0.66% (Sigal et al, 2001). In the Da Qing study, the exercise group reported a 46% decrease in incidence of type 2 diabetes (Pan X.-P et al,1997); in the Finnish Diabetes Prevention Study, the intervention group who achieved the exercise goal (moderate exercise for at least 30 min per day) had an odds ratio for diabetes of 0.3 compared to the control group (95% CI 0.1–0.7) (Tuomı`lehto J., et al,2001). Similar results were obtained in the DPP study, 2002 (Van Dam et al,2003 and King et al,2001).

In the University of Pennsylvania Alumni Health Study, 5,990 men were surveyed and the amount of leisure-time physical activity was inversely related to the development of diabetes; each additional 500 kcal/wk of physical activity was associated with a decrease in risk of 6%.

The Physicians' Health Study followed 21,271 men 40 –84 yr of age and free of diagnosed diabetes for 5 yr; men who exercised at least once/wk had an age-adjusted relative risk for diabetes of 0.64 compared with those who exercised less frequently. (Van Dam et al,2003 and King et al,2001). Among 6,815 Japanese American men in the Honolulu Heart Program, 6-yr age-adjusted odds ratios for diabetes comparing the upper vs. the lower four quintiles of physical activity were 0.5. The relative risk of diabetes decreased in male physicians with increasing frequency of exercise: 0.77 for once weekly, 0.62 for 2 to4 times/wk, and 0.58 for 5 or more times/wk (241). Hu et al., demonstrated in over 14,000 Finnish men and women that occupational physical activity, leisure-time physical activity, and walking to and from work all significantly reduced the risk of developing diabetes over a 12-yr follow-up (Van Dam et al,2003 and King et al,2001).

In the Arab countries this association was also seen. In Libya only 18% of Libyans practice any form of physical exercise and more than 69% have a BMI of more than 25 kg/m². According to the authors, the sedentary life style and obesity were considered as major contributing factors for the diabetes epidemic (Bakoush et al, 2006). In Tunisia, urban residency and high BMI were significantly and independently related to diabetes prevalence in a national representative study in Tunisia (Bouguerra et al, 2006).

6.3.4 Self management

In our study, various techniques were used in managing self diabetes. An 87.5% of the study population said that they taking their medication as prescribed by their doctor, 87.5% measured blood sugar regularly at home or UNRWA, while 86.5% kept doctor visit and follow instruction. However, 62.5% of study population did not follow diet program and similarly 59.6% did not share in any physical activity. But, 58.7% of the patients were very compliant in sharing in the diabetes lectures and workshops, and 59.6% were always searching for specialized doctor. A 69.2% of the study population had a positive perception in consulting a nutritionist.

At the level of self management, 55.8% this study population had a glucose check machine at their houses (n=58). However, we found that only 3.8% of our study population had a low fasting blood sugar (FBS) at their last check up, but the 70.2% had high FBS. Therefore, and as recommended by the diabetes experts, blood glucose monitoring devices must be available to all diabetic patients. Studies recommended for diabetic patients to have this home device that would enable the diabetic patients to have more frequent measurement of their blood sugar levels, which will help automatically for the patients to have a significant level of independence in managing their disease process (Al-Khdoir, 2007).

The cost-effectiveness of home monitoring of blood glucose (HMBG) in Type2 diabetes in a developing country was evaluated. In Bangladesh, a total of 64 uncomplicated Type2 diabetic individuals of higher middle class to rich socio-economic status were studied. Thirty-two were allocated to conventional monthly hospital visits group-I (Gr-I) and 32 to HMBG with hospital visits at 3 monthly intervals group-II (Gr-II). In Gr-I, compared to baseline, HbA1c values decreased by

0.76% (95% CI 0.11–1.42) after 9 months and by 0.95% (95% CI 0.12–1.77) after 15 months but lost significance after 18 months follow-up. On the other hand, in Gr-II patients, HbA_1c decreased significantly from baseline from 3 months and remained so at 18 months when it was decreased by 1.37% (95% CI 0.25–2.49). Hypoglycaemic episodes per patient year follow-up were significantly lower among Gr-II patients (0.172 vs. 0.354, P=0.03) (M.Kibriya, 2009).

Two large randomized intervention trials, the Finnish Diabetes Prevention Study and the Diabetes Prevention Program in the United States, both demonstrate that lifestyle change can significantly reduce the risk of developing diabetes in individuals with impaired glucose tolerance. In the Finnish Diabetes Prevention Study, 522 subjects with impaired glucose tolerance were randomly assigned to either control or lifestyle intervention, including specific recommendations to increase fiber and decrease fat, via whole grains, vegetables, fruits, and low-fat dairy and meats, weight reduction, and daily exercise, including supervised, progressive resistance training and endurance exercise. Later than an average 3-yr follow-up, the risk of diabetes was reduced 58% in the intervention group, despite minimal weight loss (3.5 kg after 2 yr)(Van Dam, 2003).

In prospective observational study (UKPDS 35), the incidence of clinical complications was significantly associated with glycaemia. Each 1% reduction in updated mean HbA_{1c} was associated with reductions in risk of 21% for any end point related to diabetes (95% confidence interval 17% to 24%, P<0.0001), 21% for deaths related to diabetes (15% to 27%, P<0.0001), 14% for myocardial infarction (8% to 21%, P<0.0001), and 37% for microvascular complications (33% to 41%, P<0.0001) (Turner et al,2000).

In USA, a higher proportion of non-Hispanic blacks were treated with insulin and a higher proportion of Mexican Americans were treated with oral agents compared with non-Hispanic whites, but the majority of adults in each racial or ethnic group (71-83%) used pharmacologic treatment for diabetes. Use of multiple daily insulin injections was more common in whites. Blood glucose self-monitoring was less common in Mexican Americans, but most patients had never self-monitored (Harris et al,1998).

Through , 3299 Kuwaiti patients (1454 male (M) and 1845 female (F) subjects) registered in Salmiya diabetic clinic, a part of the national network of diabetes control and care program, and located in the urban Hawally Governorate, Kuwait. The mean age of the patients was 53 years (± 13.9 years), and 73.8% were in the age group 45–64 years. A high percentage of the diabetic patients (63%) reported a positive family history in first degree relatives. The mean duration of diabetes mellitus was 7.8 years (range 2–28 years) and 70% of the patients had diabetes mellitus for 9 years or less. The mean body mass index (BMI) was 31.8 ± 6.3 kg/m2 and 28.5 ± 6.3 kg/m2 in women and men, respectively. Among the diabetic women 57.7% were obese (BM > 30 kg/m2) and 30.2% were overweight (BMI 25–30 kg/m2) as compared to 33.6% and 44.3% among diabetic men, respectively. High blood pressure (≥ 160/95 mmHg) was reported in 14.9%. The main therapeutic modality in the majority of patients, (63.2%), was the administration of oral hypoglycaemic agents (OHA), while 23.7% were on a diet regimen and only 13.1% were on insulin therapy (Abdella et al,1995).

However, these results present the role of patient's awareness of study objectives; patients try to give answers fulfilling their knowledge for what is suitable for diabetic patients. Since the majority of study population received education about diabetes and its management. This may lead to these unconventional findings between study population's self – management, exercise, diabetes complications, and diet and HbA1c values.

6.5 Nutritional history among study population

Nutrition consultation, Eating behavior, and Food availability considered an important element when discuss nutritional history for any one. Even with good nutrition consultation, if there is no availability of healthier food choices and proper eating behavior, no matter what frequency of these consultation. This study tries to search this topic regarding type 2 diabetic patients in Dheisheh refugee camp.

In United Kingdom, data demonstrate that no direct correlation has been reported between the prevalence of obesity and increased energy intake in developed nations, given the ready availability of highly tasty foods. The understanding of the role of energy intake in the etiology of obesity is confounded by failure to report food intake accurately. Under-reporting is widely recognized as a feature of obesity, with

comparisons of energy intake and expenditure in obese subjects showing a consistent shortfall in self-reported food intake of approximately 30% of the energy requirements. There is good evidence that individual macronutrients (protein, fat and carbohydrate) exert differing effects on eating behavior predominantly as a result of their effects on satiety. Fat has a weak satiating capacity, particularly when compared with protein, and subjects in experimental situations readily overeat when presented with high-fat foods (Lawton et al, 2000).

6.5.1 Food availability

Of this study population, 57.7% reported a regular eating behavior and 13.5% of population did not care any more to their eating pattern, and 39.4% reported the unavailability of the suitable food for diabetes mellitus. However, data in Palestinian societies find that healthier foods are more expensive for a consumer compared to others (Palestinian Central Bureau of statistics (PCBS), 2005). During field work and data collection phase, many of study population complaining from unavailability to some food item for diabetic patients especially low fat, which prevent some of them from choice suitable food for their disease.

By looking to the fact that, obesity results from a combination of genetic susceptibility, increased availability of high-energy foods and decreased requirement for physical Activity in modern society (Kopelman ,1994). There has been general agreement among experts over the last decade on what constitutes a healthy diet for the prevention of many of the major causes of morbidity and mortality, and for the treatment of diabetes mellitus. People are generally aware of the link between diet and health, but there is concern that foods which need to be included in the diet for it to meet current recommendations may be difficult to find and expensive (Barratt, 2003).

The 7-day intake of an adult woman in the United Kingdom(UK) , which matched many of the current diet targets (including those of NACNE, the Department of Health and the British Diabetic Association), was calculate in supermarkets in southern Derbyshire in 1990, 1992 and 1994, and also in smaller retail outlets in 1994. This study found that many people, especially low-income consumers, do not successfully follow dietary recommendations to eat more whole grains and less fat

and added sugar. The food environment may have a significant impact on the choice by low-income consumers to eat healthier foods, as both the availability and price of healthier food items may limit their ability to eat a healthier diet (Barratt, 2003).

However, the Market-basket surveys were conducted in 25 stores in Los Angeles and Sacramento. Stores were selected from neighborhoods that were varied by income and surveyed three times from September 2003 to June 2004. In the analysis which conducted in 2005. The access to whole-grain products, low-fat cheeses, and ground meat with <10% fat is limited. Among all items that were unavailable, 64% were in small grocery stores. The average cost of the healthier market basket was more expensive by $36 due to higher costs of whole grains, lean ground beef, and skinless poultry. The higher cost of the healthier basket is equal to about 35% to 40% of low-income consumers' food budgets of $2410 a year (Jetter et al, 2005).

6.5.2 Daily consumption of carbohydrate, protein, fat, and calories

In this study, seven groups were formed according to Diabetes Food Pyramid. These groups are: grains and starchy, vegetables, Fruits, milk and milk products, meat and meat substitutes, fat, sweets and alcohol, and the oriental dishes. These groups were the base for calculating the total consumption of CHO, Proteins, and Fat in each group as grams per day and the total calories' consumption.

Data shows distribution of CHO consumption round the mean 231.6 g/day and also distribution of consumption within 33td quartile with 172.9g/day and 66^{th} quartile with 283.7g/day. That also seen for protein, fat, and calories consumption. Avery high caloric intake per day was seen by some patients. Nevertheless, that not affects our results when calculating the regression. These results not matching with other studies that discussed in this thesis, it is show low level of consumption for CHO, Protien, Fat, and Calories compared with valued limits. That may due to small sample size (87 patients).Other reason may explained by the affect of volunteer's bias .

The Nurses' Health Study on 65,173 women followed for 6 years, reports an increase in the incidence of diabetes in those consuming a diet with a higher glycemic load especially in combination with a low intake of cereal fiber. In this study, the Relative Risk (RR) of type 2 diabetes was 2.50 (95% CI, 1.14–5.51) for women with the

combination of high GL and low fiber intake (Tampfer et al, 2001). These results have been confirmed in men in the Health Professionals' follow-up study. Many epidemiological studies, i.e. the San Luis Valley Diabetes Study, the Finnish and the Dutch cohorts of the Seven Countries Study, reported that both total fat consumption and saturated fat intake contribute to increase the risk of type 2 diabetes(Hermansen et al., 2001).Information on this issue in humans has emerged from the Kanwu study, which is so far the only intervention study that evaluated the effect of dietary fat on insulin sensitivity using adequate methodologies and a sufficiently large sample size (Hermansen et al., 2001). This study involved 162 healthy individuals from five different countries, randomly assigned to consume either a high-saturated fat or a high-monounsaturated fat diet without any change in other dietary constituents; a randomly selected subsample within each group was also given fish oil supplement or placebo. Insulin sensitivity was significantly impaired on the diet rich in saturated fatty acid (-10%, p=0.03) but remained unchanged on the one rich in monounsaturated fatty acids, this seems to suggest that the total amount of fat can influence insulin sensitivity and, possibly, the risk of type 2 diabetes only when it exceeds the threshold level that is between 35% and 40% of the total energy intake. This is in line with many clinical studies showing that alterations within currently acceptable limits of total fat intake (<35–40%) per se are unlikely to have a major impact on insulin sensitivity (Zimmat et al, 1999).

Few epidemiologic studies have examined the role of type and amount of carbohydrates in relation to the development of type 2 diabetes mellitus. Those that have, generally found little association between total carbohydrate intake or intake of simple sugars and the development of diabetes. One exception, the Iowa Women's Health Study, reported that intake of glucose or fructose was significantly and positively related to risk of developing type 2 diabetes mellitus (Villegas, 2007).

Studies in Chile showed that nutritional risk factors are prevalent, diet is changing to a 'Western diet' with an increasing fat consumption, and sedentarianism is constant in all groups. High blood pressure (>140/90) is greater than 10% in adults. Diabetes is increasing in urban areas which physical activity normally decreased, including in the indigenous population, and more than 40% of adults have a cholesterol level of more than 200 mg ml. (Albala et al, 2002).

However, a cohort of 64 227 Chinese women with no history of diabetes or other chronic disease at baseline for 4.6 years. Results show that dietary carbohydrate intake and consumption of rice were positively associated with risk of developing type 2 diabetes mellitus. The multivariable-adjusted estimates of relative risk comparing the highest vs. the lowest quintiles of intake were 1.28 (95% confidence interval, 1.09-1.50) for carbohydrates and 1.78 (95% confidence interval, 1.48-2.15) for rice (Villegas, 2007).

A study in Mexico finds that over half of the patients and their relatives had energy consumption above the recommendations from total and saturated fat (54% and 57%; 62% and 66%, respectively). Total cholesterol value was also exceeded (56% and 63% of participants). Mean fiber consumption was 26 g (with a range of 8–64) (Albarran et al, 2005).

In addition to study submitted in Greek revealed that increased consumption of red meat and whole milk products is associated with insulin resistance .This may lead to the development of chronic diseases, such as obesity, type 2 diabetes, and cardiovascular disease(Emilia et al, 2005).

6.5.3 Association of the various variables and the consumption of total Carbohydrate, fat, protein and caloric intake

Relationship between CHO, Protein, Fat and calories intake and the various demographic characteristics were studied. Results shows that protein consumption and the dependant's number at the family was not significant (p value of 0.08), while a value a border p-value of 0.057 was seen between fat consumption and dependant's number. Also, the relationship between total consumption of CHO, protein, fat and calories intake with various health indicators and follow up of diabetes among the study population, not shows significant association. However, the relationship between total consumption of CHO, protein, fat and calories intake with the nutritional indictors of diabetes among the study population were studied, a significant association was seen between CHO, Protein and Fat consumption with keeping a diet program P value less than 0.05 and as well a significant association between nutritional consultation and calories intake.

A clinical trial at an academic medical center in Worcester, Massachusetts, USA, examined baseline dietary intake, body weight, and physiologic status in patients enrolled in a dietary intervention for type 2 diabetes mellitus .Dietary, physiologic, and demographic information were collected at baseline from 40 adult patients with poorly controlled T2DM (glycosylated hemoglobin >7%) ,the average age at enrollment was 53.5 y (SD 8.4), average body mass index was 35.48 (SD7.0),and HbA1c was8.3%(SD1.2).Participants were predominantly married, employed full time. Forty-eight percent were men, seventy –eight percent had hyperlipidemia, and 68% had hypertension. Reported baseline daily average energy intake was 1778Kcal (SD814) , daily carbohydrate was159g(SD71.5),Dietary fiber was 11.4g(SD5.2).The dietary composition was 35%carbohydrate,45% fat(15saturated fat, and 20% protein. Comparing to American Diabetes Association (ADA) guidelines recommends 45-65% of energy from carbohydrate, 20-35% from fat (<7% saturated), and 20% from protein (Mu et al,2006)

In a study by Stampfer et al, in 2000 ,when the highest and the lowest quintiles of intake were compared, the age and energy-adjusted relative risk of type 2 diabetes mellitus was 0.62 (95% confidence interval [CI] = 0.53, 0.71; P < .0001 for trend) for whole grain and 1.31 (95% CI = 1.12, 1.53, P = .0003 for trend) for refined grain. These associations were attenuated but remained significant after additional adjustment for BMI, cigarette smoking, alcohol intake, history of diabetes in first-degree relative, use of multivitamins, use of vitamin E supplements, physical activity, and total energy intake. When the *2* extreme quintiles were compared, the relative risk was 0.73 for whole grain (95% CI = 0.63, 0.89, P < .0001 for trend). Among the above covariates, BMI appeared to be the strongest confounding factor: the relative risk of type 2 diabetes mellitus when the *2* extreme quintiles of whole-grain intake were compared decreased to 0.72 (95% CI = 0.62, 0.84) after adding BMI into the age- and energy-adjusted model. In particular, the inverse relation between whole-grain intake and risk of type 2 diabetes mellitus remained significant: multivariate-adjusted relative risk was 0.74 (95% CI = 0.63, 0.86, P < .0001 for trend) when the *2* extreme quintiles were compared. This study found that the risk of type 2 diabetes mellitus associated with whole-grain intake was independent of that associated with refined-grain intake; the relative risks were almost identical whether or not refined

grain and whole grain were included in the model simultaneously (Stampfer et al, 2000).

6.5.4 Perception of food items consumption and the amount of CHO, fat, protein intake

Recent study investigated the association between total consumption of CHO, protein, fat, and calories intake with patient's perception about food consumption. The results of the patients' perception towards certain food items showed statistically significant difference with patient's perceptions for some meat and meat substitute with protein tertiles ($p < 0.05$) for Fish and patient's perceptions for some Orient dishes and CHO tertiles for Maqlouba (upside-down) ($p < 0.05$), while, no any statistically significant associations were seen for others. These results show patient's knowledge affect in their perception toward Maqluba consumption .Even they explain when filling the questionnaires that it have a lot of CHO and fat and affect negatively diabetic patients , but they will continue eating it. That reflects the fact that changes lifestyle is hard task and need more than knowledge.

However, one study present changes in lifestyle,in 2000 by Erikson, particularly in dietary and exercise habits, which are difficult to carry out. However, Antonovsky describes a salutogenic health perspective grounded in patients' developing what he terms 'a sense of coherence' (SOC). Can a strong SOC help diabetes patients to control the disease? The aim of this study was to analyse the relationship between SOC and treatment results measured as glucolysed haemoglobine (HbA1c) in patients with type-2 diabetes. The aim was further to test the relationship between treatment results and an index of patients' participation in active management and emotional state. Eighty-eight patients answered a questionnaire containing 13 statements about sense of coherence (SOC-13), questions about self-assessed health, diabetes activity such as self-management of diet, exercise and self-control of blood sugar and emotional acceptance. There was no direct relationship between SOC-13 and treatment results measured as HbA1c but there was a positive correlation between SOC-13, self-assessed health and HbA1c ($P < 0{\cdot}02$). Self-assessed health was seen as a mediating factor. The better patients' estimation of their own health, the higher were SOC-13 scores and the lower HbA1c. There was also a strong positive correlation

between low levels of HbA1c and high levels of an index of active management and emotional acceptance of diabetes ($P < 0{\cdot}001$) (B.Eriksson, 2000).

6.5.5 Consultation with dietitian

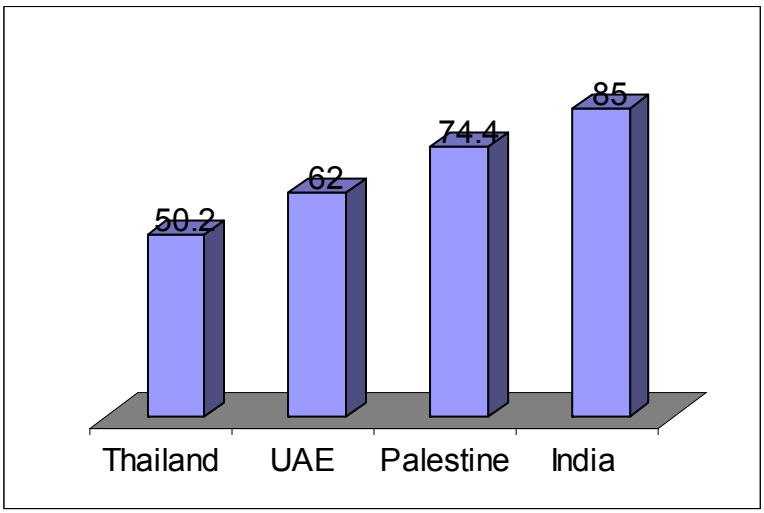
Results show that 62.5% of the study population (n=65) did not consult with any nutritionist in their life and follow special individual program in order to manage their disease; merely 56.4% from the 39 patients who consult nutritionist follow the nutritionist instructions.

Literature shows that diabetic patients usually obtain knowledge of the condition from a variety of sources. These include education programs and encounters with health-care. Some studies were directly concerned with these issues. In the Fremantle Diabetes Study (FDS) a community-based cohort study, 1264 type 2 patients were investigated to assess whether diabetes knowledge is related to prior attendance at diabetes education programs, visits to dieticians or the current use of SMBG (self management blood glucose). Attendance at education programs, visits to dieticians, and SMBG were independently associated with greater diabetes knowledge. Subjects who were older, whose schooling was limited, were significantly less likely to have received diabetes education, dietetic advice or to be performing SMBG (Furler et al, 2008).

6.6 Evaluation of objective testing (HbA1c) among the study population

In this study, 83.7 %(n=87) did HbA1c testing in which only 25.3% had values < 7 and 74.4% had HbA1c > 7. Worldwide a large interest given to the role of HbA1c test in managing type 2 diabetes which given view about glycemic control within an acceptable period for diabetic patients. Figure 6.1 showed HbA1c in selected populations. India showed that 85% had a controlled glycemic control.

Figure (6.1): Percentage of Poor Glycemic Control among diabetic patients in selected populations.



Several studies used HbA1c and correlate it for several risk factors. For example, in the USA, poor glycemic control (HbA1c > 8%) was more common in non-Hispanic black women (50%) and Mexican-American men (45%) compared with the other groups (35-38%), but HbA1c for both sexes and for all racial and ethnic groups was substantially higher than normal levels(Maliket al,2007) In Germany, an elevated HbA1c was found in approximately 5% of the participants who share in the study and donate with their blood to do HbA1c test in the first study week, and in approximately 19% in the second study week. The analysis of the questionnaire and the HbA1c results indicated that elevated HbA1c values correlate with known diabetes risk factors. Persons with a body mass index greater than 25 had an increased score in the Find Risk questionnaire and aged over 50 years more frequently showed an elevated HbA1c value (Martin et al, 2007). The Mexican Official Norm, discussed that HbA1c levels above 7% might indicate an inadequate disease control (Albarran et al, 2005).

6.6.1 Association between HbA1c values and various demographic factors

No significant association ($p<0.05$) was seen in the analysis of data between HbA1c and any of demographic factors that were studied, i.e. gender, age, educational level, working status , family size, and dependant's number. This finding may be due to small sample size, which was being in this study.

A study in Trinidad, one hundred and ninety-one (127 females, 64 males, mean age 56.6 years) patients with type 2 diabetes (mean duration 9.2 years) attending primary care clinics were studied after a 12 to 14-h overnight fast. Weight, height, waist and hip circumferences, and blood pressure were measured, and a blood sample was taken for glucose, glycated hemoglobin, total cholesterol, triglycerides, high-density lipoprotein-cholesterol, low-density lipoprotein-cholesterol, and creatinine determinations. About 85% of patients had glycated hemoglobin levels >7.0%, 31% had central obesity, 49% had diastolic blood pressure >83 mmHg, while 40% had a total-cholesterol/high-density lipoprotein-cholesterol ratio greater than 6. In comparison with males, female patients had significantly higher levels of total-cholesterol and low-density lipoprotein-cholesterol independent of obesity ($P<0.01$) while male patients of East Indian descent had the highest risk of cardiovascular disease compared with males of any other ethnic group ($P<0.01$)(Ezenwaka et al,2001).

The mean diabetes knowledge scores among Chinese with type 2 diabetes was 22.1 ± 3.76 out of a possible 30 marks. There was no difference in overall diabetes knowledge in people with HbA1c <7%, indicating good control and those with HbA1c ≥7%, indicating suboptimal glycemic control ($t = -0.811$, $P = 0.419$). Moreover, socio-demographic characteristics such as age and occupation were significantly correlated with diabetes knowledge; age was negatively correlated with diabetes knowledge and white-collar workers had the highest mean knowledge score and housewives the lowest (Wharrad et al, 2007).

6.6.2 Evaluation of Objective testing (HbA1c) and diabetes history

Association between HbA1c and diabetes history investigated, factors such as: disease duration, health care provider, last fasting blood sugar level (FBS), and receiving anti-glycemic drugs, were the core. There is no significant association was seen in our study. These results may be due to small sample size.

A retrospective cohort study set in the Tayside region of Scotland (population approx. 400 000). Among 2920 subjects, significant linear trends of poorer adherence with each increase in the daily number of tablets taken was shown ($p = 0.001$). One tablet per day administration was associated with greater adherence than multiple tablets.

(Donnan et al, 2001). However, a study in USA find that those with HbA1c > 8% included 52% of insulin-treated patients and 42% of those taking oral agents (reference).

Other study in USA, in which during 326,876 person-years of follow-up, documented 1,558 incident cases of type 2 diabetes. After adjusting for age, BMI, total energy intake, exercise, alcohol intake, cigarette smoking, and family history of diabetes, we found positive associations between intakes of red meat and processed meat and risk of type 2 diabetes. Comparing women in the highest quintile with those in the lowest quintile, the multivariate-adjusted relative risks (RRs) of type 2 diabetes were 1.28 for red meat (95% CI 1.07-1.53, P < 0.001 for trend) and 1.23 for processed meat intake (1.05-1.45, P = 0.001 for trend). Furthermore, the significantly increased diabetes risk appeared to be most pronounced for frequent consumption of total processed meat (RR 1.43, 95% CI 1.17-1.75 for >/=5/week vs. <1/month, P < 0.001 for trend) and two major subtypes, which were bacon (1.21, 1.06-1.39 for >/=2/week vs. <1/week, P = 0.004 for trend) and hot dogs (1.28, 1.09-1.50 for >/=2/week vs. <1/week, P = 0.003 for trend). These results remained significant after further adjustment for intakes of dietary fiber, magnesium, glycemic load, and total fat. Intakes of total cholesterol, animal protein, and heme iron were also significantly associated with a higher risk of type 2 diabetes (Song et al;2004).

In Australia, a total of 83 patients with type 2 diabetes who had inadequate glycemic control (HbA1c > 7.1%), receiving the anti-diabetic agent metformin were enrolled in multi center, double-blind trial. Subjects were randomized to continue with their pre-study dose of metformin (n = 27), to continue with their pre-study dose of metformin with the addition of repaglinide (n = 27), or to receive repaglinide alone (n = 29). For patients receiving repaglinide, the optimal dose was determined during a 4- to 8-week titration and continued for a 3-month maintenance period. In subjects receiving combined therapy, HbA1c was reduced by 1.4 +/- 0.2%, from 8.3 to 6.9% (P = 0.0016) and fasting plasma glucose by 2.2 mmol/l (P = 0.0003). No significant changes were observed in subjects treated with either repaglinide or metformin mono-therapy in HbA1c (0.4 and 0.3% decrease, respectively) or fasting plasma glucose (0.5 mmol/l increase and 0.3 mmol/l decrease respectively). Subjects receiving repaglinide either alone or in combination with metformin, had an increase in fasting levels of

insulin between baseline and the end of the trial of 4.04 +/- 1.56 and 4.23 +/- 1.50 mU/l, respectively (P < 0.02) (Moses et al,1999).

6.6.3 HbA1c and obesity, exercise

To be obese or over weight that may but you at risk to develop type 2 diabetes. In this study, the relation between HbA1c and exercise, exercise types was studied. No significant association was found. Also, the relation between HbA1c and Obesity and related variables were studied too. No significant associated were found. Additionally, the affect of sample size may leads to this result.

In literature, one study choose selected studies that evaluated the effects of exercise interventions (duration ≥8 weeks) in adults with type 2 diabetes. Fourteen (11 randomized and 3 nonrandomized) controlled trials were included. Studies that included drug co-interventions were excluded (Jeon et al, 2007).

Twelve aerobic training studies (mean [SD], 3.4 [0.9] times/week for 18 [15] weeks) and 2 resistance training studies (mean [SD], 10 [0.7] exercises, 2.5 [0.7] sets, 13 [0.7] repetitions, 2.5 [0.4] times/week for 15 [10] weeks) were included in the analyses. Results shows that the weighted mean post-intervention HbA_{1c} was lower in the exercise groups compared with the control groups (7.65% vs 8.31%; weighted mean difference, -0.66%; P<.001). The difference in post-intervention body mass between exercise groups and control groups was not significant (83.02 kg vs 82.48 kg; weighted mean difference, 0.54; *P* = .76) (Signal,2001).

In a cross-sectional in Bankok, HbA1c was used as an index of glycemic control. The proportions of cases with good adherence to physical exercise and diet regimen were 31.7 and 54.3%, respectively. About 46.5% reported receiving good social support for diabetes from his/her family. The median of HbA1c was 8% (normal range 4.7-6.3%). Approximately 33.3% achieved good glycemic control (HbAlc < or =7%), while 50.2% had poor control (HbAlc >8%). Multiple logistic regression analysis indicated two variables were significantly associated with glycemic control: adherence to diet control and exercise. (Howteerakul et al**,** 2007).

However, during 12 years of follow-up (466 508 person-years), 1321 cases of type 2 diabetes were documented. The prudent dietary pattern score was associated with a modestly lower risk for type 2 diabetes (relative risk for extreme quintiles, 0.84 [CI, 0.70 to 1.00]). In contrast, the western dietary pattern score was associated with an increased risk for type 2 diabetes (relative risk, 1.59 [CI, 1.32 to 1.93]; $P < 0.001$ for trend). A high score for the western dietary pattern combined with low physical activity (relative risk comparing extreme quintiles of dietary pattern score and physical activity, 1.96 [CI, 1.35 to 2.84]) or obesity (relative risk for BMI ≥30 kg/m^2 vs. <25 kg/m^2, 11.2 [CI, 8.07 to 15.6]) was associated with a particularly high risk for type 2 diabetes(Van Dam et al,2002). In other study , in which of the total 1879 cases of type 2 diabetes mellitus, 1475 cases occurred among women with a BMI greater than 25. Because BMI was the major confounding factor, we examined the association between the ratio of refined- to whole-grain intake and the risk of type 2 diabetes mellitus among women with a BMI greater than 25. Similar findings were observed among this subgroup: the multivariate-adjusted relative risks across ascending quintiles were 1.00, 1.07, 1.14, 1.25, and 1.33 (95% CI = 1.12, 1.56 for the highest quintile, P = .001 for trend) (Stampfer et al, 2000).

In the United Kingdom, a study combining data on energy intake and physical activity in relation to the secular increase in adult obesity shows no relationship between total energy intake or fat consumption and the prevalence of obesity, but a close relationship between proxy measures of physical activity (television viewing and car ownership) and energy intake (Lawton et al, 2000).

6.6.4 HbA1c and self-management factors

Discuss use of Glucocheck machine and using medications and consulting a nutritionist, in addition to several patients self -management techniques and patient's perception toward his/her health, nutritional advice, physical activity level, and toward his/her weight. However, no significant association was noticed. These results may be due to small sample size.

However, findings from the Diabetes Control and Complications Trial (DCCT) and the United Kingdom Prospective Diabetes Study (UKPDS) have clearly shown that aggressive and intensive control of elevated levels of blood sugar in patients with type

1 and type 2 diabetes decreases the complications of nephropathy, neuropathy, retinopathy, and may reduce the occurrence and severity of large blood vessel diseases. Aggressive control with intensive therapy means achieving fasting glucose levels between 70-120 mg/dl; glucose levels of less than 160 mg/dl after meals; and a near normal hemoglobin A1C levels (medicine net web site, 2008 and Nielsen et al, 2006). And glycemic control can not be achieved without good self management by patient himself ns d good medical follow up.

Worldwide studies support patient's role in managing their disease. A total of 8668 patients with type 2 diabetes cared for by generalist physicians from 1990 through 1993. After adjusting for age, sex, race, socioeconomic status, disease duration, and severity of diabetes and co-morbidities, insulin users had slightly more laboratory tests performed, 2.4 more outpatient visits per year, and almost 300 more finger sticks for home glucose testing per year compared with sulfonylurea users (all P<.01). Although 15% of patients receiving insulin therapy reported weekly symptoms of hypoglycemia, insulin therapy was not associated with an increase in emergency department visits (after case-mix adjustment) and resulted in only 0.5 hypoglycemia-related hospitalizations per 100 patient-years (Hayward et al, 1997).

In china, in a non-experimental cross-sectional study, the relationship between patients' diabetes knowledge and their glycemic control was explored. There was no difference in overall diabetes knowledge in people with HbA1c <7%, indicating good control and those with HbA1c ≥7%, indicating suboptimal glycemic control ($t = -0.811$, $P = 0.419$). However, there were differences in scores between the two groups for some specific questions on food substitution. Moreover, socio-demographic characteristics such as age and occupation were significantly correlated with diabetes knowledge; age was negatively correlated with diabetes knowledge and white-collar workers (professionals) had the highest mean knowledge score and housewives the lowest (He et al., 2007).

6.6.5 HbA1c and the consumption of CHO, fat, protein and caloric intake

When comparing between the levels of HbA1c ≤7 and HbA1c > 7 with the means of total carbohydrate, total protein, total fat, and total caloric intake consumption per day, the independent sample t-test results showed no significant difference among

those with or low levels of HbA1C . Also, the association between HbA1C categories and the tertiles of the various total components intake were studied. However, no significant difference was seen. These results may be due to small sample size.

The relationship between diet and glycemic control was examined among a racially mixed population of male and female adults with type 2 diabetes. Data from 3-day dietary records and glycosylated hemoglobin (HbA1c) were analyzed for two-hundred eighty two patients of a Family Practice Ambulatory Care Unit and a community-based health center in Winston-Salem, North Carolina. Correlations were calculated for individual nutrients to determine their strength of association with glycemic control. Analyses by tertiles of HbA1c were also conducted for each race/gender group. Regression analysis was used to determine independent dietary predictors of HbA1c.For all subjects, energy, energy per kilogram of body weight, fat, carbohydrates saturated fat, and cholesterol were significantly correlated with HbA1c. Nutritional differences across tertile levels of HbA1c for all subjects were not significant. For black females, consumption of energy, protein and fat was significantly higher among upper tertile subjects compared to the lowest tertile; and intake of energy, protein, fat, and saturated fat was significantly correlated with HbA1c in this group. For black males, energy intake was highest among upper tertile subjects compared to those in the middle tertile, while energy per kilogram of body weight, and percent of calories from protein, were significantly correlated with HbA1c. For white males, energy intake expressed as a function of body weight was highest among subjects in the upper tertile and a significant positive correlation with HbA1c was observed. No relationship between nutritional intake and HbA1c was found among white females. Racial differences in nutrient intake were also compared for males and females in the upper tertile of HbA1c. Black females in the upper tertile consumed significantly more energy, protein, and significantly less dietary fiber per 1000 kilocalories. No significant differences were observed between black and white males in the upper tertile, although higher cholesterol consumption in black males compared to white males approached significance. Regression analysis revealed that total energy intake significantly predicted HbA1c for all subjects and all white subjects, while a similar observation was made for total fat intake among all black subjects and among black females (Bell et al,1995).

In a study by Reaven et al, 2007, make clear that baseline characteristics between groups did not differ significantly. Reported macronutrient consumption in the 60% vs. the 40% carbohydrate group, respectively, was 52 vs. 43% carbohydrate ($P < 0.0001$), 18 vs. 19% protein ($P = 0.31$), 29 vs. 38% total fat ($P = 0.006$), and 8 vs. 9% saturated fat ($P = 0.31$)(Reaven et al,2007)**.**

In other study , evaluate the long-term effect of a loose restriction of carbohydrate intake (carbohydrate-reduced diet: CARD) compared to a conventional diet (CD) in type 2 diabetes. One hundred and thirty-three type 2 diabetic outpatients followed the CD (n=57, 1734±410kcal, carbohydrate: protein: fat ratio=57:16:26) or CARD (n=76, 1773±441kcal, carbohydrate: protein: fat ratio=45:18:33) according to their own will, and were followed up for 2 years. Glycemic control, body mass index (BMI), serum cholesterols and dose of anti-diabetic drugs were assessed at baseline and after 1 and 2 years. At baseline, hemoglobin A1c (HbA1c) and BMI levels were 7.1±1.0% and 24.2±2.9, respectively, in the CD group, and 7.4±1.1% and 25.1±3.4 in the CARD group, showing no significant differences. During the 2-year follow-up period, HbA1c levels were significantly improved in the CARD group (CD: 7.5±1.3%, CARD: 6.7±0.6%, $P<0.001$), and BMI decreased more significantly in the CARD group (CD: 23.8±3.0, CARD: 23.8±3.5, $P<0.001$). (Haimoto et al, 2008).

In a retrospective review of medical records of patients who completed 1 year of follow-up after dietary prescription. The study subjects included 151 patients in the diet group (whose dietary instructions included high saturated fat but starch avoidance) and 132 historical control subjects (who were allowed unlimited monounsaturated fat but had restriction of starch in their diets). Hemoglobin A1c (HbA1c) levels improved in both study groups (-1.4 - 0.2% [$P<0.001$]; 95% confidence interval [CI], -1.9 to -0.9). Use of metformin was associated with a decrease in HbA1c (-0.12 - 0.003%/mo [$P<0.001$]; 95% CI, -0.17 to -0.07). The diet group had an additional decrease of -0.7 - 0.2% ($P<0.001$; 95% CI, -1.1 to -0.3). Weight increase was associated with the use of insulin (+0.3 - 0.07 kg/mo [$P<0.001$]; 95% CI, 0.2 to 0.5), sulfonylurea (+0.18 - 0.06 kg/mo [$P<0.01$]; 95% CI, 0.05 to 0.30), and troglitazone (+0.7 - 0.2 kg/mo [$P<0.005$]; 95% CI, 0.3 to 1.2). Although not statistically significant, metformin therapy showed a trend for weight loss (-0.14 - 0.08 kg/mo; $P = 0.07$). An additional weight loss was noted in the diet group (-2.65 -

0.62 kg [P<0.001]; 95% CI, -3.87 to -1.44. The diet group had an additional decrease of -13.0 - 4.5 mg/dL (P<0.001; 95% CI, -21.9 to -4.1). No significant effect of the diet on triglyceride, low-density lipoprotein, or high-density lipoprotein levels was detected. Addition of saturated fat and removal of starch from a high-monounsaturated fat and starch-restricted diet improved glycemic control and were associated with weight loss without detectable adverse effects on serum lipids (JamesH.Hays, 2002).

In a solitary study, a 20 % carbohydrate diet was significantly superior to a 55–60 % carbohydrate diet with regard to bodyweight and glycemic control in 2 non-randomized groups of obese diabetes patients observed closely over 6 months. A retrospective follow-up of previously studied subjects on a low carbohydrate diet. Initial mean HbA1c was 8.0 ± 1.5 %. After 6 and 12 months it was 6.6 ± 1.0 % and 7.0 ± 1.3 %, respectively. At 22 months, it was still 6.9 ± 1.1 % (Van Dam et al,2003).

The 7 controls were followed for 2 periods of 6 months separated by a gap of 2 months. Reduction of bodyweight and HbA1c in the low-fat period was 3.5 ± 3.5 kg and 0.9 ± 0.8 % respectively. Both bodyweight and HbA1c increased slightly in the 2 month gap period but the change to a low-carbohydrate diet led to a mean reduction of bodyweight during the 20 %-carbohydrate period of 7.5 ± 6.4 kg and of HbA1c of 0.9 ± 1.1 % (range: 0–2.4). The weight and HbA1c achieved during the 20% carbohydrate period were retained over the following 6 months (Villegas et al,2007 and Van Dam,2003).

This has been clarified by short term study in weight stable diabetic patients where carbohydrate restriction resulted in significant decrease (8.1% to 7.3%, $p < 0.05$) in glycosylated hemoglobin (HbA1c) compared to a high carbohydrate control diet. In another study by the same group in 8 diabetic men in a randomized 5-week cross over design with a 5-week wash out period, even larger beneficial effects on glycemic control were observed with low carbohydrate intervention (carbohydrate 20%, protein 30% and fat 50%) compared to control diet (carbohydrate 55%, protein 15% and fat 30%). The low carbohydrate diet had lower HbA1c (7.6 % ± 0.3), glucose levels and insulin levels compared to high carbohydrate group (HbA1c 9.8 % ± 0.5) despite

similar weight loss with both diets. These data demonstrate that the benefits of low carbohydrate diet on glycemic control are independent of weight loss and are primarily due to carbohydrate reduction (Villegas et al,2007 and Van Dam,2003).

The walnut group achieved a significantly greater increase in HDL cholesterol-to-total cholesterol ratio (P=0.049) and HDL (P=0.046) than the two other treatment groups. A 10% reduction in LDL cholesterol was also achieved in the walnut group, reflecting a significant effect by group (P=0.032) and time (P=0.036). There were no significant differences between groups for changes HbA1c levels (Tapsell et al, 2004).

In Belgium, compared immigrant Italian group to 115 Belgians subjects matched for age, sex, and education. Known duration of diabetes (16 years), smoking and drinking habits, use of oral hypoglycaemic, antihypertensive and hypolipaemic drugs, complications, CRP, estimated glomerular filtration rate, micro-albuminuria prevalence, blood pressure, insulin sensitivity/ beta-cell function estimated by HOMA modelling, as well as fat mass indirectly estimated by impedancemetry were not significantly different between the two populations. There was a non-significant trend toward higher HbAlc (8.7 +/- 2 vs. 8.2 +/- 2%, NS) in Italian subjects whose LDL-cholesterol was however significantly lower (105 +/- 31 vs. 120 +/- 33 mg.dL-1, $P < 0.01$) (Selvais et al, 2005).

In a recent study on obese diabetic subjects, a diet (20% carbohydrates) was associated with a significant reduction HbA1C at 6 months compared to the high carbohydrate group (60% carbohydrates) (Nielsen, 2006).

6.7 Study bias and limitations

This is a cross –sectional study design that was used to gather information from diabetic patients themselves. quite a lot of questions answered by patients about their health status, treatment options, history of disease, self-management and nutritional history as well as types of food that consumed in the last years prior to the survey. This type of design has its limitations and is exposed to recall and information bias.

This study population is type 2 diabetic patients aged 40-65 years and many of them experienced a long history with the disease. Living at Dheisheh Refugee Camp in

Bethlehem district. This type of selection for study population can also limit this study.

Using food frequency questionnaire means that patients has to recall the consume food of different kinds which not easy to recall any how. So this bias might limit the reporting the consumption or over reporting of such consumptions. Also, due to age, many of the study population did not accept or willing to participate in filling the questionnaire (response rate 67.5%) and many did not accept to do the blood testing (response rate56.4%). Therefore, the response bias could be an important factor that affects the study results.

Generalizabilty is an issue here since the sample which included in this study was selected from one refugee camp in Palestine; therefore we can not generalize the study findings to the whole community.

Another difficulty that limited or might cause a bias in the stage of questionnaire preparation and analysis, is that there was no availability to a food exchange list for Palestinian population traditional foods, that put up a complexity to get necessary information to analyze Food frequency Questionnaire (FFQ) and that lead to the fact that we depended on list and food compositions prepared by Nestle company.

6.8 Conclusion

Any research tend to provide new explanation to present knowledge, this study provide the first nutritional assessment for type 2 diabetic patients diet where residence at Dheisheh Refugee Camp in Bethlehem district. Increased obesity prevalence and expanding of sedentary lifestyles contributed to increase prevalence of type 2 diabetes among Palestinians.

1. Data show that there is no difference between patients who have HbA1c >7 or HbA1c ≤7 regarding food consumption.
2. In this study, we used FFQ, which is considered as a semi-quantitative assessment tool. Also, many types of oriental dishes were not included in this questionnaire, which might have an effect in this assessment. Therefore, a continuation of this study using a quantification method is recommended. Moreover, type 2 diabetics patients in Dheisheh refugee camp may adapt to use some foods that not ignored and clarified properly in the study.
3. The design of the study is cross-sectional. Within two weeks; data collection was finished and objective testing measurements were done. The need to do before and after assessment may be better to study the effect of diet on HbA1c within 3 months period or more, and obtain data reflect real changes on HbA1c levels due to diet.
4. Other explanation to the study findings, suggest that there is no problem with food consumption patterns with study population, but there is a lack in patients compliance with their medication and treatment. That leads to raising HbA1c level in some patients while they follow a proper diet Regime and used to practice an acceptable physical activity range. However, the need for follow up and make necessary adjustment in medication are crucial part in obtaining acceptable glycemic control.
5. Another explanation to study findings may highlight volunteer bias and the influence of patient's education on diabetes and its managements, which affect patient's answers but not their situation.

Recently, UNRWA tends to advice patients who come to its clinic to do the HbA1c as a regular test for diabetic patients every three or six month in order to capture glycemic control for diabetic patients.

6.9 Recommendations

The major concern in setting any control program is to define plans of action. The goal of the program is to be able to have a marked reduction in type 1 or type 2 diabetes prevalence, incidence, morbidity and mortality, furthermore to have positive change in patient's lifestyle. So as an academic and public health researcher ,these are my study recommendations:

1. To set up professional education programs that are based on research findings this will help professional to set up a Palestinian national program for nutrition of Type 2 diabetes.
2. Diabetes protocols of treatments should be unified and a national community for diabetes should be activated if present. This committee should emphasis on cooperation between the various health care providers to set up a national care strategy for diabetes.
3. The need to produce a professional educational media that based on scientific research and findings, that suitable for target ages to deal with nutritional issues in type 2 diabetes.
4. To have a national study for assessing the food composition of diabetic patients. More advanced research methodology such as cohort or case-control designs might be more informative of some missing information needed for controlling diabetic patients' glycemia.
5. To establish a nutrition community that train specialists who are capable for such an important field of public health.
6. Community has to provide all the facilities to help them managing their chronic disease such as fitness clubs, healthy food in acceptable prices, necessary drugs, and psychological counseling.

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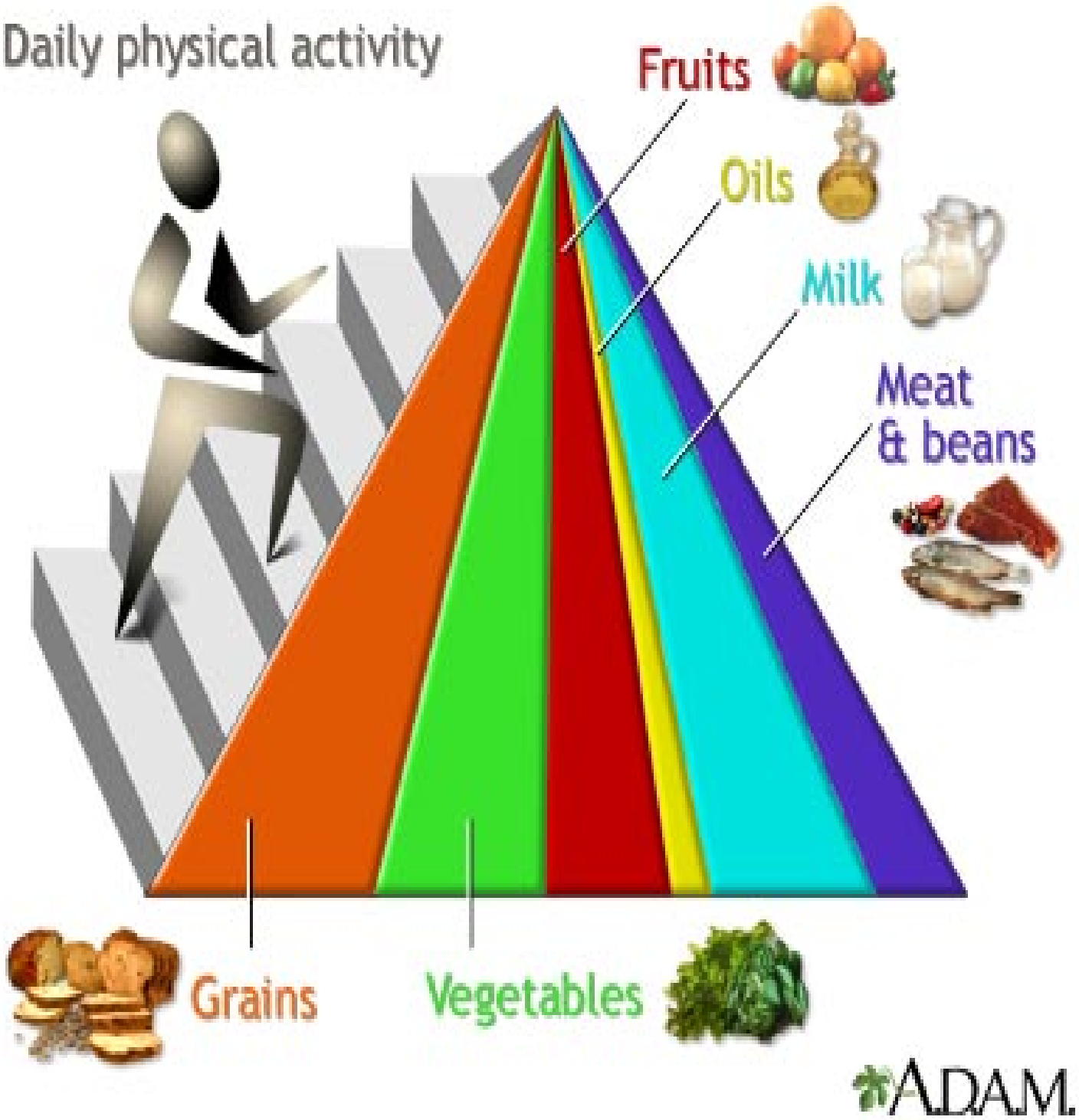
Annex: 1


Daily physical activity
Fruits
Oils
Milk
Meat
& beans
Grains
Vegetables
A.D.A.M.

Annex: 2

The Diabetes Food Pyramid contents:

<u>Grains and Starches</u>:

Choose 6-11 servings per day.

Serving sizes are:

1 slice of bread
¼ of a bagel (1 ounce)
½ an English muffin or pita bread
1, 6 inch tortilla
¾ cup dry cereal
½ cup cooked cereal
½ cup potato, yam, peas, corn, or cooked beans
1 cup winter squash
1/3 cup of rice or pasta

<u>Vegetables</u>:

Choose at least 3-5 servings per day.

A serving is:

1cupraw
½ cup cooked

<u>Fruit</u>:

Choose 2-4 servings per day

A serving is:

½ cup canned fruit

1 small fresh fruit

2 tbs dried fruit

1 cup of melon or raspberries

1 ¼ cup of whole strawberries

Milk:

Choose 2-3 servings per day

A serving is:

1 cup non-fat or low-fat milk

1 cup of yogurt

Meat and Meat Substitutes:

Choose 4-6 oz per day divided between meals

Equal to 1 oz of meat:

¼ cup cottage cheese

1 egg

1 Tbsp peanut butter

½ cup tofu

Fats, Sweets, and Alcohol:

Serving sizes include:

½ cup ice cream

1 small cupcake or muffin

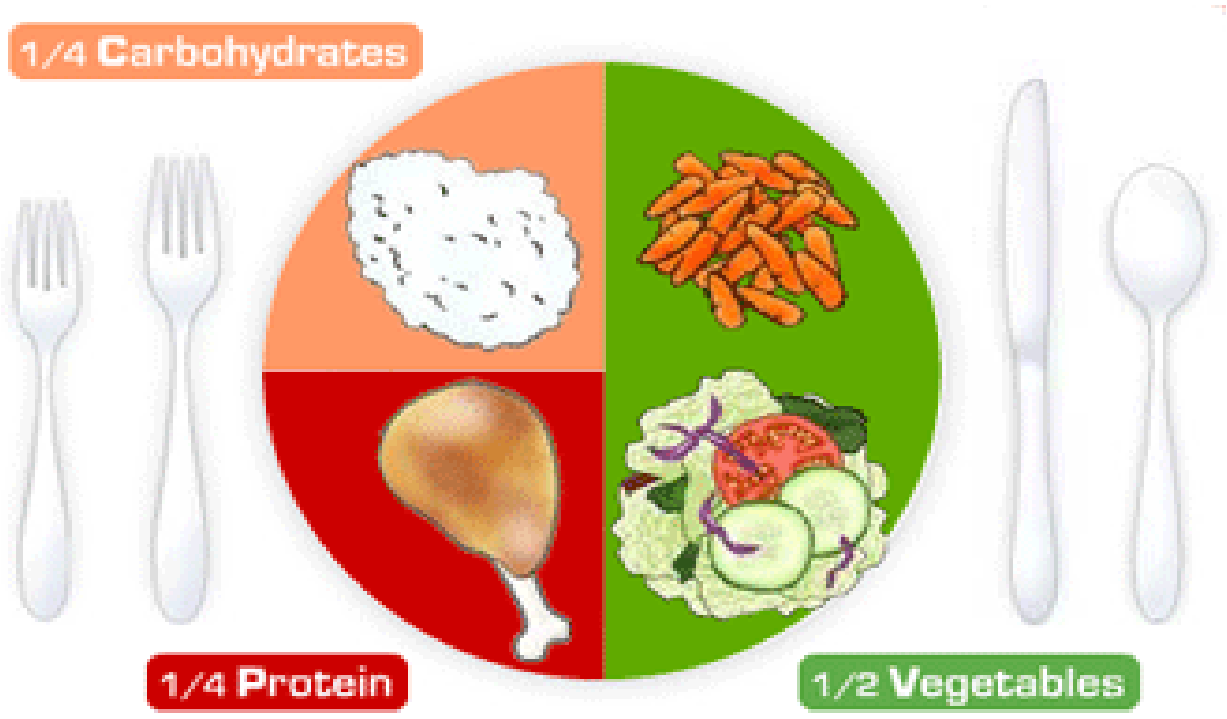
2 small cookies

Annex: 3

Determining Portions:

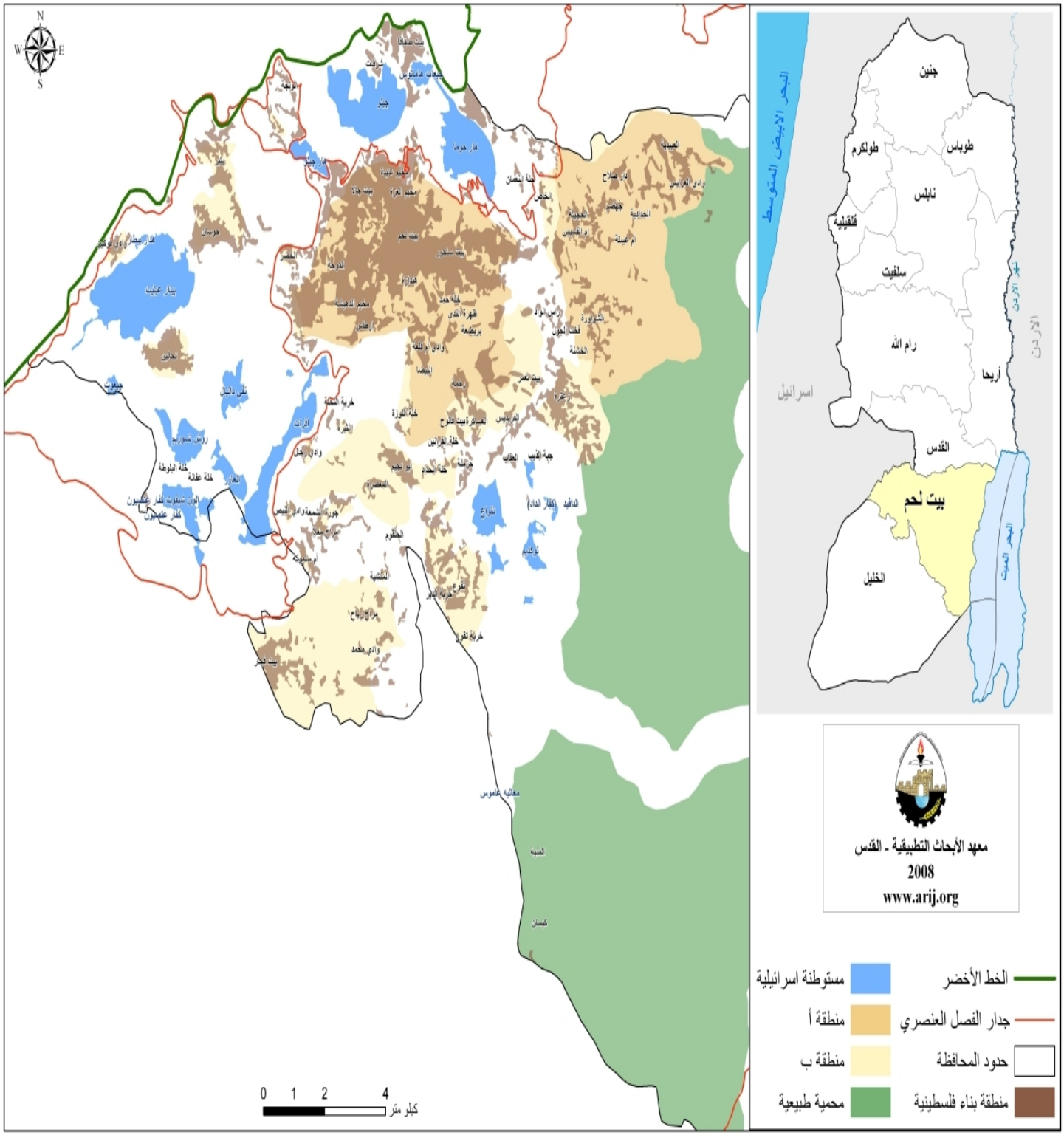
The American Diabetes Association recommends to "Rate Your Plate," to make sure 1/4 is devoted to starchy foods, 1/4 to lean protein, and 1/2 to colorful, delicious vegetables. It's a quick, visual way to assure that eating in balance**.**

Figure (3.3): determining portion size (Rate Your Plate):



Source: adapted from American Diabetes Association, 2008

Annex: 4


جنين
طوباس
طولكرم
نابلس
قلقيلية
سلفيت
رام الله
أريحا
القدس
بيت لحم
الخليل
البحر الابيض المتوسط
نهر الاردن
البحر الميت
اسرائيل
الاردن
معهد الأبحاث التطبيقية - القدس
2008
www.arij.org
الخط الأخضر
مستوطنة اسرائيلية
جدار الفصل العنصري
منطقة أ
حدود المحافظة
منطقة ب
منطقة بناء فلسطينية
محمية طبيعية
0 1 2 4
كيلو متر

Annex: 5

استمارة تقييم الوضع الغذائي لمرضى السكري النوع الثاني

القسم الأول: بيانات المبحوث

: رقم الاستمارة المتسلسل: HH01 ☐☐☐		
: تاريخ المقابلةHH02 ☐☐/☐☐/2007		
: اسم المبحوث: HH03 _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _	**: الجنس:** (1- ذكر. 2- أنثى.)**HH04**	☐
: تاريخ ميلاد المبحوث: HH05 19☐☐/☐☐/☐☐	**: عمر المبحوث: HH06** ☐☐(بالسنوات):	
: التلفون: HH7 _____	**:الجوال: HH08** _____	
: الحالة الاجتماعية: HH09 1- أعزب. 2-متزوج/ة ☐ 3- أرمل/ة. 4- مطلق/ة	**: عدد ا فراد الأسرة(أي شخص يسكن في البيت):HH10** _____	
: المستوى التعليمي:HH11 1 - ابتدائي (0-6 سنوات دراسية).	**: هل أنت المعيل؟** 1- نعم. 2- لا **HH12** ☐	

2- أساسي (7-9 سنوات دراسية). 3- ثانوي (10-12 سنوات دراسية). 4- جامعي (13-16سنوات دراسية).	
HH13 الرجاء(؟ المعيل يعيلهم الذين الأفراد عدد كم : **التحديد):**	
HH14 (1- يعمل. 2- عاطل عن العمل. 3- أخرى.) حالة العمل:	
HH15 إذا كنت لا تعمل, فما هو مصدر الإعالة: **1- الراتب 2-المساعدات 3-الأقارب** **4- لا يوجد 5- غير ذلك**	**HH16 المهنة:_____**

القسم الثاني: التاريخ المرضي

DH01 متى تم تشخيصك بالسكري: (سجل بالسنوات) اقل من سنة00 / لا أتذكر 99	
DH02 من يقوم أو قام بمعاينتك: **(الشخص الرئيسي)**	1- طبيب عام. 2- طبيب مختص. 3- ممرض/ة. 4- لا اعرف.
DH03 متى قمت بأخر زيارة للمؤسسة الصحية:	1- أسبوع. 2- أسبوعين. 3- شهر. 4- أكثر من ذلك. 5- لا اذكر

DH04 : كم عدد الزيارات للمؤسسة الصحية في السنة الماضية؟	1- ولا مرة. 2- مرة. 3- مرتين. 4- 3- 4 مرات. 5-خمس مرات.6- ستة مرات فأكثر.	☐
DH05 : كيف تقيم صحتك بشكل عام؟	1- جيدة جدا. 2- جيدة. 3- متوسطة. 4- سيئة. 5- سيئة جدا.	☐
DH06 : هل لديك جهاز فحص السكري ألبيتي؟	1- نعم. 2- لا. 3- لا اعرف الجهاز	☐
DH07 : إذا لا, لماذا؟	A. لا اعرف من أين احصل عليه. B. لم يخبرني أحد بضرورة الحصول عليه. C. تكلفة الجهاز مرتفعة. D. غير ذلك (حدد): _ _ _ _ _ _ _ _ _ _ _ _ _ _ _	☐ ☐ ☐ ☐
DH08: كم كان مستوى السكر في الدم في أخر فحص قمت به : (999- لا اعرف. 998- طبيعي. 997- عالي. 996 منخفض)		☐☐☐
DH09: هل تتلقى علاج للسكري حاليا: **(إذا لا انتقل إلى السؤال DH10)**	1- نعم. 2- لا	☐

DH10: ما هو دوائك الذي تتناوله حاليا (الرجاء التحديد بإشارة (X) في المكان المناسب):

اسم الدواء	الإجابة	الجرعة				وقت الجرعة		
		مرة	مرتين	ثلاث مرات	غير ذلك	قبل الأكل	بعد الأكل	لا اهتم متى
Mixtard30/70 (ابر تحت الجلد)								
MPH(human insulin) (ابر تحت الجلد)								
Glucophage 850 mg(حبوب)								
Glucophage 500mg(حبوب)								
Daonil 5mg(حبوب)								
Amaryle 1mg(حبوب)								
Amaryle 2mg(حبوب)								
Amaryle 3mg (حبوب)								
Amaryle 4mg (حبوب)								
Gliclazid 80mg (حبوب)								
غيـــــر ذلـــــك(الرجـــــاء التحديد):_____								

DH11: هل تعاني أي من المشاكل الصحية التالية وما نوع العلاج

المستخدم لكل مشكلة, الرجاء وضع علامة ˚X في المربع الملائم (يمكن اختيار أكثر من إجابة)**:**

المشكلة الصحية(الرجاء وضع علامة X في المربع المقابل)		نوع العلاج (ممكن اختيار أكثر من إجابة)			
		حمية	عملية جراحية	حبوب	غير ذلك: حدد
ضغط دم					
مشاكل في الكلى					
مشاكل في العيون					
مشاكل في القلب					
مشاكل أعصاب (فقدان الإحساس في الأقدام)					
مشاكل جنسية					
أخرى					

القسم الثالث:متابعة المرض

: ماذا تعمل للحفاظ على DF01 صحتك من مرض السكري؟ نعم لا لا اعرف	أتناول الأدوية في مواعيدهاA.	☐
	افحص مستوى السكر دائما.	☐
	أحافظ على مواعيد الطبيب دائما والتزم بنصائحه.	☐
	أحافظ على نوعية الغذاء.	☐
	أمارس الرياضة وخصوصا المشي.	☐
	احضر جميع المحاضرات والندوات بخصوص الموضوع.	☐
	ابحث عن أي مختص للعلاج.	☐

: هل تعتقد بأنك تحتاج إلى مساعدة DF02A أو استشارة أخصائي تغذية للسيطرة على مرضك:	1- نعم. 2- لا. 3- لا اعرف.	☐
: لماذا:_____DF02B		
: هل استشرت أخصائي/ة تغذية من DF03A قبل؟	1- نعم. 2- لا	☐

DF03B؟إذا نعم، لماذا: **(ممكن اختيار أكثر من إجابة)** **إذا نعم Xضع/ي إشارة**	1- لتنظيم غذائي للتحكم بمستوى السكري لدي 2- بسبب زيادة في الوزن 3- حولني طبيبي 4- أخرى، حدد/ي.....	☐ ☐ ☐ ☐
DF04؟ هل التزمت بإرشادات الأخصائي:	1- نعم. 2- لا **(إذا كانت الإجابة نعم, اجب السؤال DF06)**	☐
DF05 ؟ إذا لم تلتزم بالإرشادات، لماذا: **(ممكن اختيار أكثر من إجابة)** **إذا نعم Xضع/ي إشارة**	1- لا أرى ضرورة لذلك. 2- لم استفد منها مسبقا. 3- لا افهم التعليمات. 4-تتضمن الاستغناء عن أطعمتي المفضلة 5- التكلفة مرتفعة. 6- غير ذلك, حدد_____	☐ ☐ ☐ ☐ ☐ ☐

: حسب تقييمك, ما هو مستوى نشاطك DF06 اليومي؟	1- عالي 2- متوسط 3- منخفض 4- غير ذلك حدد_____	☐
: هل تمارس الرياضة؟DF07	1- نعم. 2- لا **(إذا نعم, الرجاء الإجابة على السؤال DF08)**	☐

DF08: الرجاء وضع علامة X في المربع الملائم؟

نوع الرياضة	**كم مرة في الأسبوع تمارس هذه الرياضة**				**مدتها في كل مرة**			
المشي	**مرة أو اقل**	**2-3 مرات**	**4-5 مرات**	**6 أو أكثر**	**نصف ساعة أو اقل**	**نصف ساعة- ساعة**	**ساعة- ساعتين**	**أكثر من ساعتين**
الركض								
تمارين عامة بدون أجهزة (ايروبكس)								
تمارين باستخدام أجهزة رياضية								
غير ذلك:_____								

								ـــــــ

القسم الرابع:التاريخ الغذائي

NH01 : هل تغير وزنك منذ إصابتك بالسكري؟	1- نعم. 2- لا 3- لا اعرف **(اذا نعم الرجاء الاجابة على السؤال NH02)**	☐
NH02A : ما سبب هذا التغيير؟	1- حمية 2- بسبب مرض السكري 3- غير ذلك	☐☐
NH02B : هل تغير وزنك بحيث:	1- زاد 2- نقص	☐
NH02C : كم كيلو غرام زاد او نقص وزنك؟		كغم☐☐
NH03 : كم طولك بالسنتمتر؟		سم☐☐☐
NH04 : برأيك هل تعاني من السمنة؟	1- نعم. 2- لا 3- لا اعرف	☐
NH05 : كيف تتناول طعامك؟	1- بشكل منتظم. 2- بشكل غير منتظم. 3- لا انتبه لنمط أكلي	☐
NH06 : هل تتوفر لديك باستمرار ماتحتاج له من الأطعمة؟	1- نعم. 2- لا 3- أحيانا	☐

NH07 إذا لا, لماذا؟ : **(ممكن اختيار أكثر من إجابة)** **إشارة Xضع/ي إذا نعم**	1- لا امتلك النقود الكافية لذلك 2- لا اهتم بنوعية أكلي. 3- لا استطيع اختيار الأطعمة الملائمة لمرضي 4- عدد إفراد الأسرة كبير 5 – لا تتوفر الأطعمة في الأسواق 6- أخرى_____	☐ ☐ ☐ ☐ ☐ ☐

NH08: برأيك, هل مريض السكري يستطيع تناول الأطعمة التالية و لماذا؟

الاحتمالات لماذا:

1. **لأنة مضر لمريض السكري.**
2. **لأنة مفيد لمريض السكري.**
3. **لأنة يرفع السكر.**
4. **لان الطبيب يمنع تناوله.**
5. **لأنة غير متوفر في الأسواق.**
6. **لان ثمنه مرتفع.**
7. **غير ذلك,الرجاء التحديد----------**

	نعم	**لا**	**لا اعرف**	**لماذا(ممكن اختيار أكثر من إجابة)**
حليبَ قليل الدسم				
حليب كامل الدسم				

لبن بدون دسم				
جبنه بلدي/ معلبة				
تفاح				
موز				
عنب				
بطيخ				
ملفوف				
جزر				
سبانخ أو ملوخية				
بازلاء أو فاصوليا				
بثدورة				
بصل				
ثوم				
خيار				
دجاج، بدون جلد				
دجاج، بالجلد				
لحم بقر/ لحم خروف				
سمك				
بيض				
شوكولاته				
سكر				
عسل				
زبده				
زيت زيتون				

زيت ذرة				
عصير تابوزينا				
مشروب غازي دايت				
شاي مع سكر				
بسكويت				
خبز كماج ابيض				
شريحة خبز ابيض				
شريحة خبز اسودِ				
بطاطا				
ارزّ أومعكرونة				
تسالي مالحة مثل شيبس				
ساندويتش فلافل(خبز كماج)				
ساندويتش شاورما(خبزكماج)				
مقلوبة				
ورق دوالي				
الأعشاب الطبية(قرفة/حلبة/ميرمية..الخ)				

NH09الرجاء الإجابة على لائحة الأغذية التالية وهي الأغذية الأكثر حضورا على مائدتك مع ذكر التكرار حسب الخيارات المبينة في اللائحة:

الرقم	اسم الغذاء	الكمية	متوسط الاستهلاك في السنة الماضية							
			6+ لليوم	4 - 6 لليوم	2-3 لليوم	مرة لليوم	5-6 في الأسبوع	2-4 في الأسبوع	مرة في الأسبوع	1-3 في الشهر	تقريبا و لا مرة
	الحليب و مشتقاته										
1	حليبَ قليل الدسم	كاس 224غم									
2	حليب كامل الدسم	كاس 224غم									
3	لبن بدون دسم	1كاس									
4	لبن رايب كامل الدسم	1 كاس									
5	آيس كريم	2/1 كاس/ حبة									
6	لبنة كاملة الدسم	ملعقة كبيرة									
7	جبنة بلدي/ معلبة	قطعة									
	الفواكه										
8	برتقال	1									
9	مشمش أو خوخ	1									
10	موز	1									
11	تفاح	1									
12	عنب	12حبات									
13	بطيخ	شريحة									
14	شمام	شريحة									
15	تمر	حبة									
16	ليمون	2/1 ليمونة									
	الخضراوات										
17	قرنبيط	2/1 كاس									
18	ملفوف	2/1 كاس									

19	جزر	1									
20	سبانخ أو ملوخية	2/1 كاس									
21	بازلاء أو فاصولياء	2/1 كاس									
22	بثدورة	1									
23	بصل	4/1 بصلة									
24	ثوم	فص ثوم									
25	خيار	1									
26	سلطة خضار بدون زيت	صحن صغير									
27	المخللات، باستثناء الزيتون	وحدة واحدة									
	اللحوم/سمك/بيض/مكسرات										
28	دجاج، بدون جلد	168-224 غم (ربع دجاجة)									
29	دجاج، بالجلد	168-224 غم (ربع دجاجة)									
30	لحم بقر/ لحم خروف	168-224 غم شريحة متوسطة الحجم									
31	سمك	168-224 غم شريحة متوسطة الحجم									
32	بيض	بيضة									
33	حمص	ملعقة طعام كبيرة									
34	فاصوليا أو عدس، مجفّفَ	2/1 كاس									
	حلويات/ زيوت/دهون/مشرو										

	بات										
35	شوكولاته	28غم قطعــة بحجــم 2اصبع									
36	حلـــــوى بـــــدون شوكولاتة(ملبس)	28غم/ 5 حبات ملبس									
37	عسل، مربّى	ملعقة صغيرة									
38	سكر	ملعقة صغيرة									
39	المارجرين	ملعقة صغيرة									
40	زبده	ملعقة صغيرة									
41	زيت زيتون	ملعقة كبيرة									
42	زيت ذرة	ملعقة كبيرة									
43	طحينية	ملعقة كبيرة									
44	زيتون	5 حبات									
45	أفوكادو	ملعقة كبيرة									
46	مايونيز	ملعقة صغيرة									
47	مكسرات	28غـــــم (10 حبات									
48	كنافة	1/4 وقية									
49	بقلاوة	قطعة									
50	كوكـا كـولا، بيبسـي، او مشـرويات غازيـة أخرى	كاس									
51	مشـــروب غـــازي دايت	كاس									
52	عصـــــــــــــير مركز(تحليل)	كاس									
53	عصير تابوزينا	كاس									
54	محليات صناعية	حبة/كيس									
55	قهوةبدون سكر	كاس									
56	شاي بدون سكر	كاس									

57	قهوة مع سكر	كاس									
58	شاي مع سكر	كاس									
	نشويات										
59	كيك	شريحة									
60	بسكويت	قطعة واحدة									
61	خبز كماج	رغيف واحد									
62	شريحة خبز ابيض	شريحة									
63	شريحة خبز اسودِ	شريحة									
64	بطاطا	حبة صغيرة									
65	ذرة	كوز صغير									
66	فريكة/ برغل	كاس									
67	مفتول	صحن صغير									
68	أرز أومعكرونة	2/1 كاس									
	وجبات/مأكولات سريعة										
69	ساندويتش مرتديلا(خبز كماج)	1									
70	ساندويتش هامبرغر(خبز سمون)	1									
71	نقانق مقلية	حبة									
72	لحم مصنّع (سجق، سلامي, الخ	قطعة/ شريحة									
73	شيبس	كيس صغير/28غم									
74	بطاطا مقلية	112غم (10 حبات)									
75	ساندويتش فلافل(خبز كماج)	1									
76	بيتزا	شريحة									
77	ساندويتش	1									

	شاورما(خبزكماج)										
	أكلات شعبية										
78	مقلوبة	صحن صغير									
79	منسف	صحن صغير									
80	ورق دوالي	10 حبات									
81	كوسا محشي	حبة واحدة									

قياس الوزن بالكيلوغرام:□□□قياس الطول بالسنتيمتر:□□□

Annex: 6

جامعة القدس

كلية الصحة العامة

بحث كمتطلب لدرجة الماجستير في الصحة العامة

يعتبر مرض السكري من أ كثر الأمراض انتشارا في فلسطين, حيث يقسم المرض إلى نوعين , النوع الأول و يصيب الأطفال و الشباب وهو ينتج عن انعدام إفراز الأنسولين من غدة البنكرياس التي تعمل على تنظيم نسبة السكر في الدم,أما النوع الثاني و هو الأكثر شيوعا بين الناس و يصيب حوالي 85% من مرضى السكري فعادة ما يصيب البالغين و لكنة يصيب أحيانا صغار السن أيضا, كما أن غالبية مرضى النوع الثاني يعانون من زيادة في الوزن.وفي هذا النوع من السكري تكون غدة البنكرياس غير قادرة على إنتاج كمية كافية من الأنسولين أو أن الجسم لا يستخدم الأنسولين بطريقة مناسبة.

من المتوقع ان تكون نسبة انتشار مرض السكري من النوع الثاني في فلسطين كباقي الدول المجاورة و هي 9% لسنة 2000 , وبين اللاجئين الفلسطينيين المسجلين في الضفة الغربية و قطاع غزة هي 4.7% لسنة 2001 , لذلك ستجرى هذه الدراسة في مخيم الدهيشة للاجئين في محافظة بيت لحم لمرضى النوع الثاني و الذين يتلقون المتابعة الطبية في عيادة الوكالة الموجودة في المخيم, حيث يتوقع أن تكون العينة الأولية هي 150 مريضا.

يهدف هذا البحث الى اجراء مقارنة بين وضع مرضى السكري من النوع الثاني الذين سيتلقون برنامجا تعليميا عن الغذاء و تاثيرة على مرض السكري والسيطرة

على تطور الأعراض المصاحبة له و عددهم 50 مريضا و بين آخرين لم يتلقوا هذا البرنامج و عددهم 100 مريض.

لقد قمنا بتجهيز استبيان يحتوي على اسئلة خاصة باهداف الدراسة, لذا نرجوا منكم الاجابة على الاستبيان ,املين من حضراتكم اجابة كافة الاسئلة بموضوعية و بقراءة كل فقرة بتمعن والاستجابة عليها حسب التعليمات الواردة قبل كل فقرة, علما ان و نضمن لكم المعلومات الواردة في الاستبيان ستستعمل لاغراض البحث فقط السرية التامة في المعلومات التي ستدلون بها.

لذا نرجو منكم التوقيع على المشاركة لاتمام اهداف هذة الدراسة بمراحلها المختلفة.

شاكرين لكم حسن تعاونكم

الباحث: عبلة صومان

لقد قمت بدراسة جميع التعليمات الواردة في هذا الاستبيان و علية فقد قررت المشاركة في هذة الدراسة, وان وجود اسمي و توقيعي هو دليل على قبولي للمشاركة في هذة الدراسة.

التاريخ:_____

اسم المشارك:_____

التوقيع:_____

اسم الباحث: عبلة صومان

التوقيع:_____