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The analysis of eating habits of diabetics in the USA

Master´s Thesis

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Declaration

I declare this thesis is my individual work, which I have developed on my own. All literature and other sources of information which I used in processing, are included in the list of references and quoted properly .

In Pardubice, April 25th 2012.

Helena Vaňkátová

Acknowledgments

Abstract

Besides the good drug compliance, appropriate nutrition plays important role in successful management of the metabolic aspects of type 2 diabetes mellitus (DM2), and in the prevention of diabetes-related conditions. The goal of this study was to analyze eating habits among DM2 patients in the part of the United States.

The Fat- and Fiber-Related Diet Habits Questionnaire (A.Shattuck, 1998) was used in this study to obtain identical data for comparison. The original version was slightly adjusted according to the local habits. The study took place at the El Rio Community Health Center clinics in Tucson, Arizona, USA; during the time period of three months (September to December 2011). Patients with DM2 patients visiting the clinic were recruited for participation. Once patients were given the questionnaire, answers were put into the database created in an Excel application (Microsoft Office 2010) and analyzed using the frequency analysis.

207 patients filled out the questionnaire. The mean age was 56,8 ± 12,6 years, the mean age when diagnosed with DM2 was 45,3 ± 12,7 years, BMI 33,2 ± 7,8 kg/m2, the mean waist circumference 109,7 ± 19,7 cm and the mean percentage of glycated hemoglobin (A1C) was 8,1± 1,7% (ad DCCT). 10% of participants were treated only by the diet, 49% with peroral antidiabetics (PAD), 14% with insulin, and 28% with combination of PAD and insulin. Equally in both Fiber- and Fat- related parts of the questionnaire 32% of participants showed increased intake of fiber and lowering fat intake by answering the questions "Always" or "Often".

Only one third of the sample indicated that they were following the advice of increasing dietary fiber and lowering fat intake in accordance with the various recommendations for patients with diabetes. We can presume the results could be affected by the patients' education, their socio-economic and

overall health status. There could be also an influence of cultural differences and various individual attitudes of the subjects toward their health.

Abstrakt

Dobrá compliance pacienta k léčebnému režimu je u diabetes mellitus 2. typu (DM2) velmi důležitá. Neméně významnou roli hraje i správná životospráva a stravování pacientů, které pomáhají ke správnému managementu nemoci a také přispívají k prevenci možných komplikací DM2. Cílem této práce bylo analyzovat stravovací návyky diabetických pacientů 2. typu ve Spojených státech amerických.

Nástrojem k získání identických dat pro porovnání pacientů byl dotazník "The Fat- and Fiber-Related Diet Habits Questionnaire" (A.Shattuck, 1998). Originální verze dotazníku byla mírně upravena podle místních stravovacích zvyklostí. Data byla sbírána na klinice El Rio Community health center clinic v Tucsonu, Arizona, (USA) po dobu tří měsíců (září až prosinec 2011). Do studie byli zařazeni DM2 pacienti dané kliniky. Odpovědi byly zaznamenány do Excel databaze a k vyhodnocení byla použita frekvenční analýza.

207 pacientů vyplnilo dotazník. Průměrný věk studované skupiny byl 56,8 ± 12,6 roků, průměrný věk, kdy byli pacienti diagnostikováni s DM2, DM2 byl 45,3 ± 12,7 roků, průměrný BMI 33,2 ± 7,8 kg/m2, obvod pasu 109,7 ± 19,7 cm, průměrný A1C byl 8,1± 1,7% (dle DCCT). 10% pacientů bylo léčeno pouze dietou, 49% pacientů perorálními antidiabetiky, 14% inzulinem a 28% kombinací inzulinu a perorálních antidiabetik. V obou částech dotazníku prokázalo shodně 32% pacientů snahu dodržovat dietní opatření, týkající se snižování přijmu tuku a zvyšování příjmu vlákniny. Pro zjištění tohoto výsledku jsme se zaměřili na pozitivní odpovědi "Vždy" a "Často".

Zjistili jsme, že základní doporučení správného stravování pro diabetiky 2. typu dodržuje jedna třetina tázaných pacientů. Domníváme se, že tento výsledek může být ovlivněn vzděláním, socio-ekonomickým statutem pacientů a jejich celkovým zdravotním stavem. Možný je také vliv kulturních rozdílů a různý individuální přístup pacientů k jejich zdravotnímu stavu.

1. Introduction

Diabetes mellitus (DM) belongs to the top ten list of life threatening diseases. According to the World Health Organization (WHO) over 346 million people worldwide suffer from diabetes mellitus. (1)

In 2010, at least 25.8 million people, or 8.3% of the United States (U.S.) population, had diabetes mellitus. (2) The alarming fact about the disease is the high number of complications; those can negatively affect patients' life and can lead to premature death.

The fast spread of the disease is mainly caused by the changed lifestyle. The importance of maintaining a normal body weight, regular physical activity, and healthy diet plays the main role and can prevent or delay development of DM2.

Good blood glucose management, proper usage of medications, collaborating with health care practitioners, and effective patient self-management is essential for people to live well with diabetes mellitus.

2. Goal

The theoretical part focuses on description of fundamental clinical pharmacy categories according to diabetes mellitus. And the practical part examines the eating habits of diagnosed DM2 patients to assess whether they follow diet recommendations of increasing dietary fiber and lowering fat intakes.

3. Theoretical part

3.1. INTRODUCTION

Diabetes mellitus is a group of metabolic diseases where the body does not produce enough insulin or does not use it properly. Insulin is the hormone responsible for carrying glucose into the cells. Insufficient amounts of insulin among other things causes disturbance of carbohydrates, fat and protein metabolism.

Diabetes mellitus is considered as a stage of chronically elevated blood sugar level, hyperglycemia. Hyperglycemia over time leads to many complications such as retinopathy, nephropathy, neuropathy, and increases the risk of cardiovascular disease. (1)

3.2. EPIDEMIOLOGY OF DIABETES MELLITUS

The long term trends have been indicating that the number of diagnosed cases of diabetes mellitus in U.S. are increasing exponentially from 1.58 million to 18.8 million diagnosed cases, within years 1958- 2010.

Number and Percentage of U.S. Population with Diagnosed Diabetes, 1958-2009
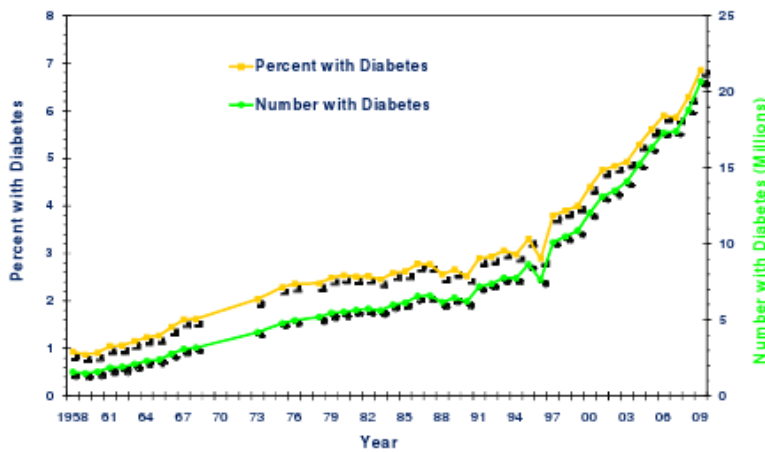
Picture 1: Number and percentage of U.S. population with diagnosed diabetes. (1958-2009) (3)

According to the estimates from the Centers for Disease Control and Prevention (CDC) at least 25.8 million people in the U.S. have diabetes. 8.3% of population is affected by the disease. 7 million or 27% of those are undiagnosed. (3)

Type 1 diabetes in adults includes 5% of all diagnosed patients and

90% to 95% accounts DM2 in adults aged 20 or older. An estimated 79 million people are pre-diabetics. (3)

The number of new cases is increasing every year. In 2010, nearly 1.9 million were diagnosed for the first time.

The ethnicity has its own role in developing any type of diabetes mellitus. The risk of getting the disease is 18% higher among Asian Americans, 66% higher among Hispanics/Latinos and 77% higher among non-Hispanic blacks, compared to non- Hispanic whites (4) (5)

Other significant factor is the presence of diabetes mellitus in younger patients. Approximately 215,000 Americans younger than age 20 have diabetes mellitus.

It is estimated 1 in 2 minority children born nowadays will develop diabetes. If these current trends continue by 2050 every 1 in 3 U.S. adults could have diabetes mellitus. (3)

3.3. Pathophysiology of type 2 diabetes mellitus

DM2 is a chronic, progressive metabolic disorder that either the β-cells do not produce enough insulin or the body is insulin resistant. (3)

Insulin is a major anabolic hormone. It is produced by β-cells of pancreatic islets, stored in secretory granulates, and secreted after physiologic stimulation. The most important stimulus that causes insulin release and synthesis is glucose. (6)

Insulin is necessary for trans-membrane transport of glucose into certain cells in the body. (7)

DM2 appears to result from a collection of multiple genetic defects or polymorphisms, each contributing its own predisposing risk and modified by environmental factors.

Insulin resistance, which is defined as a lower sensitivity of muscle tissue to insulin, is influenced by family history and environment, especially lifestyle and being overweight. Insulin resistance evokes limited utilization of glucose and leads to excessive production of glucose in the liver, that is followed by hyperglycemia.

Hyperglycemia stimulates the pancreas to produce more insulin, which contributes to hyperinsulinism. In early stages of diabetes, hyperinsulinism is capable to exceed the insulin resistance. However that is just a temporary solution and over time pancreas cannot secrete enough insulin to cover and compensate the body's needs. Hyperinsulinism contributes to β-cells exhaustion and leads to developing the condition of diabetes mellitus. (6)

3.4. CLINICAL PRESENTATION OF TYPE 2 DIABETES MELLITUS

DM2 is usually presented with tiredness, weakness, polyuria and polydipsia. Patients are often older (age > 35) and frequently obese. (6)

An acute clinical feature which occurs in the decompensated state of DM2 is called hyperosmolar nonketonic coma. A syndrome engendered by the severe dehydration resulting from sustained hyperglycemic diuresis in patients who do not drink enough water to compensate for urinary losses. (7)

The chronic features are presented with enhanced susceptibility to infections, as are infections of the skin, pulmonary tract (pneumonia, tuberculosis), and renal infections (pyelonephritis). Microangiopathy and macroangiopathy, atherosclerotic events such as myocardial infarction, cerebrovascular accidents, gangrene of the leg sometimes resulting to amputations, and renal insufficiency are the most frequent concomitants. (7)

To summarize, DM2 is a complex, multifactorial disorder, which continues to be one of the top ten *killers* in the US.

3.5. Criteria for the diagnosis of diabetes mellitus

Today there are four different ways how to diagnose diabetes.

They are listed as follows: a glycosylated hemoglobin (A1C) test, fasting plasma glucose (FPG), 2-h plasma glucose based on oral glucose tolerance test (oGTT), and random plasma glucose (RPG). (8)

The A1C test

The A1C test result reflects the average blood sugar level for the past two to three months. Specifically, the A1C test measures what percentage of hemoglobin — a protein in red blood cells that carries oxygen — is glycated. The use of A1C can avoid the problem of day-to-day variability of glucose values, and avoids the need for the person to fast and to have previous dietary preparations. (9)

There are two different ways how the A1C can be marked. Diabetes Control and Complications Trial (DCCT) calibration is used in the U.S., Japan and Sweden. International Federation of Clinical Chemistry (IFCC) calibration is used in Europe. Conversion between DCCT and IFCC needs special equation. (10)

$$\textbf{A1C (DCCT)} = 0{,}915 * \textbf{A1C (IFCC)} + 2{,}15 \ (11)$$

In this study all of the A1C values are listed in % ad DCCT method.

An A1C of 6.5% (ad DCCT) is recommended as the cut point for diagnosing diabetes. Diagnosis should be confirmed with a repeated A1C test, unless classical symptoms of hyperglycemia or hyperglycemic crisis and plasma glucose levels > 200 mg/dl (11.1mmol/l) are present in which case further testing is not required. (8)

Fasting Plasma Glucose (FPG)

Prior to being tested, a person must not to eat for at least 8 hours. Because of this fast, the test is usually done in the morning. Fasting glucose cut point of > 126 mg/dl (7.0 mmol/l) is recommended.

Oral Glucose Tolerance Test (oGTT)

The plasma glucose is measured 2 hours after administration of 300 milliliters water with 75 grams dissolved glucose.

The established glucose criteria for the diagnosis are a threshold of > 200mg/dl (11.1mmol/l).

Random Plasma Glucose (RPG)

Random plasma glucose is measured in the patient with clinical symptoms of hyperglycemia; a RPG cut point is > 200mg/dl (11.1mmol/l).

If two different tests are both above the diagnostic thresholds, the diagnosis of diabetes is confirmed. However in practice, a large portion of the diabetic population remains unaware of their condition. Often times, diabetes is discovered accidentally when the complications have already developed.

Table 2

Criteria for the diagnosis of diabetes

A1C ≥6.5%. The test should be performed in a laboratory using a method that is NGSP certified and standardized to the DCCT assay.*
or
FPG ≥126 mg/dl (7.0 mmol/l). Fasting is defined as no caloric intake for at least 8 h.*
or
2-h plasma glucose ≥200 mg/dl (11.1 mmol/l) during an OGTT. The test should be performed as described by the World Health Organization, using a glucose load containing the equivalent of 75 g anhydrous glucose dissolved in water.*
or
In a patient with classic symptoms of hyperglycemia or hyperglycemic crisis, a random plasma glucose ≥200 mg/dl (11.1 mmol/l)

- ↵*In the absence of unequivocal hyperglycemia, result should be confirmed by repeat testing.

PICTURE 2: CRITERIA FOR THE DIAGNOSIS OF DIABETES MELLITUS (8)

3.6. TREATMENT GOALS

Objective treatment goal of DM2 is improvement of monitoring blood glucose levels to prevent hypoglycemia or hyperglycemia. A significant intervention to treat diabetes is in educating patients about the importance of regular self-monitoring and understanding the number. (12)

Good compensation and maintaining physiological levels of blood glucose contributes to an improved quality of living.

Prevention of diabetes complications such as cardiovascular disease, neuropathy, retinopathy, infections and renal insufficiency, vindicates diabetes populations to enjoy a longer active life with decreased morbidity.

3.7. PHARMACIST'S ROLE IN DIABETES TREATMENT

3.7.1 DRUG COMPLIANCE

DM2 treatment often requires many lifestyle changes and taking multiple medications, which could seem complicated for the patient who was just diagnosed. It must be emphasized that a positive interaction between patient and pharmacist is essential for successful management of chronic disorder such is DM2.

Compliance with a medication regimen is generally defined as "the extent to which patients take medications as prescribed by their healthcare providers." (13)

Pharmacists should always look for compliance and manage patient's regimen by making the regimen simple, and customizing the regimen to the patient's lifestyle. Asking patients nonjudgmentally about medication-taking behavior is a practical strategy for identifying the level of compliance. The patient must actively participate in the selection and adjustment of drug treatment and in changes in lifestyle in order to maximize the benefits of the therapeutic regimen. Pharmacist can help by simplifying instructions and medication schedules to the patient.

Minimizing the total number of daily doses has been found to be more important in promoting adherence than minimizing the total number of medications. (14)

3.7.2 PHARMACIST-DIRECTED DIABETES MELLITUS MANAGEMENT

Pharmacists in the US can attend pharmacy residency program to specialize within a narrow field of practice. A pharmacist-directed diabetes management clinic belongs to the examples of highly specialized practice.

Pharmacists and pharmacy residents provide diabetes education and management services to patients. The pharmacists providing these services have credentials such as certified diabetes educators (CDE) and practice under a standardized protocol created by the American Association of Diabetes Educators (AADE). (15) The National Certification Board for Diabetes Educators (NCBDE) defines Diabetes Self-Management Education (DSME) as a process which incorporates the needs, goals and life experiences of the person with pre-diabetes or diabetes and is guided by evidence-based standards. (16) (17)

How does a typical visit in pharmacist-directed diabetes management clinic look like? The day before appointment pharmacist thoroughly reviews the patient´s electronic medical records for current medications, and laboratory data. At the day of the appointment the following is obtained: patient´s height and weight, A1C, blood pressure and foot exam performed by the pharmacist. Then the pharmacist provides patient-specific education such as smoking cessation counseling, diet, exercise, immunization, self-testing, carbohydrate counting. The pharmacist sets individualized goals, orders laboratory tests as needed, consults for depression and provides a glucometer if the patient does not already have one. If necessary, they are able to adjust the medication regimen in accordance with the protocol. Patients usually see the pharmacist every 3 months and visits are managed to obtain patient´s goals and needs. In addition all patients are followed up with their primary care physicians.

Studies had confirmed that pharmacist-directed DM management helps patients reach their set goals much more effectively, have significant decreases in A1C, LDL, total cholesterol, triglycerides, and blood glucose, result in better renal outcomes, and reduced diabetes-related risks. (18) (19) (20) (21) (22) (23) (24) (25)

3.8. Treatment strategies of Type 2 Diabetes

3.8.1. Pharmacotherapy

Pharmacotherapy of U.S. DM2 patients is based on algorithm created by American Association of Clinical Endocrinologists/ American College of Endocrinology (AACE/ACE). (26)

It is essential to combine pharmacotherapy with life style modifications and physical activity, then achieving treatment goals could be faster.

The optimal threshold of A1C to prevent and minimize complications is set to 6.5% (ad DCCT) or less. The A1C levels should be checked every 2-3 months to adjust or advance therapy.

The algorithm considers monotherapy, dual therapy, and triple therapy, including 8 major classes of oral medications (biguanides, sulfonylureas, meglitinides, dipeptidyl-peptidase-4-inhibitors, incretin mimetics, thiazolidinediones, α-glucosidase inhibitors, and bile acid sequestrants) and insulin therapy. (26) The appropriate therapy is chosen according to current A1C level and customized.

An important element of the algorithm is the stratification by current A1C level, which sorts patients into three groups. (26)

1. Patients with A1C value of **7.5% or lower** (ad DCCT)
2. Patients with A1C level in the range of **7.6-9.0%** (ad DCCT)
3. Patients with A1C value **> 9.0%** (ad DCCT)

Regarding this stratification, monotherapy may be considered in patients of the group 1 (A1C value of 7.5% or lower). If they fails to achieve the A1C, goal dual therapy should be started and then triple therapy; finally, insulin therapy should be initiated.

Group 2 (A1C level in the range of 7.6-9.0%) begins with dual therapy, because monotherapy is unlikely to achieve the A1C goal. If dual therapy fails, they should be advanced to triple therapy and then to insulin therapy. Insulin therapy can be used separately or as a combination with oral medication.

Group 3 (A1C value >9.0%) is the most complicated to achieve the cut point of 6.5% of A1C. In asymptomatic patients it may begin with triple therapy, but in symptomatic patients is recommended to initiate the insulin therapy, either with or without additional oral medication.

3.8.1.1 PHARMACOTHERAPY OF PATIENTS WITH A1C LEVEL < 7.5% (26)

Monotherapy

Metformin is considered as the most appropriate agent to start the treatment of DM2 because of its safety, mechanism of action, and insulin sensitization. (27) However, if metformin is contraindicated, thiazolidinediones (TZDs), dipeptidyl-peptidase-4-inhibitors (DPP-4 inhibitors), and α-glucosidase inhibitors (AGIs) may be used instead.

Dual Therapy

The combination of an insulin sensitizer (metformin or TZDs) with an incretin mimetic (GLP-1 agonist), DPP-4 inhibitor, glinide or sulfonylurea (SU) might be right regime to achieve the A1C goal, if the monotherapy failed.

METFORMIN+ GLP-1 agonist/DPP-4 inhibitor

METFORMIN+ Glinide/SU/AGI/TZD

TZDs + GLP-1 agonist/DPP-4 inhibitor

Triple Therapy

The algorithm includes 6 combinations of metformin and a GLP-1agonist or DPP-4 inhibitor with option of TZD, glinide, or SU.

METFORMIN + GLP-1 agonist + TZD/ glinide/SU

METFORMIN + DPP-4 inhibitor + TZD/ glinide/SU

Insulin Therapy

When triple therapy does not show any improvements in achieving the A1C goal, insulin therapy should be considered.The therapy could be instituted as basal, premixed, prandial, or basal-bolus insulin. Titration of doses and customizing the treatment for every single patient is highly recommended.

3.8.1.2 PHARMACOTHERAPY OF PATIENTS WITH A1C LEVEL 7.5%-9.0% (26)

Management of patients with the A1C range of 7.5-9.0% has to be initiated with at least two different groups of medications for sufficient achievement of A1C levels. One agent is unlikely to achieve the goal of 6.5% A1C.

Dual Therapy

The algorithm considers 5 options of combinations in this exact order.

METFORMIN + GLP-1 agonist/ DPP-4 inhibitor/ TZD/ SU/ glinide

Metformin is again the foundation of the treatment, because of its safety and effectiveness. The other agents are ranked at the exact order as written above, according to their safety and efficacy.

Triple Therapy

Triple therapy is similar as described for patients with lower A1C levels. Metformin is the basis of the treatment combined with other groups of medications.

METFORMIN + GLP-1 agonist**/** DPP-4 inhibitor + TZD/SU

METFORMIN + TDZ + SU

Insulin Therapy

Insulin therapy may be initiated when the goals are not achieved with oral medications and the patient is not improving. Insulin can be safely combined with metformin. Combination with TZDs and SU can increase the risk of hypoglycemia, weight gain, and fluid retention. GLP-1 agonists and DPP-4 inhibitors have not been approved by the Food and Drug Administration (FDA) for concomitant use with insulin although they are currently being studied for that indication.

3.8.1.3 Pharmacotherapy of Patients with A1C Level > 9.0% (26)

In asymptomatic patients, where some probability of preserved β- cell function exists, the treatment might begin with dual therapy:

METFORMIN + GLP-1 agonist **/** DPP-4 inhibitor / TZD

Or triple therapy:

METFORMIN + GLP-1 agonist**/** DPP-4 inhibitor + SU

METFORMIN + GLP-1 agonist**/** DPP-4 inhibitor + TZD

If symptoms such as polydipsia, polyuria, tiredness, weakness, and weight loss are already present it is appropriate to initiate insulin therapy without delay.

3.8.1.4 CONCLUSION

Even though this algorithm in detailed and perfectly describes all three groups of potential patient, it should be used as an advisory tool for healthcare professionals. Assuming the fact that every patient is unique, the treatment has to be tailored to be the most effective and to avoid hypoglycemia, which is considered as a substantial negative clinical effect of treatment. For some patients, the risk of hypoglycemia may warrant specific choices of therapy and reevaluation of therapeutic goals.

3.8.1.5 OVERVIEW OF THERAPEUTIC AGENTS

Biguanides- metformin

The mechanism of action is seen through decreased hepatic gluconeogenesis as well as improved glucose utilization and uptake in peripheral tissues and decreased intestinal absorption of glucose. (28) (27)

Thiazolidinediones (TZDs)

TZDs are agonist of the PPAR-γ receptor which improves peripheral muscle and adipose tissue insulin sensitivity as well as suppresses hepatic glucose output. (28)

Insulin Secretagogues- glinides, sulfonylureas

The primary mechanism of this group is to cause a reduction in blood glucose by stimulating the release of insulin from the pancreas. (6)

α- Glucosidase Inhibitors (AGIs)

α -glucosidase inhibitors delay the digestion of carbohydrates into simple sugars and their subsequent absorption in the small intestine.

Dipeptidyl-peptidase-4 Inhibitors (DPP-4 inhibitors)

This group of medications inhibits the degradation of endogenous glucagon-like peptide-1 (GLP-1) and glucose-dependent insulinotropic polypeptide (GIP), which in turn causes increased insulin production, and decreased production of glucagon, and improved β-cell functioning. (29)

Incretin Mimetics (GLP-1 agonist)

Incretin mimetics are receptor agonist of endogenous GLP-1 that cause increased insulin production in a glucose-dependent fashion, decreased production of glucagon, slowing of gastric emptying, increased satiety and weight loss, and improved β-cell functioning.

Insulin

At low levels, insulin causes suppression of endogenous hepatic glucose production. At higher levels, insulin promotes glucose uptake by muscle tissue.

3.8.2. NON-PHARMACOTHERAPY

The non-drug therapy is very important in preventing diabetes mellitus, managing existing diabetes and preventing, or at least slowing, the rate of diabetes complications. (30)

Lifestyle changes through diet and exercise should be emphasized. Patient education is an essential component of successful diabetes management. (31)

Physical activity and Exercise

Regular exercise improves blood glucose control, reduces cardiovascular risk factors, and contributes to weight loss. (32) An exercise regimen should be individualized regarding to the patient´s pre-exercise program history.

For most patients, a program of 150 min/week of moderate intensity aerobic exercise is recommended. This physical activity leads to long-term weight loss of 5-7 % of starting weight. Modest weight loss has been shown to improve insulin resistance. (33)

Blood glucose monitoring may be necessary before and after exercise. Fast-acting oral carbohydrates should be available during and after exercise.

Medical nutrition therapy

Medical nutrition therapy (MNT) should be individualized to achieve treatment goals with consideration of usual dietary habits, metabolic profile, and lifestyle.

Carbohydrates should be monitored by exchanges, carbohydrate counting, or experience-based estimation. Carbohydrates should be 45-50% of total daily caloric intake. The recommended dietary allowance for

digestible carbohydrate is 130 g/day and is based on providing adequate glucose as the required fuel for the central nervous system without reliance on glucose production from ingested protein or fat. (33)

Diabetes patients should be encouraged to choose a variety of fiber-containing foods such as legumes, fruit, vegetables, and whole grain products to achieve the fiber intake goals set for the general population of 14 g fiber/ 1000 kcal. (33)

Protein should be 15-20% of total daily caloric intake; this should be modified if renal function is reduced. (33)

The individuals with DM2 should be encouraged to limit saturated fat to < 7% of total calories, and cholesterol intake to < 200mg/day, minimize *trans* fatty acids so as to reduce risk of cardiovascular disease. (33)

3.9. REVIEW OF SIMILAR STUDIES

The right diet and eating behaviors play important role in patient´s outcomes. Medicinal nutrition therapy is essential for preventing DM2, managing existing DM, or at least slowing the progress of DM2 complications.

Educating patients about the ways of healthy eating, nutrient levels, what to avoid and why to increase intake of dietary fiber contributes to better outcomes. However, dietary modifications may be difficult to achieve because it often requires changes in long-term food consumption and food-preparation habits especially in older patients.

The main dietary modifications recommended for DM2 patients are reduction in saturated and *trans* dietary fats and increase the dietary fiber. (33)

Fat contains more energy per gram than protein or carbohydrates, and high-fat diet contributes to weight gain, especially in the abdomen area. Visceral fat is measured by waist circumference and together with body mass index (BMI) is used to predict the severity of DM2 risks. (33)

Fiber helps to feel fullness and delays gastric emptying, and may decrease dietary energy intake by reducing absorption of fat and carbohydrate. Studies also describe that increased fiber intake was associated with reduced waist circumference. (34) Furthermore, there are data verifying the beneficial effects of high dietary fiber intake in patients with DM2. (35) The study put patients on two types of diet with different level of daily fiber intake- moderate 24g fiber/day and high-fiber diet 50g fiber/ day- each for six weeks. The results showed significant role of high-fiber diet on improved glycemic control, decreased hyperinsulinemia, and lower plasma lipid concentrations in patients with DM2. (35)

It is difficult, however, to obtain a sufficient quantity of fiber in typical Western diet, and there are some gastrointestinal side effects which could be a barrier for patients. It is necessary to encourage patients to increase the consumption of high-fiber foods such as legumes, fruit and vegetables. Replacing regular white rice with the brown rice was associated with lower risks of DM2, this type of rice has the upper layers which are richer in fiber and the glycemic index of brown rice is lower and contributes to weaker postprandial glucose response than the same amount of white rice. By definition, brown rice is a whole grain. (36)

4.Practical Part

4.1 AIM OF THE STUDY

Dietary self-management is an important part of managing diabetes; it is associated with improved glycemic control and reduced risk of diabetes. This study examines eating habits of diagnosed DM2 patients to assess whether they follow diet recommendations of increasing dietary fiber and lowering fat.

4.2. MATERIALS AND METHODS

The Fat and Fiber- Related Diet Habits Questionnaire (37) was used in this study. All the participants provided informed consent. Recorded were last measured A1C levels, height, weight, waist circumference and pharmacotherapy of each patient from their medical records.

4.2.1. THE FAT AND FIBER- RELATED DIET HABITS QUESTIONNAIRE

This questionnaire consists of 25 main questions followed by sub-questions, about the way patients ate over the past three months. Questions are divided into Fat- and Fiber- related parts which contain thematic group such as: Meat, fish and main dishes; Breads, rolls, muffins and cereals; Dairy products; Fruit, vegetables and salads; Meal patterns; Food preparation. Each of main questions had just two possible answers: YES or NO. And the sub-questions asked about the frequency of each eating habit, there are 4

possible answers: Usually, Often, Sometimes, and Never. Those lead to see whether patients changed the ways of eating regarding their medical condition with substituting low fat alternative foods, reduction in fat used as flavoring, avoiding high fat cooking methods, and increasing dietary fiber through grains, fruit and vegetables.

The original version of the questionnaire was slightly adjusted according to the local habits and translated into Spanish. Both versions of the questionnaire were followed with an informed consent, which assured participants about anonymity of the study, and its optional character.

4.2.2. PARTICIPANT RECRUITMENT

The study took place at the El Rio Community Health Center clinics in Tucson, Arizona, USA; during the time period of three months (September to December 2011) under the supervision of the Director of Clinical Pharmacy Sandra Leal, PharmD, FAPhA, CDE.

Requested for participating in the study were all incoming DM2 patients seeing Dr. Leal periodically, and as well other DM2 patients waiting at the pharmacy or intern medicine departments via the information board announcing the study. Limits for participating in the study were confirmation of DM2 for at least three months, and ability to understand the questions.

Those who had agreed with participating filled informed consent and could choose to complete the questionnaire on their own or with the pharmacy student- in English version, or with nurse- in Spanish. Dr. Leal´s office waiting room allowed for a nice environment for all participants to answer the questions comfortably. They were then measured and weighted. The waist circumference was measured usually without any layer of clothes. The measuring tape was placed on the top of the hip bone without pushing, while

the patient was breathing normally. (38) The latest level of A1C and the medication list were retrieved from the patient´s medical records.

4.2.3. Study measures

Interview data were recorded on paper forms. Each answer was marked by numbers using the scale from 0 to 4. Negative answers were marked by 0. Positive answers were marked by 1 and the scale 1 to 4 was used to mark all the sub-questions. The lower number was matched the lower or fewer fat intakes, and higher or more frequent fiber intakes. These marks were put into the database created by Excel application (Microsoft Office 2010) and analyzed using the frequency analysis.

4.3. RESULTS

4.3.1. DESCRIPTION OF PARTICIPANTS

The final sample included 207 participants who filled the questionnaires and provided informed consent. Of the 207 participants 62% were women, and 38% men as shown in Graph n. 1.

**Graph 1:** Percentage of patients by sex. (100%=207)
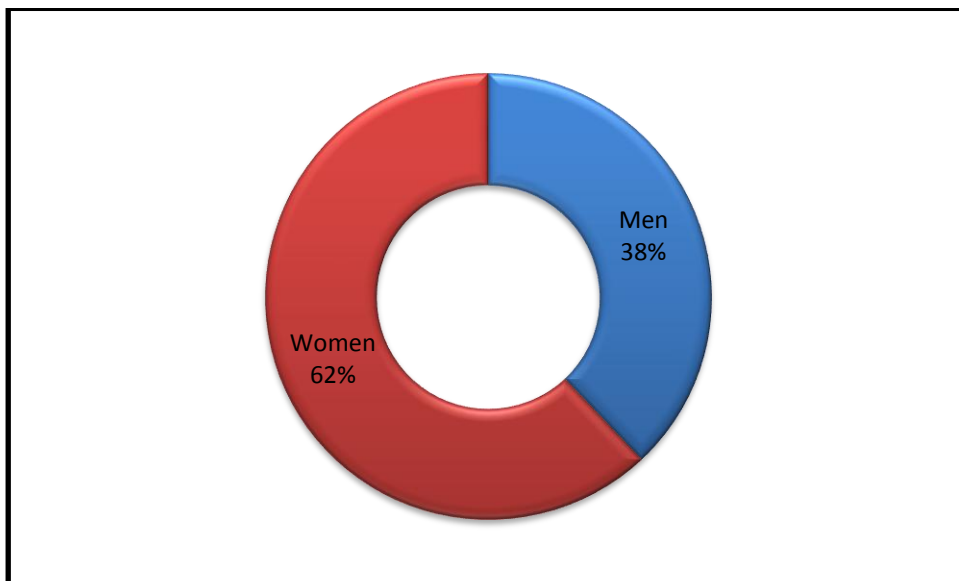
Recorded were the various ethnic groups. Graph n. 2 shows that the most represented was the Hispanic population by 52% of all the participants, followed by 25% Native Americans, 18% American whites, and 5% American Asians.

Graph 2: Percentage of patients by ethnicity. (100%=207)
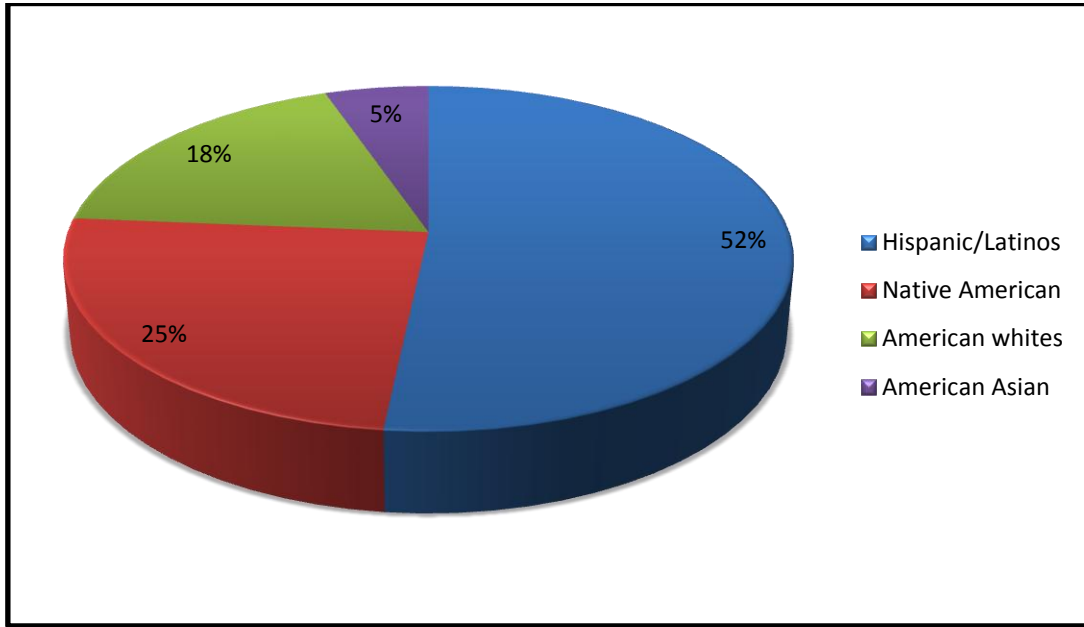
Stratification by age was another parameter how to structure participants. The mean age of studied group was 56,8 ± 12,6 years, 56,4 ± 12,9 years in women, and 57,4 ±12,2 in men. 46% of all participants belong to the group with the age range of 41-59 years. In graph n.3 can be seen the percentage of participants in each of age groups. The group with range of 60-80 years is represented by 40% of all participants; range of 26-40 years includes 11% of all participants. The mean age of Hispanic/ Latinos participants was 56,5 ± 11,9 years, 55,0 ± 14, 6 year for Native Americans, 56,9 ± 11,2 years for American whites, and 67,4 ± 10,5 years for American Asians.

Graph 3: Percentage of participants by age. (100% all= 207; women = 128; men=79)
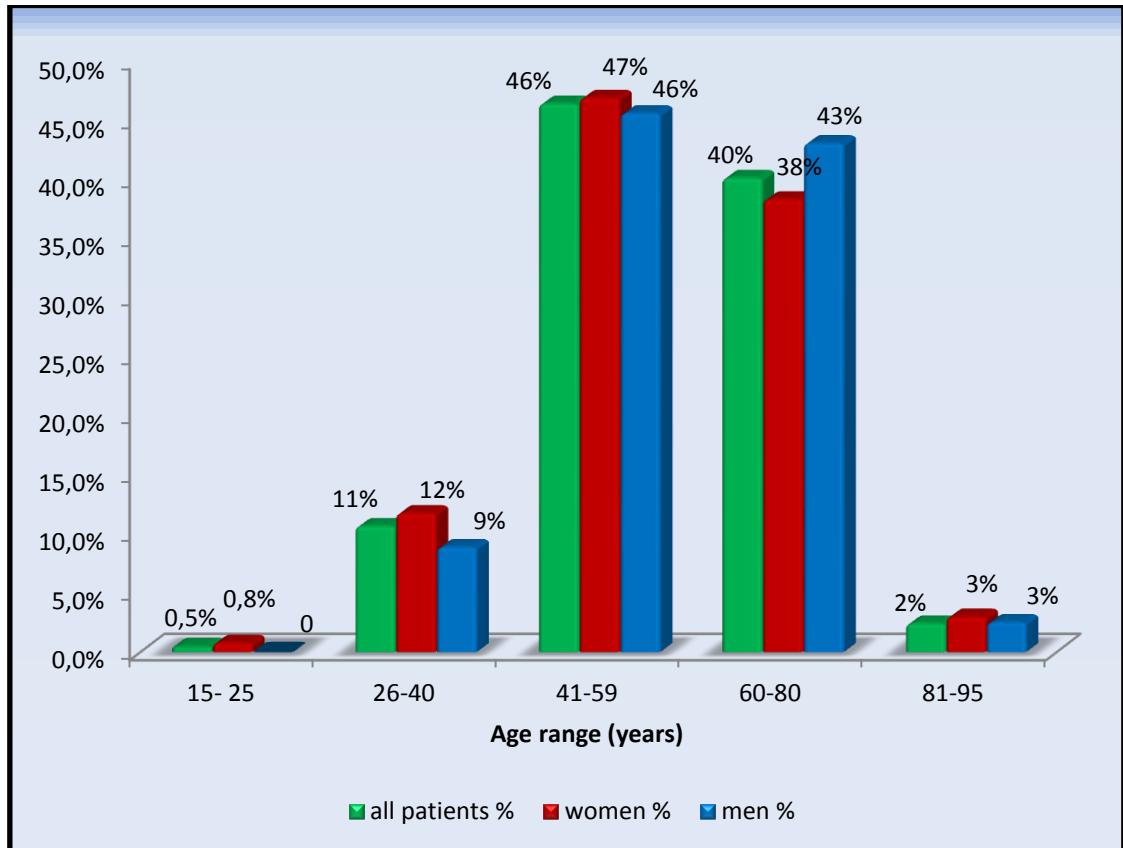
The mean age of the whole group of participants when diagnosed with DM2 was 45,3 ±12,7 years. For women 45,1 ± 12,5 years and for men 45,6 ±13,2 years. 26% patients were first diagnosed with DM2 during the lifetime period of 26-40 years, and 52% during the period of 41-59 years of age. An alarming number of patients first diagnosed with DM2 can be seen in the group with age range of 15-25 years as described in graph n. 4. This represented 8% of the population that participated.

Hispanic/ Latinos participants were first diagnosed in the mean age of 45,3 ± 12,4 years, Native Americans in the mean age of 41,6 ± 12,9; American whites in the mean age of 45,2 ± 9,9; and American Asian in the mean age of 62,3 ± 11,1 years.

Graph 4: Rate (in %) of age by sex when first diagnosed with DM2. (100% all= 207; women = 128; men=79)
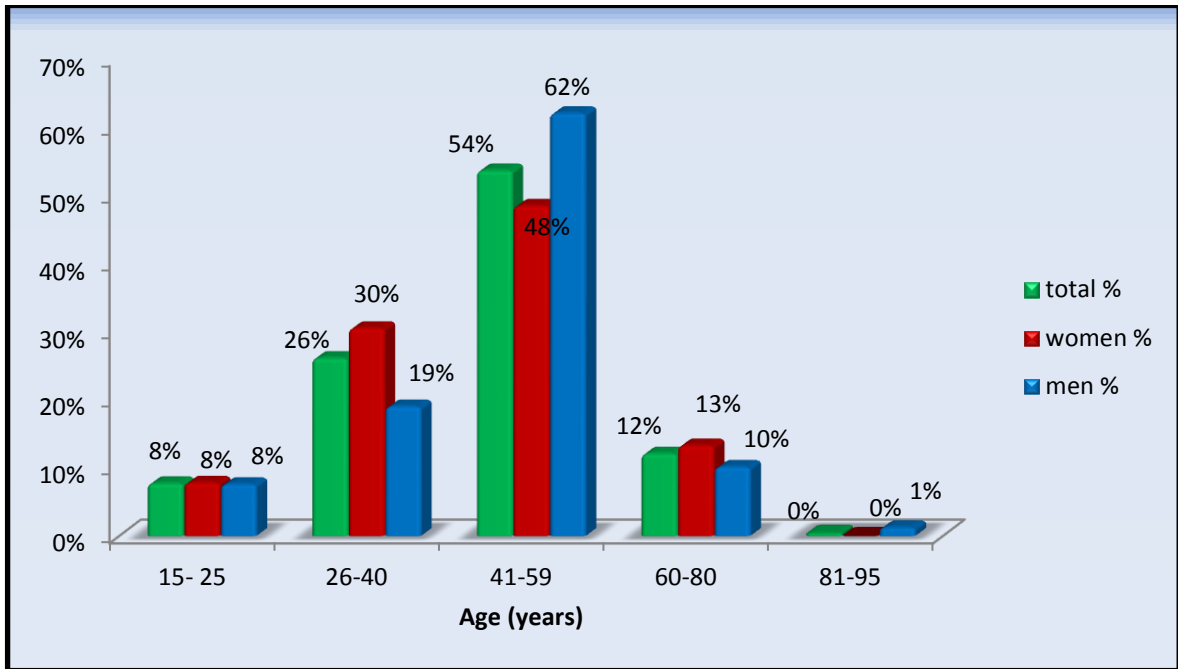
BMI (body mass index) is defined as the individual's body weight divided by the square of his or her height, and is used to classification of the level of obesity. (39)

The mean BMI of studied group is 33,2 ±7,8 kg/m^2. Female patients had mean BMI of 33,5 ± 8 kg/m^2, and male patients had mean BMI of 32,7 ± 7,6 kg/m^2. Graph n. 5 shows that normal weight (BMI 18,5-24,9 kg/m^2) had 11% of all participant, 29% were overweight (BMI 25-30 kg/m^2) , 26% patients belong the Obese Class I (BMI 30-35 kg/m^2), 15% patients are Obese Class II (BMI 35-40 kg/m^2), and remaining 19% suffer from extreme obesity Class III (BMI over 40 kg/m^2).

The mean BMI in Hispanic/ Latinos was 32,9 ± 7,2 kg/m^2; 33,9 ± 7,6 kg/m^2 in Native Americans; 35 ± 9,6 kg/m^2 in American whites; and 26,7 ± 3,9 kg/m^2 in American Asians.

Graph 5: Percentage of BMI by sex. (100% all= 207; women = 128; men=79)
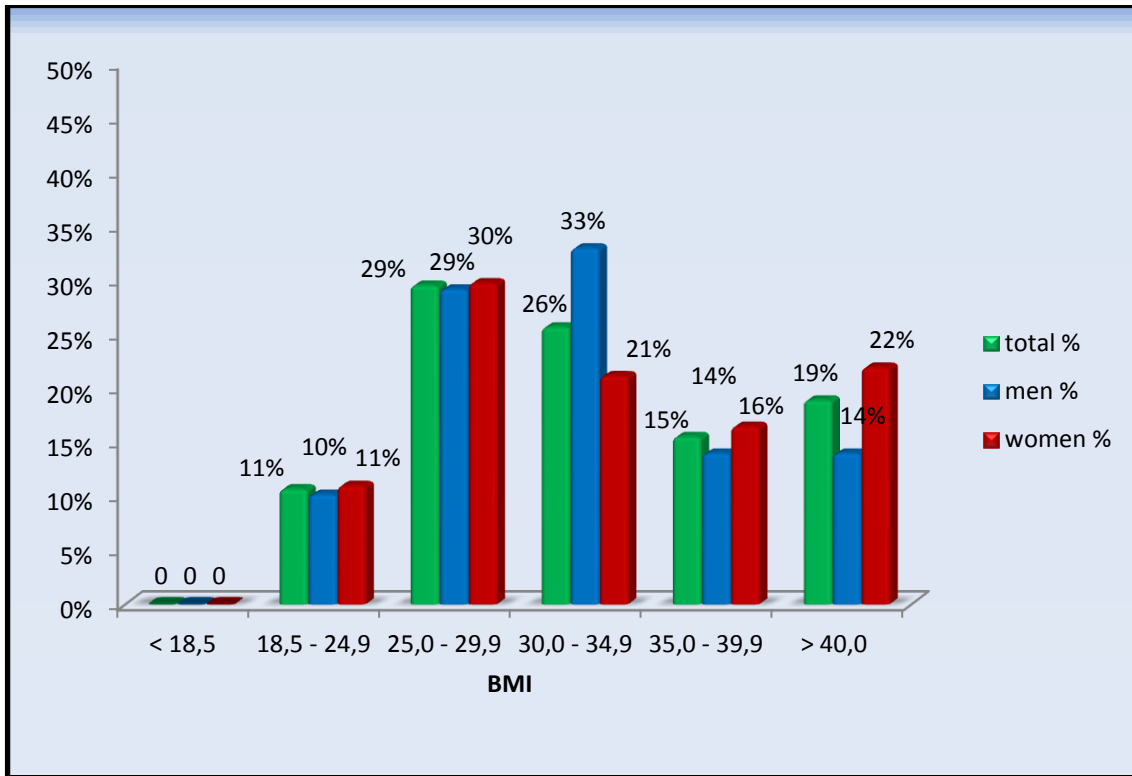
Waist circumference was measured with the agreement of each participant. The mean waist circumference was 109,7 ± 19,7 cm, in female participants the mean measured waist circumference was 109,7 ± 21,0 cm, and in male participants 109,8 ± 17,8 cm.

The ideal waist circumference for women is less than 88 cm and for men less than 102 cm. (8) This ideal range reached 9% of women and 23% of men, as seen in graph n 6. And 59% of all participants had waist circumference higher than 103 cm.

The mean waist circumference in Hispanic/ Latinos was 109,9 ± 17,8 cm; 111,7 ± 22,1 cm in Native Americans; 114,3 ± 18,6 cm in American whites; and 82,6 ± 5,3 cm in American Asians.

Graph 6: Waist circumference by % and sex. (100% all= 207; women = 128; men=79)
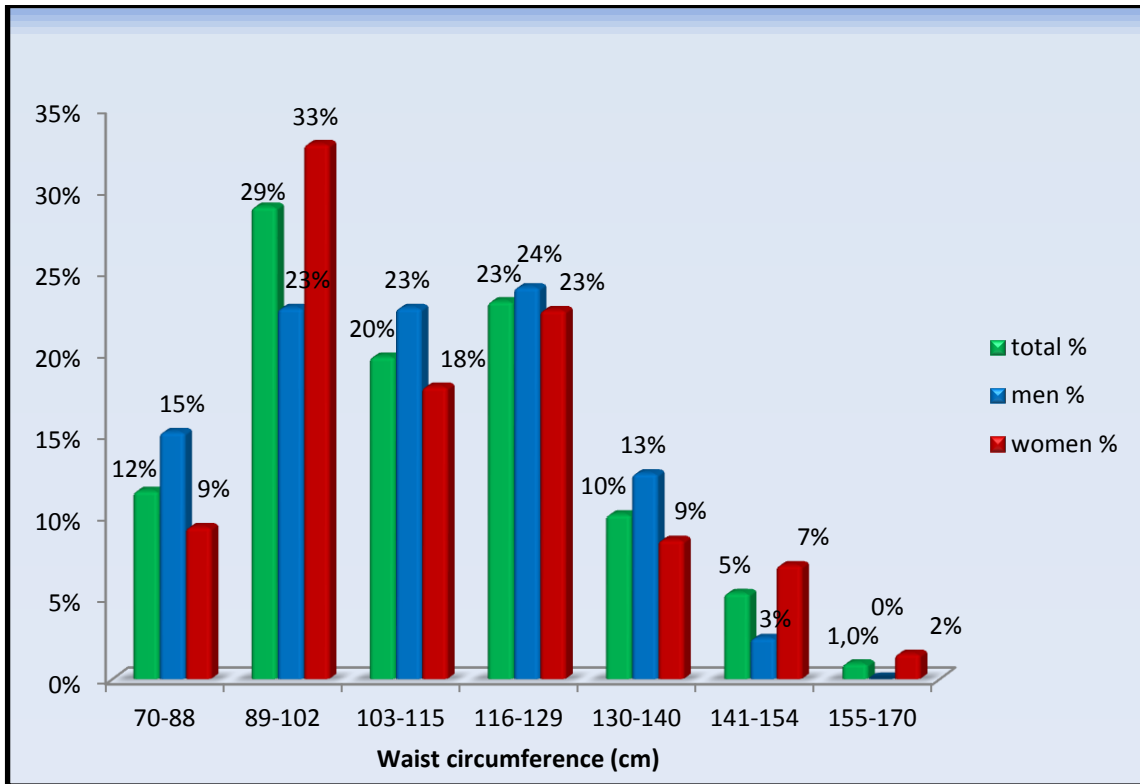
Compensation of diabetes is measured by A1C test. The goal for patients is to achieve A1C of 6,5% (ad DCCT). This level was obtained by 20% of all participants. Graph n. 7 describes that 31% of patients reached the level of A1C in the range of 6,6-7,5% (ad DCCT), 24% the level of A1C in the range of 7,6-9% (ad DCCT), and the remaining 24% had the level of A1C >9% (ad DCCT).

The mean level of A1C in Hispanic/ Latinos was 8,2 ± 1,9% (ad DCCT); 8,3 ± 1,8 % (ad DCCT) in Native Americans; 7,8 ± 2 % (ad DCCT) in American whites; and 7,1 ± 0,9 % (ad DCCT) in American Asians.

Graph 7: Levels of A1C by sex in %. (100% all= 207; women = 128; men=79)
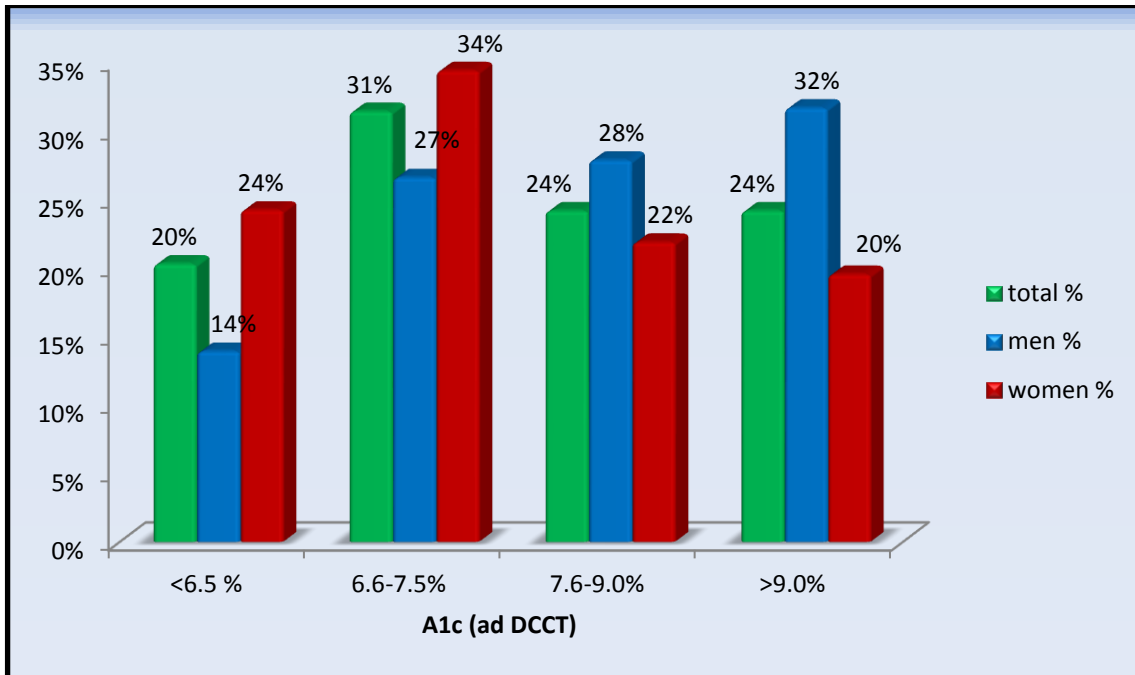
Reaching the thresholds of A1C is usually performed by combination of oral medication and insulin, and following right dietary recommendations.

The next graph n.8 describes the percentage of used types of treatment in the group of 207 participants.

9,7% of patients are treated only by appropriate diet, 48,8% use per-oral anti-diabetics (PAD), 14% use insulin, and 27,5% of patients use the combination of PAD and insulin.

Graph 8: Types of treatment in %. (100%=187)

9,7%

27,5%

14%

48,8%

- Diet
- PAD
- Insulin
- Insulin & PAD
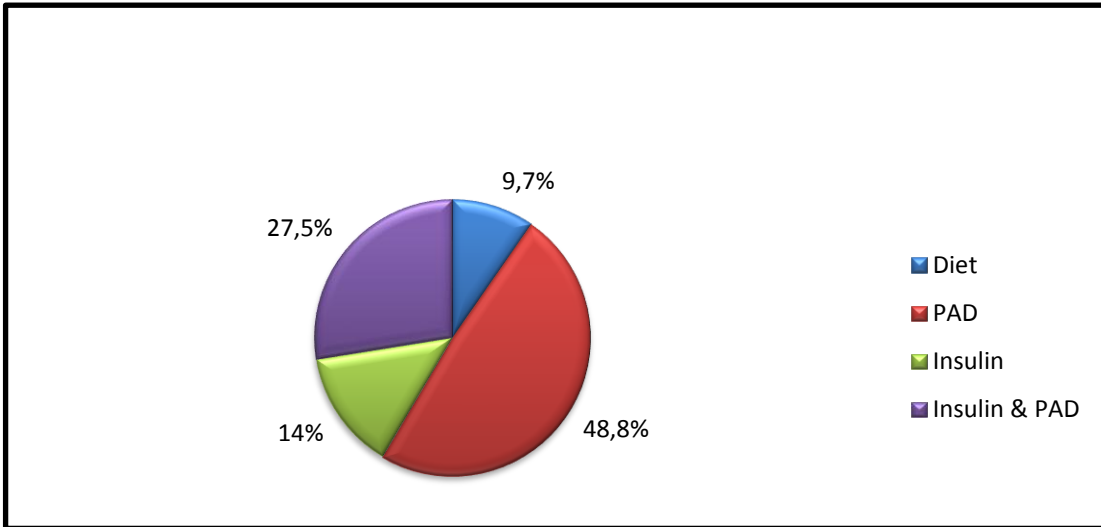
Note: PAD: per-oral anti-diabetics

PAD can be used in mono, dual, or triple therapy. In this sample was monotherapy presented by 44%, dual therapy by 48%, and triple therapy by 9%, as seen in graph n 9.

Graph 9: PAD combinations in %. (100%=101)

9%

44%

48%

- monotherapy
- dual therapy
- triple therapy
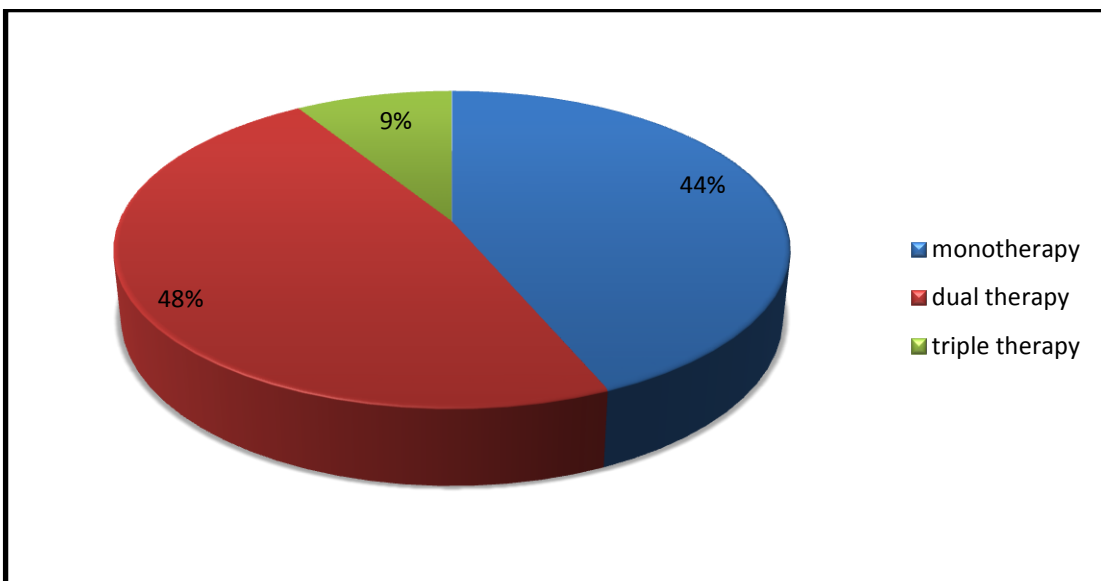
Graph n. 10 describes the percentage of used per-oral anti-diabetics (PAD) agents. Metformin is supposed to be the most effective agent in achieving A1C goals, and is used in 80% of all PAD treatments. Followed is by 58% of sulfonylureas, 11% of thiazolidinediones, 2% of DPP-4 inhibitors, and 1% of GLP-1 analogues.

Graph 10: Used PADs by %. (100%=158)
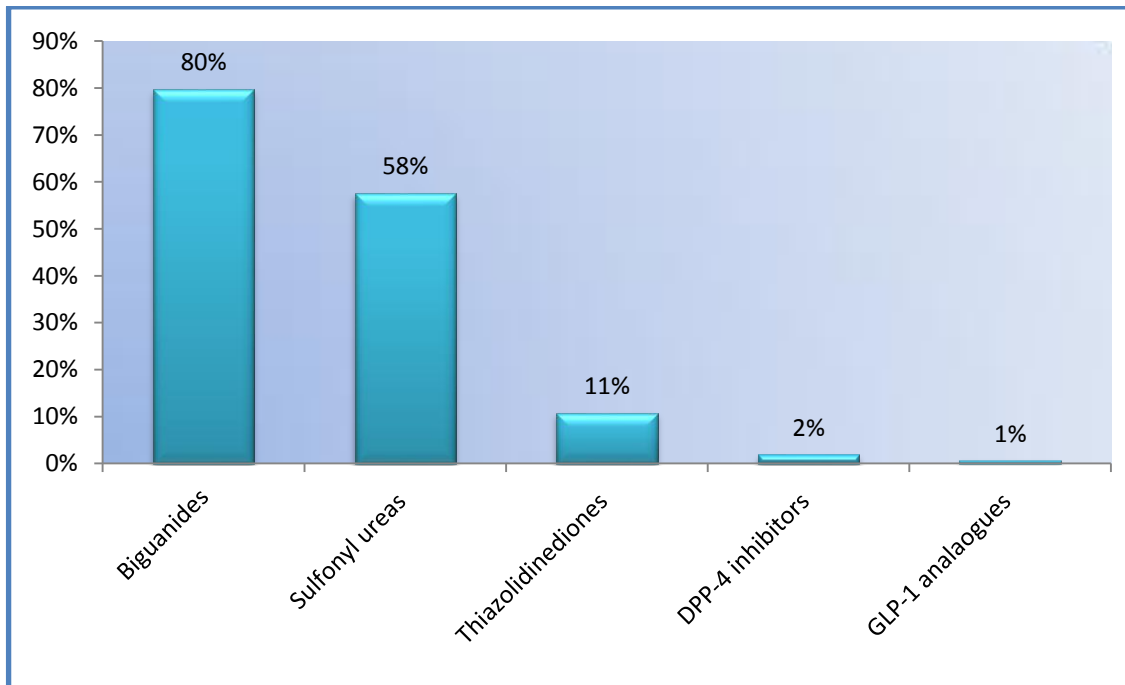
Note: DPP-4 inhibitors: Dipeptidyl-peptidase-4-inhibitors, GLP-1 agonist: Incretin mimetic

DM2 is multifactorial disease and patients are often forced to use other medications to prevent cardiovascular disease and risks connected with diabetes. Graph n. 11 shows that 51% of patients are using statins to lower their cholesterol, 50% of patients are taking antiaggregants to prevent blood cloths, 44% of patients are taking ACEi, 26% of patients are using beta blockers, 20% of patients are taking diuretics (such as hydrochlorothiazide, or furosemide) and calcium-channel blockers are used in 11% of patients. And many other pharmacotherapy agents are used for DM2 patient treatment.

Graph 11: Rates of other pharmacotherapy agents. (100%=187)
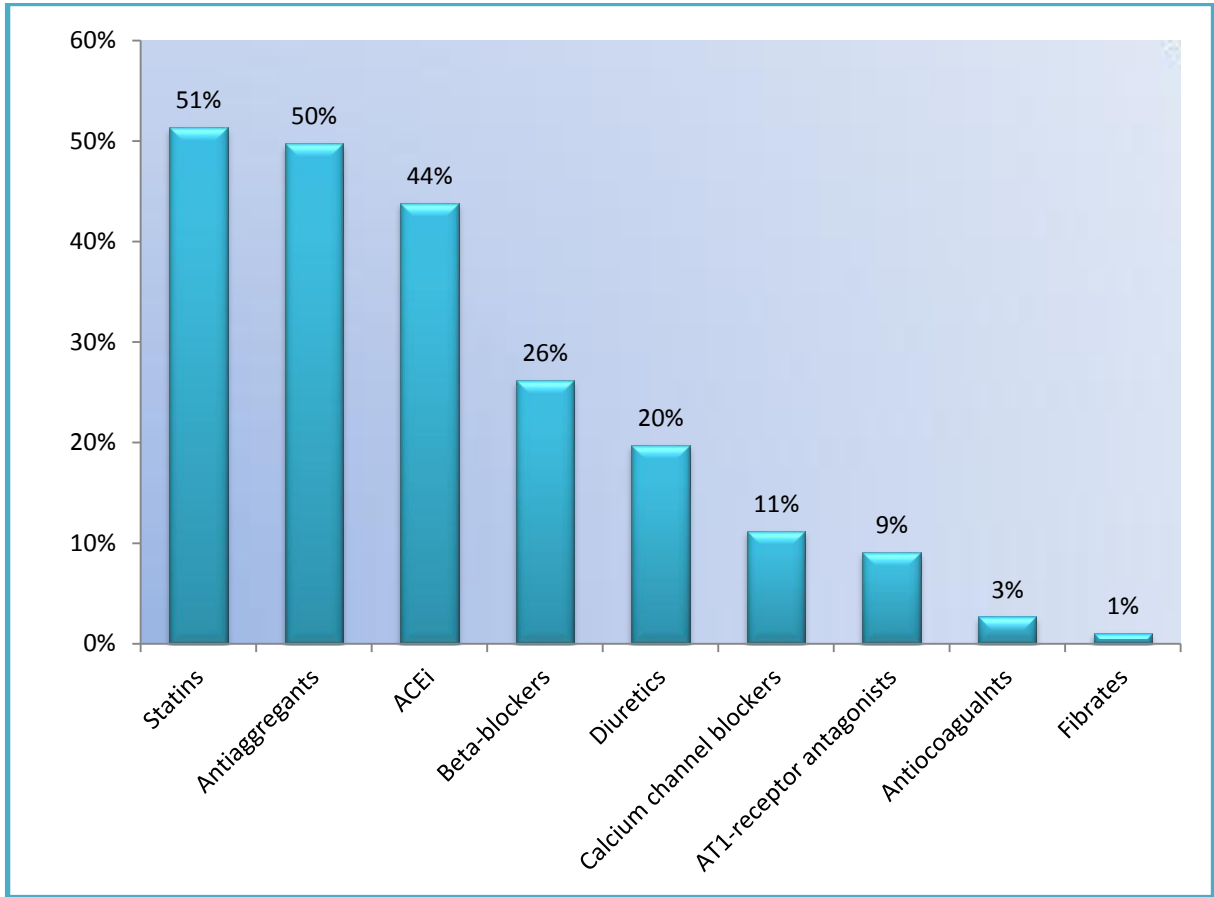
Note: ACEi : Angiotensin-converting-enzyme inhibitor; AT1 i.:Angiotensin II receptor antagonists

4.3.2. DESCRIPTION OF EATING HABITS

The Fat and Fiber- Related Diet Habits Questionnaire focuses on two fields-increasing dietary fiber and lowering fat intake. To describe eating habits of all participants we used the percentage of ALLWAYS and OFTEN answer, this type of analysis was used in one previous study. (40)

These answers reflected to the frequency of lowering fat and increasing dietary fiber behaviors in the last three months prior the interview. Within the Fiber section there were eight questions divided into two main thematic

groups. The Fat section includes six main thematic groups created by twenty-three questions.

Increased intake of dietary fiber

We distinguish two thematic modules in the Fiber section of the questionnaire. First is the _increased intake of cereals and grains,_ which includes questions about eating of whole-wheat pasta, breads; breakfast cereals; added bran to the breakfast cereals; and consumption of brown rice.

Graphs n. 12 and 13 describe the percentage of ALWAYS and OFTEN answer in women and in men depending on their ethnicity in this first group.

Graph 12: Percentage of Always and Often answers in women in "cereals and grains" module. (100%H/L= 63; NA=35; AW=23; AA=7)
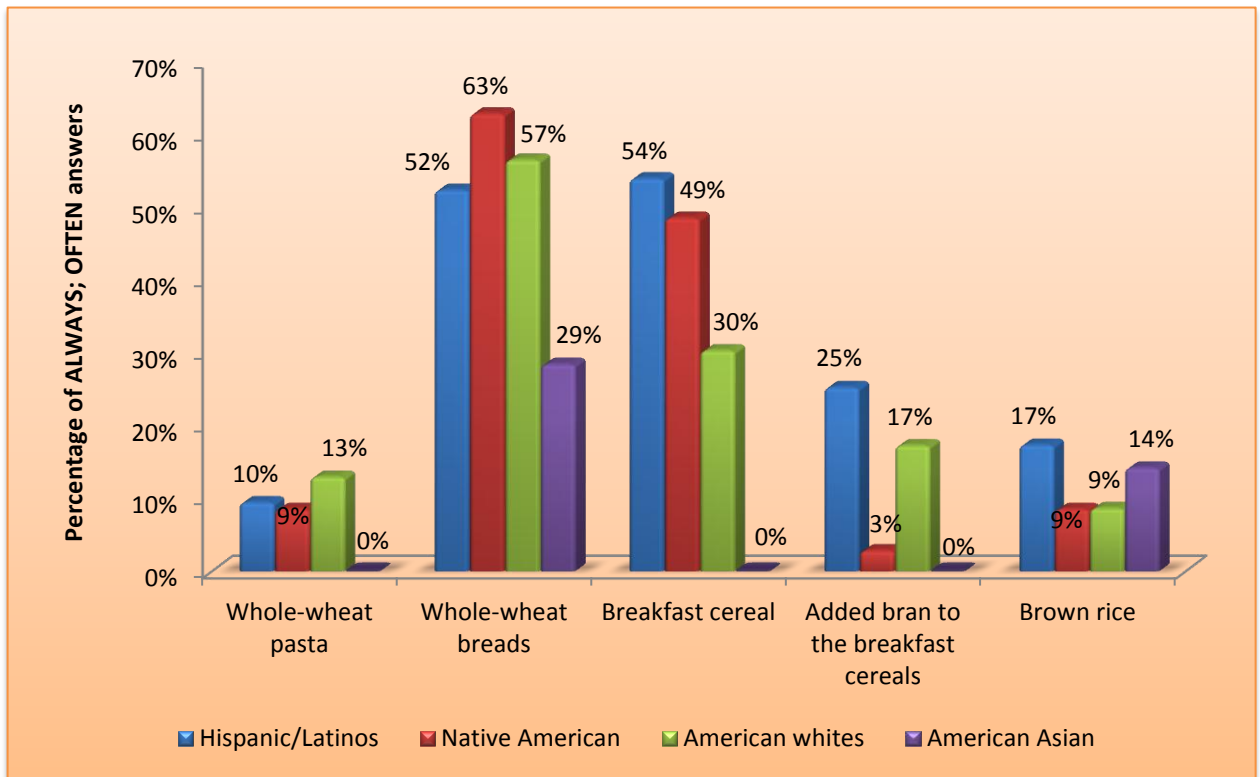
Note: H/L: Hispanic/Latinos; NA: Native American; AW: American whites; AA: American Asian

Graph 13: Percentage of Always and Often answers in men in "cereals and grains" module. (100%H/L= 44; NA=16; AW=15; AA=4)
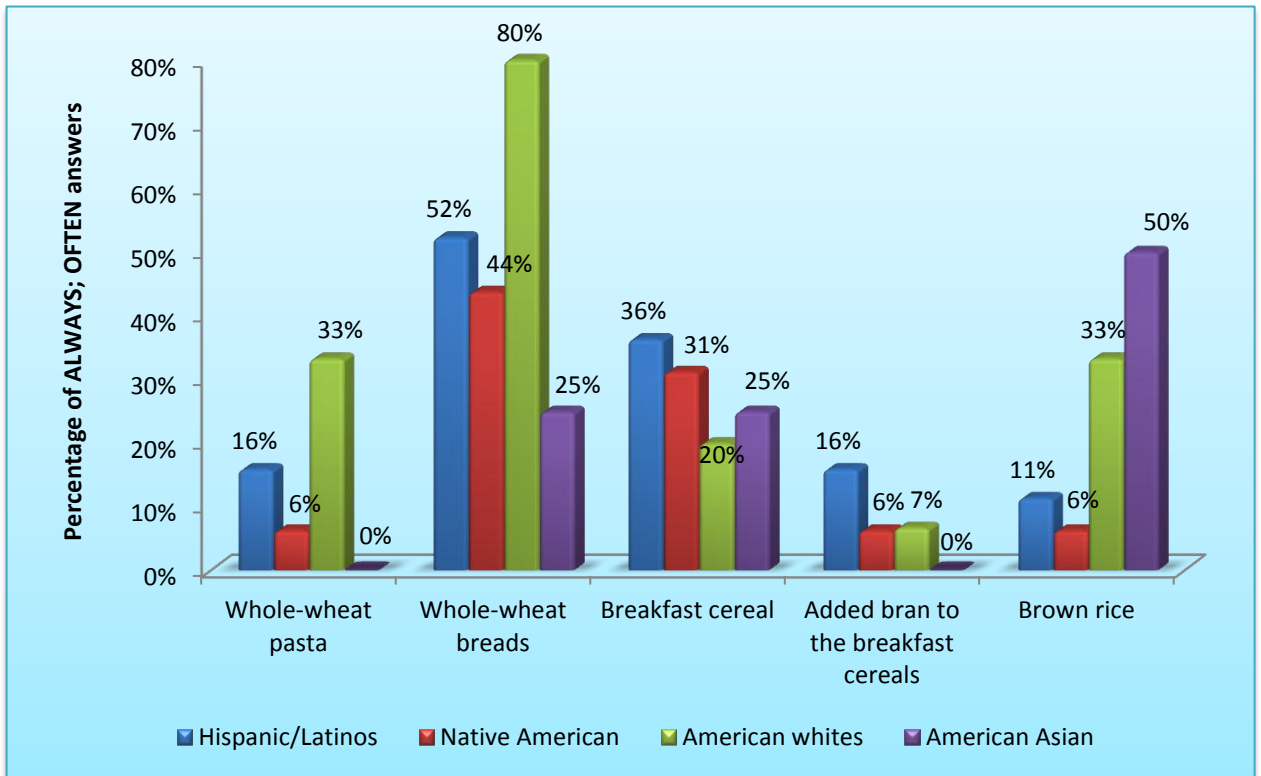
Note: H/L: Hispanic/Latinos; NA: Native American; AW: American whites; AA: American Asian

Both sexes preferred increasing the dietary fiber through regular consumption of whole-wheat breads and breakfast cereals.

The second thematic module focuses on _increased intake of fruit and vegetables._ Results for women and men can be seen in the graph n.14 and 15.

Women had similar results in each of three questions included in this part. Men scored the highest in the question about regular consumption of 2 or more vegetables with their dinner.

Graph 14: Percentage of Always and Often answers in women in "fruit and vegetables" module. (100%H/L= 63; NA=35; AW=23; AA=7)
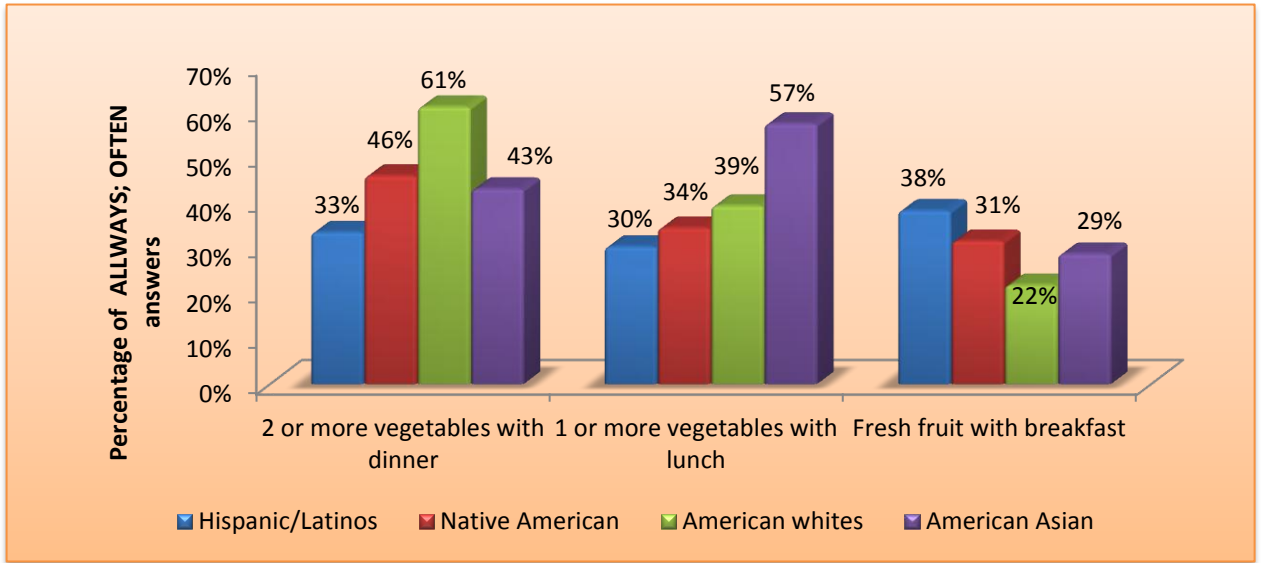
Note: H/L: Hispanic/Latinos; NA: Native American; AW: American whites; AA: American Asian

Graph 15: Percentage of Always and Often answers in men in "fruit and vegetables" module. (100%H/L= 44; NA=16; AW=15; AA=4)
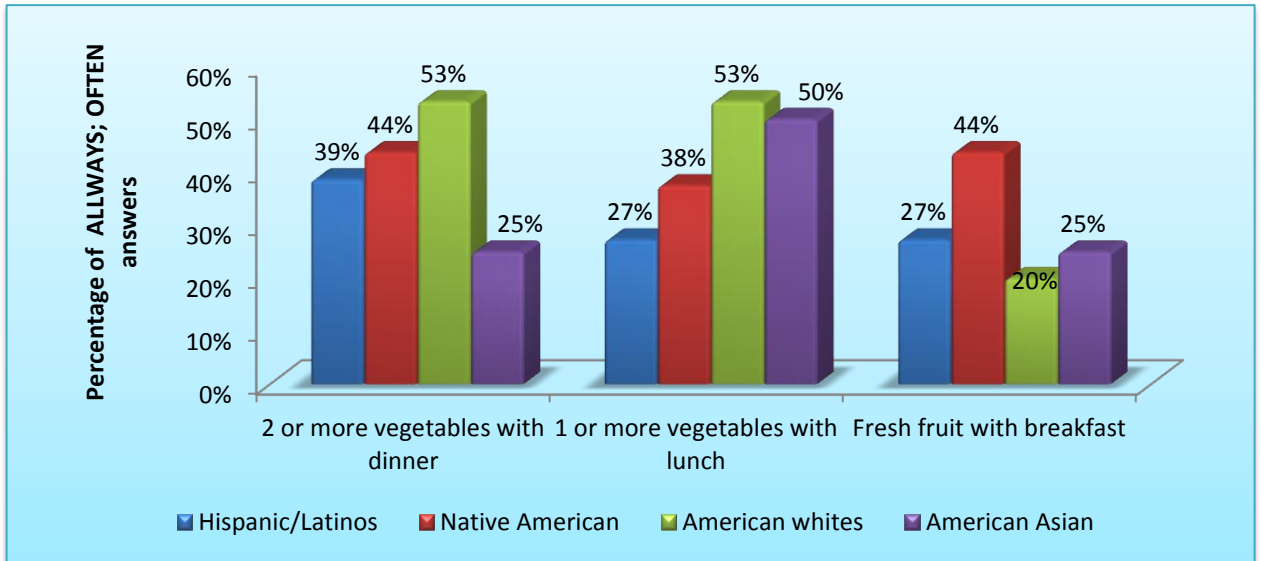
Note: H/L: Hispanic/Latinos; NA: Native American; AW: American whites; AA: American Asia

In general, results had shown increased intake of fruit and vegetables as the most preferable way how to improve dietary fiber intake in both sexes, and all ethnicities.

Graph 16: Percentage of Always and Often answers in all participants. Modules focused on fiber intake.   (100% all= 207; women = 128; men=79)
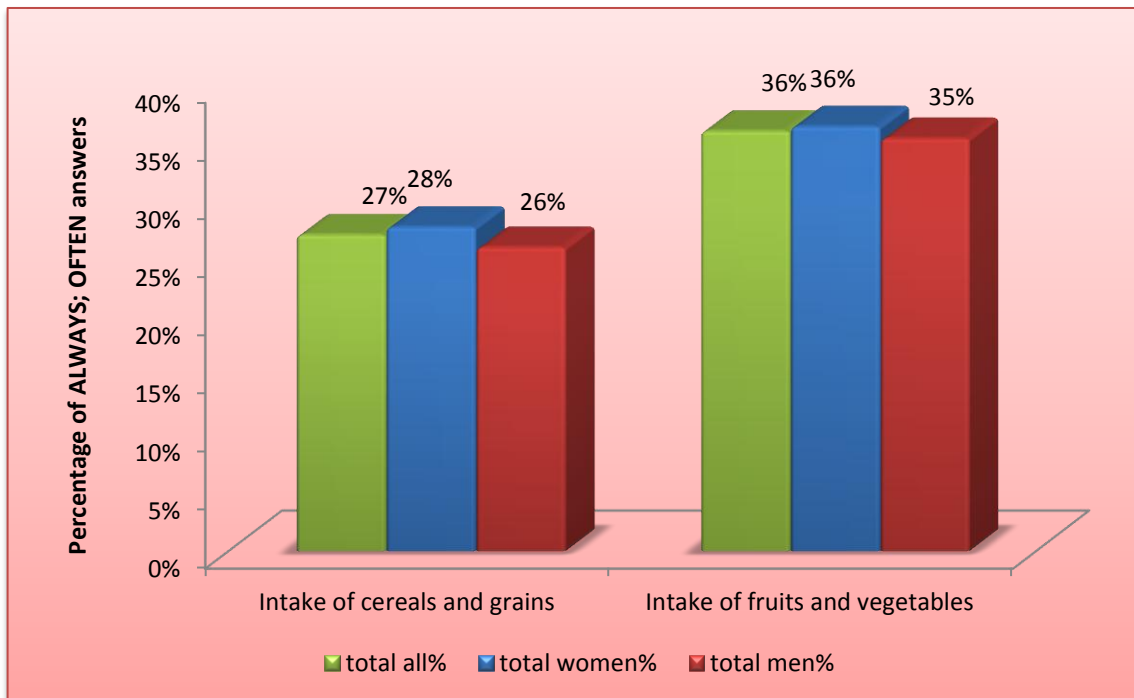
This graph shows the equality between men and women. The percentage of all women (28%, 36%) consuming regular amounts of food rich in fiber is only slightly higher than the percentage of all men (26%, 35%).

Lower fat intake

Lowering fat intake is the more extensive section of the questionnaire created by six main thematic modules: _Substitute low fat, Modify meats Avoid frying, Substitute vegetables and fruit, Substitute vegetables and fruits, Different ways of food preparation_

1. _Substitute low fat_ module focuses on low fat products such are milk, cheese, frozen desserts, salad dressings, and mayonnaise.

Graph 17: Percentage of Always and Often answers in women in "substitute low fat" module. (100%H/L= 63; NA=35; AW=23; AA=7)
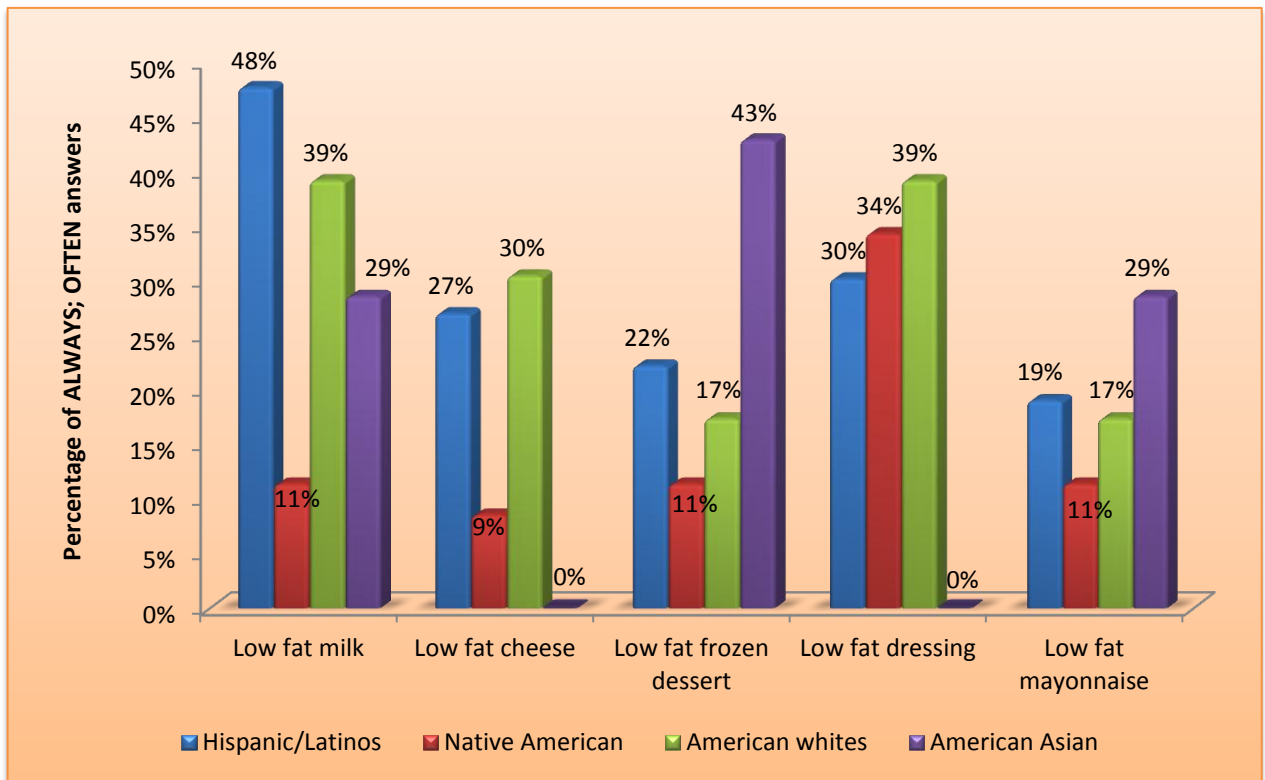
Note: H/L: Hispanic/Latinos; NA: Native American; AW: American whites; AA: American Asian

The graph n. 17 describes the percentage of regular eating of low fat products among ethnic groups of women. Using low fat milk and consuming low fat dressings on salads got the higher scores. Less favorable seems usage of low fat mayonnaise.

Graph 18: Percentage of Always and Often answers in men in "substitute low fat" module. (100%H/L= 44; NA=16; AW=15; AA=4)

Note: H/L: Hispanic/Latinos; NA: Native American; AW: American whites; AA: American Asian

In both graphs can be observed that Native American women or men belong to the group which uses the low fat products the least.

2. _Modify meats_ module aims to questions about taking off the skin of
   chicken, trimming visible fat, and choosing lean ground beef. Women
   scored much higher in all these three questions than men.
   76% of Hispanic women took off the skin, 60% trimmed visible fat, and
   59% choose lean ground beef. The remaining three ethnics scored almost
   the same in all questions.

Graph 19: Percentage of Always and Often answers in women in "modify meats" module.
(100%H/L= 63; NA=35; AW=23; AA=7)
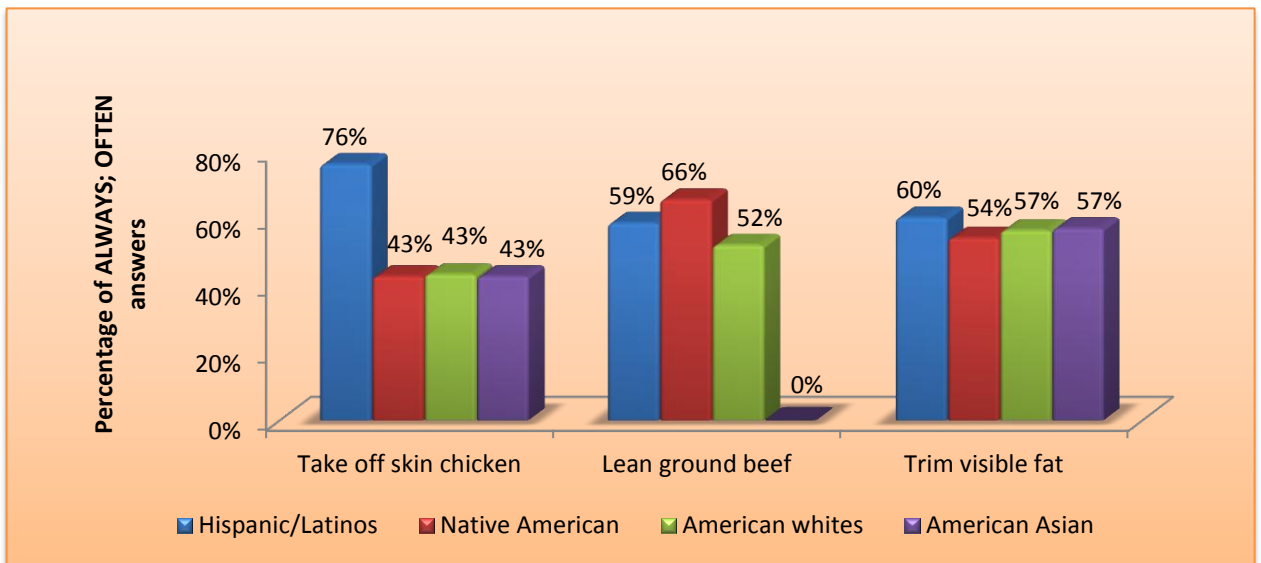
Graph 20: Percentage of Always and Often answers in men in "modify meats" module.
(100%H/L= 44; NA=16; AW=15; AA=4)
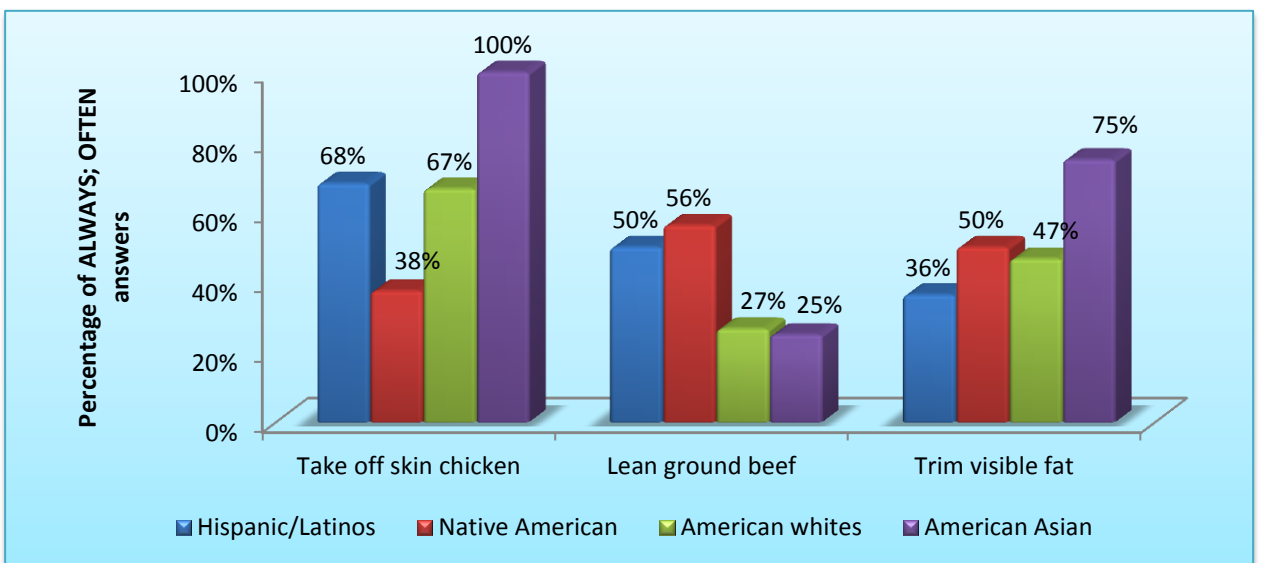
Variety of answers among men by ethnicity is higher. Taking off the skin from chicken seems in men, to be the most favorable way how to modify meats.

3. *Avoid frying* module includes module of questions about preferring non-fried chicken, fish, potatoes and vegetables. The highest scores obtained all ethnicities in preferring non-fried potatoes, all remaining questions got about the same percentage of answers.

Graph 21: Percentage of Always and Often answers in women in "avoid frying" module. (100%H/L= 63; NA=35; AW=23; AA=7)
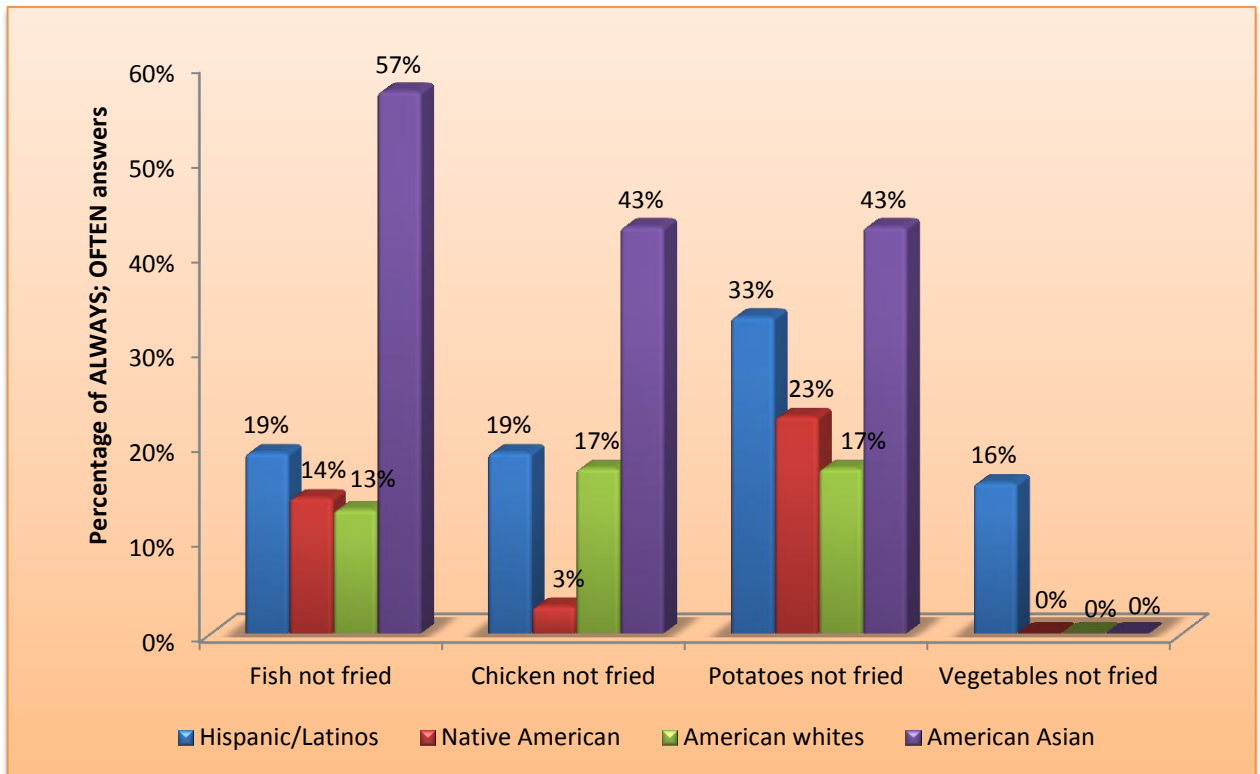
Note: H/L: Hispanic/Latinos; NA: Native American; AW: American whites; AA: American Asian

Men compared to women scored higher in regular consumption of non-fried potatoes and non-fried chicken. Interesting is fact that 50% Native

American and American Asian men always or often avoid fried potatoes, in comparison to 30% Hispanic/Latinos and 20% American whites male participants.

Graph 22: Percentage of Always and Often answers in men in "avoid frying" module. (100%H/L= 44; NA=16; AW=15; AA=4)
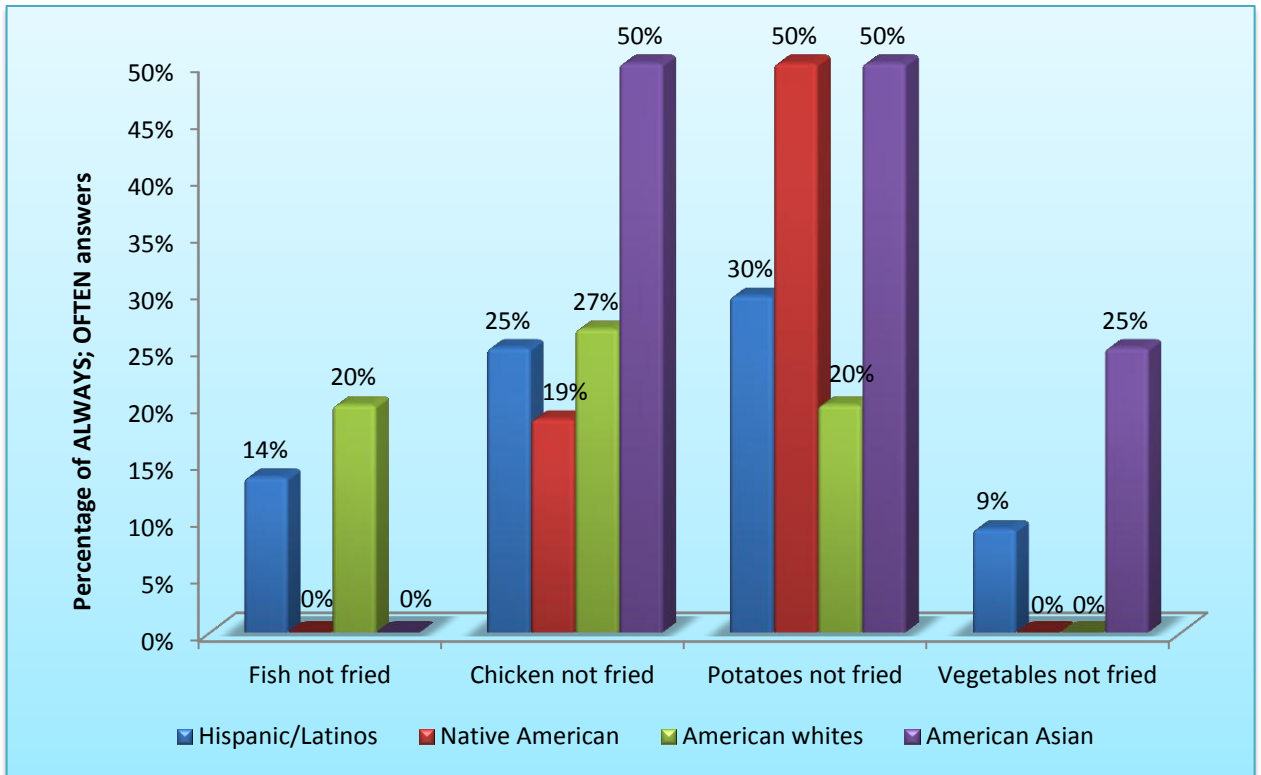
Note: H/L: Hispanic/Latinos; NA: Native American; AW: American whites; AA: American Asian

4. _Substitute vegetables and fruit_ is module of questions where patients try to substitute high fat desserts or snacks.
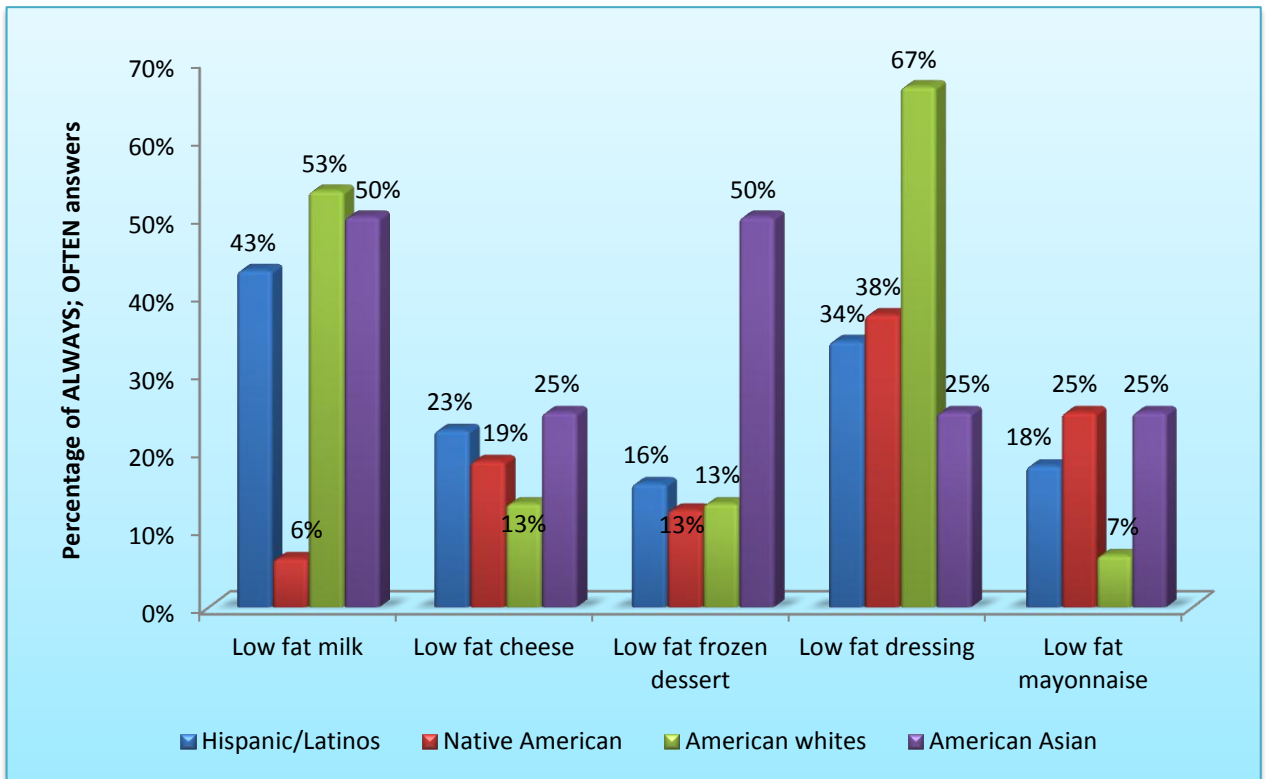
Graph 23: Percentage of Always and Often answers in women in "substitute vegetables and fruit" module. (100%H/L= 63; NA=35; AW=23; AA=7)
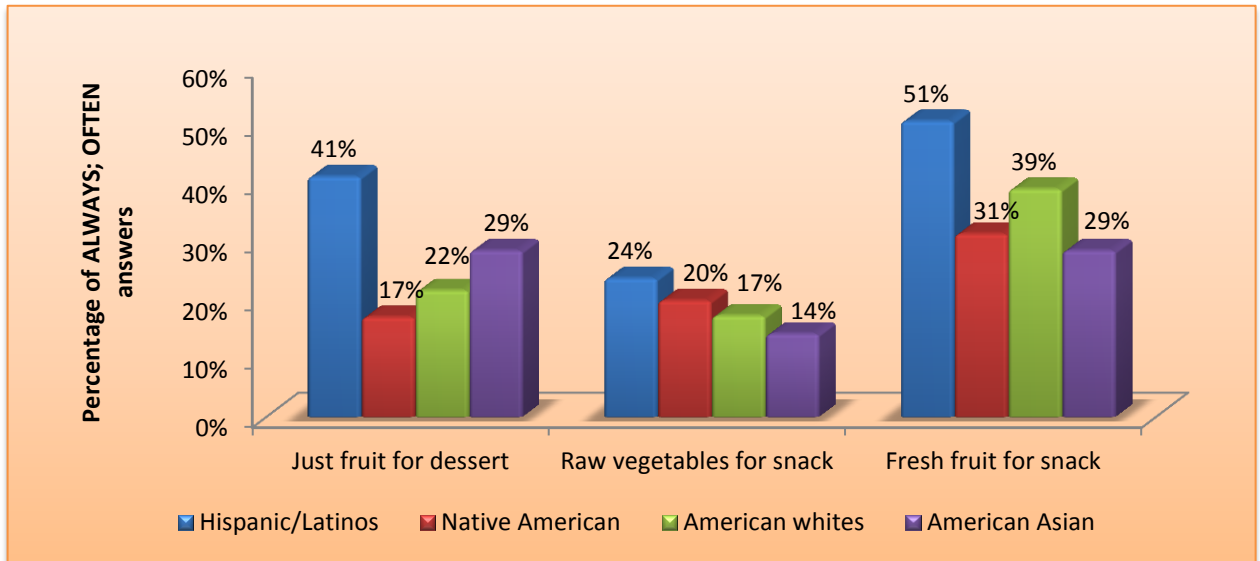
Note: H/L: Hispanic/Latinos; NA: Native American; AW: American whites; AA: American Asian

Graph 24: Percentage of Always and Often answers in men in "substitute vegetables and fruit" module. (100%H/L= 44; NA=16; AW=15; AA=4)
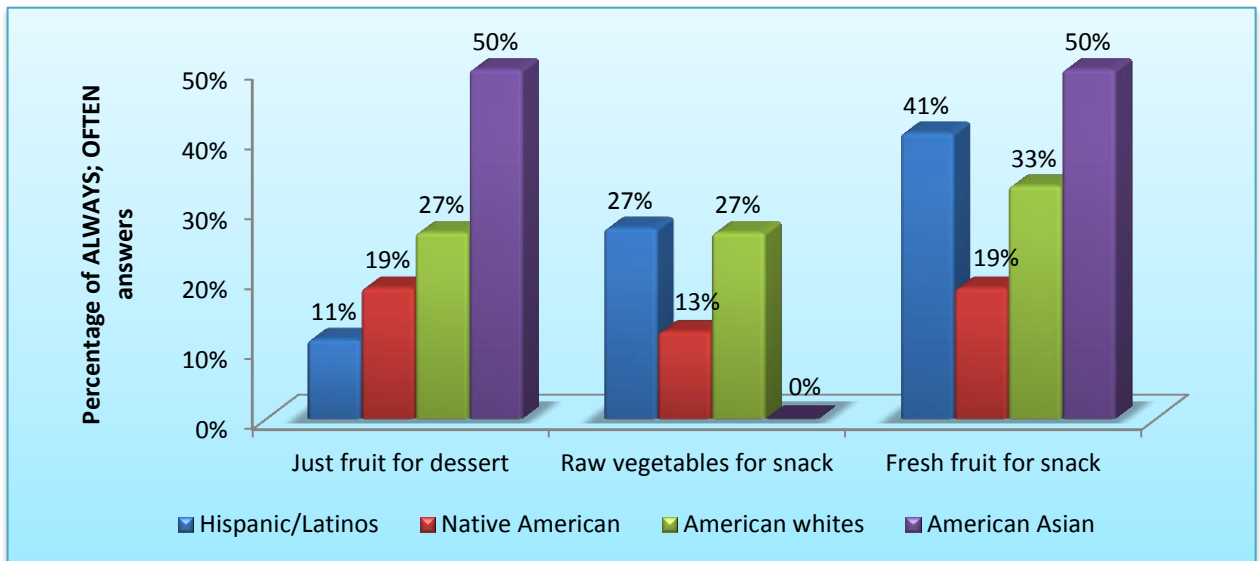
Note: H/L: Hispanic/Latinos; NA: Native American; AW: American whites; AA: American Asian

Fresh fruit for dessert and for snack were the two most preferable options in both males and females

5. _Avoid fat as flavoring_ module asked participants if they flavor their bread, cooked/ steamed vegetables, potatoes, and dessert with some added fats, such are butter, margarine, sour cream, or whipped cream.
Both males and females scored high in regular preventing eating breads and cooked vegetables with added fat. Men had even higher scores in avoiding butter on breads than women. (Graphs n. 25, 26)
Whipped cream on top of dessert got the lower scores and the question is if it is so because of less people eating dessert, or if they really prefer this combination

Graph 25: Percentage of Always and Often answers in women in "avoid fat as flavoring" module. (100%H/L= 63; NA=35; AW=23; AA=7)
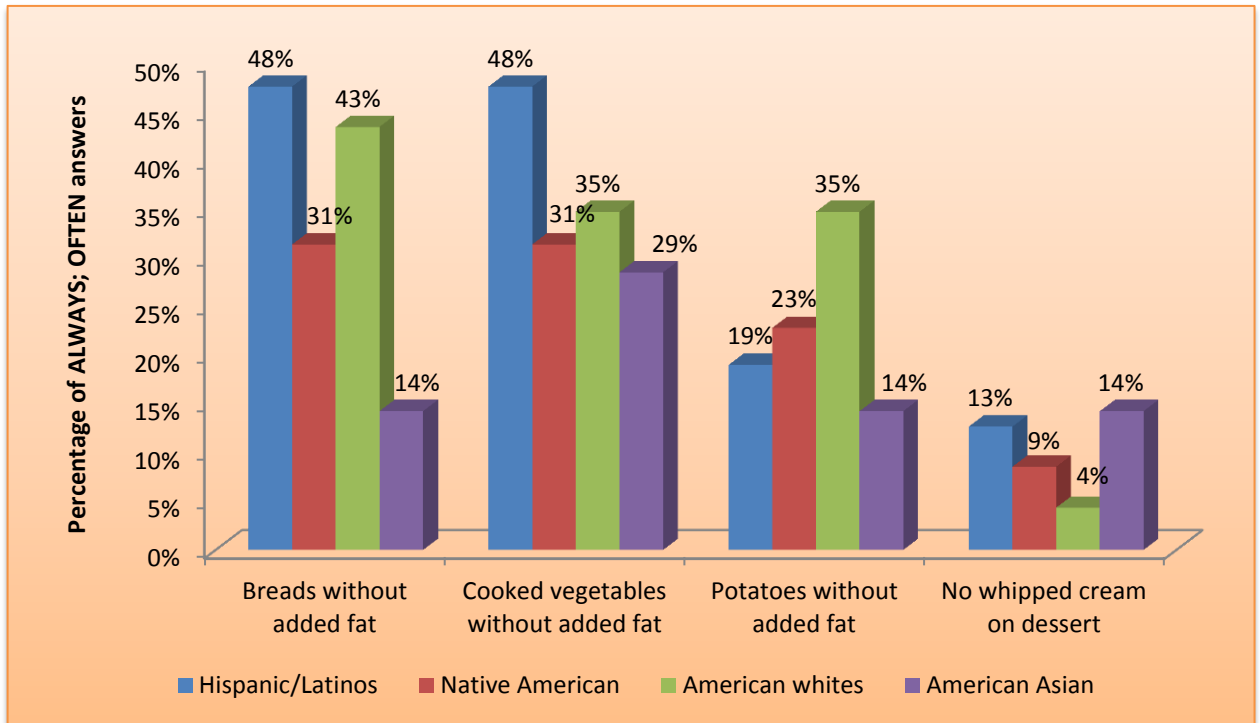
Note: H/L: Hispanic/Latinos; NA: Native American; AW: American whites; AA: American Asian

Graph 26: Percentage of Always and Often answers in men in "avoid fat as flavoring" module. (100%H/L= 44; NA=16; AW=15; AA=4)
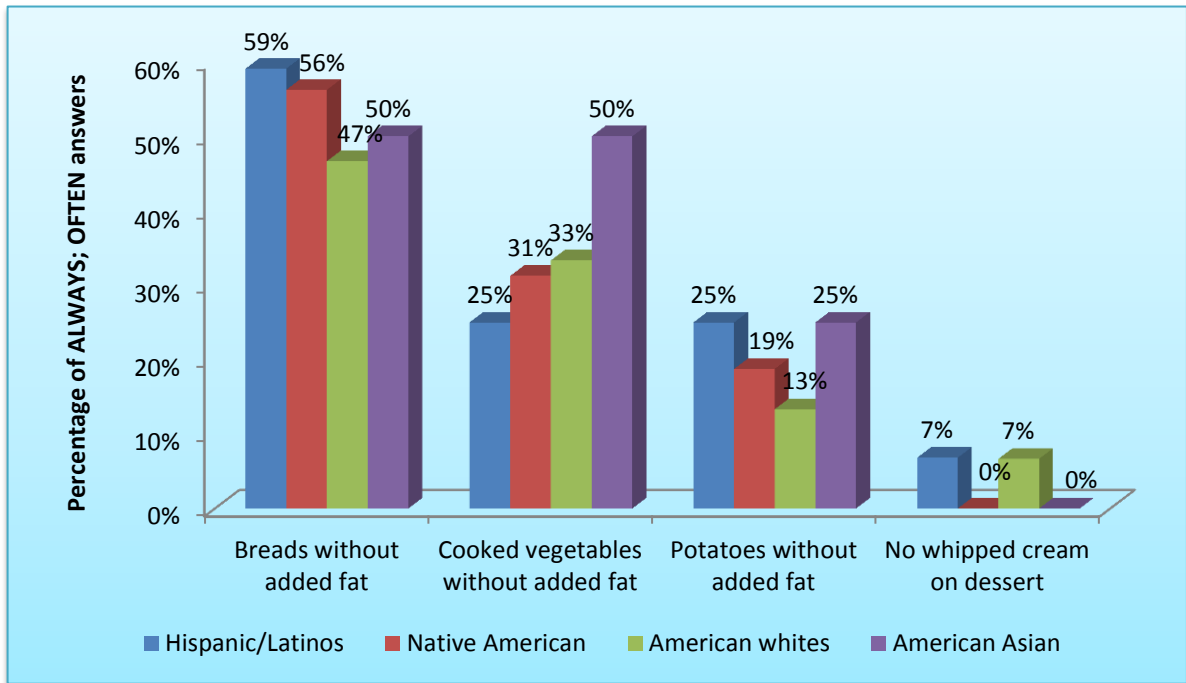
**Note**: H/L: Hispanic/Latinos; NA: Native American; AW: American whites; AA: American Asian

6. Different ways of food preparation module contain four questions about cooking methods where less added fat can be used, or preferring vegetable oils to animal fats for frying and baking.

Women of all ethnic groups preferred broiled or baked chicken to fried one. Scores were over 70% in all ethnics. Second highest scores got broiled or baked fish.

Using non-stick spray or olive oil for frying frequently does 27% Hispanic/Latinos women, 20% Native American, 17% American whites, and 14% American Asian women.

Graph 27 Percentage of Always and Often answers in women in "different ways of food preparation" module. (100%H/L= 63; NA=35; AW=23; AA=7)
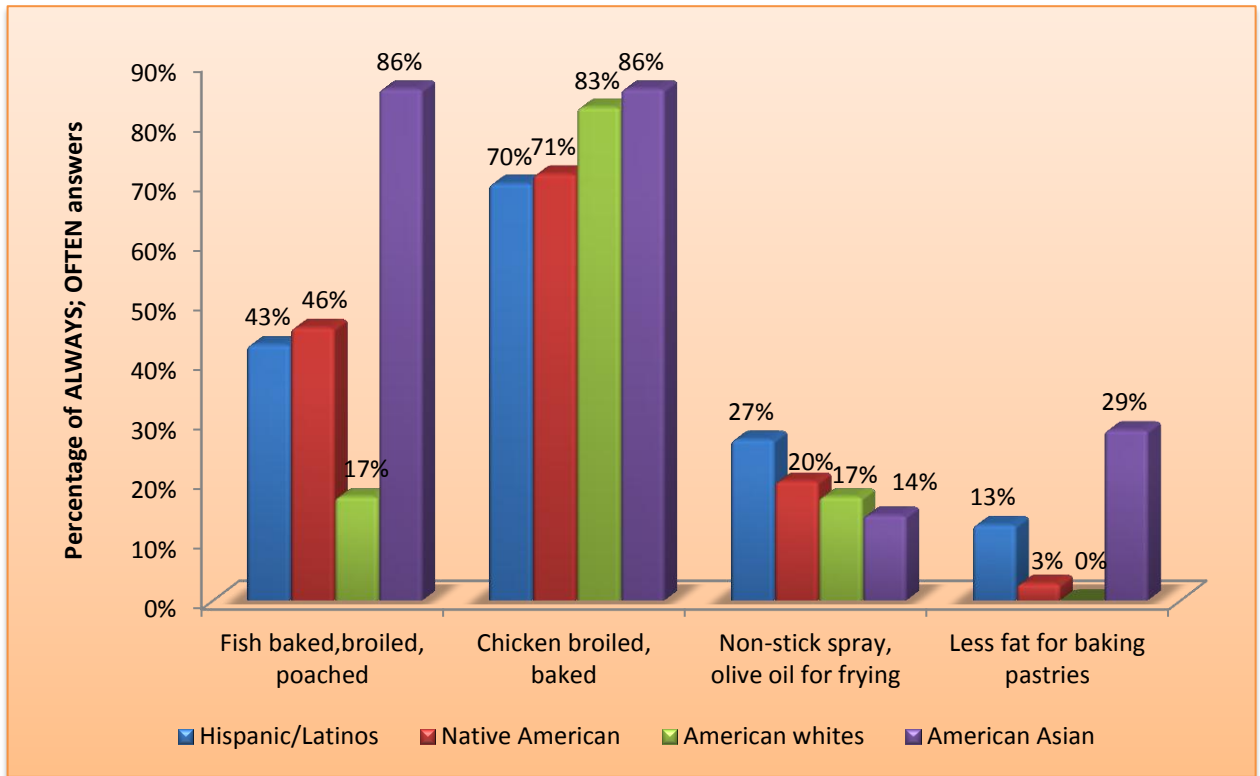
Note: H/L: Hispanic/Latinos; NA: Native American; AW: American whites; AA: American Asian

Men scored well with both broiled or baked chicken and fish as well, but the average percentage of those eating them always or often was lower than in women. (Graph n. 28)

Graph 28: Percentage of Always and Often answers in men in "different ways of food preparation" module. (100%H/L= 44; NA=16; AW=15; AA=4)
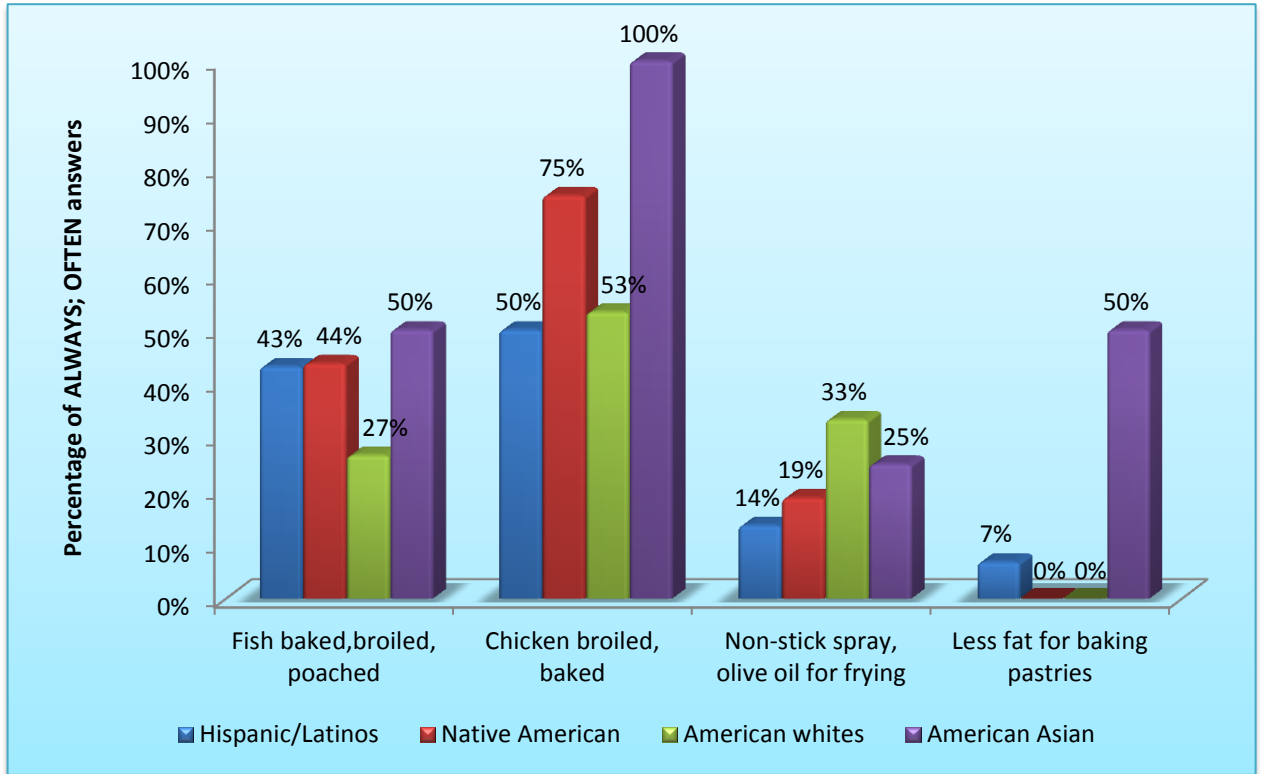
Note: H/L: Hispanic/Latinos; NA: Native American; AW: American whites; AA: American Asian

For the total sample, the most favorable scores were for _Modify meats_ module (55% of all participants), while the least favorable were for _Avoid frying_ (18% of all participants). Women scored better than men on all remaining modules except those related to the _Substitute low_ fat and _Avoid frying._

Graph 29: Percentage of Always and Often answers among all participants. Summary of all modules focused on fat. (100% all= 207; women = 128; men=79)
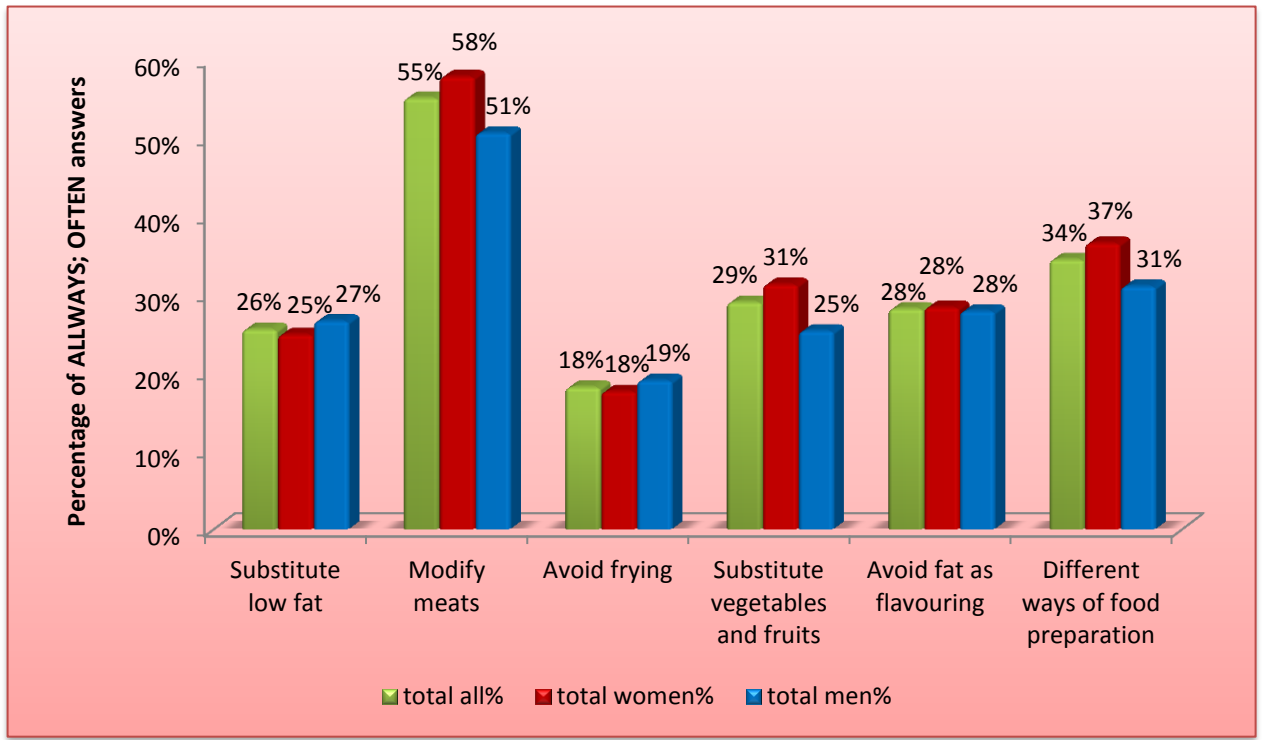
Both Fat-lowering and Fiber-increasing sections were compared together and in this studied group results for all participants were same in each section, as describes graph n. 30. 32% of patients were "always and often" trying to follow dietary recommendation for increasing fiber and lowering fat.

Graph 30: Percentage of Always and Often answers among all participants. Summary of studied behaviors. (100% all= 207; women = 128; men=79)
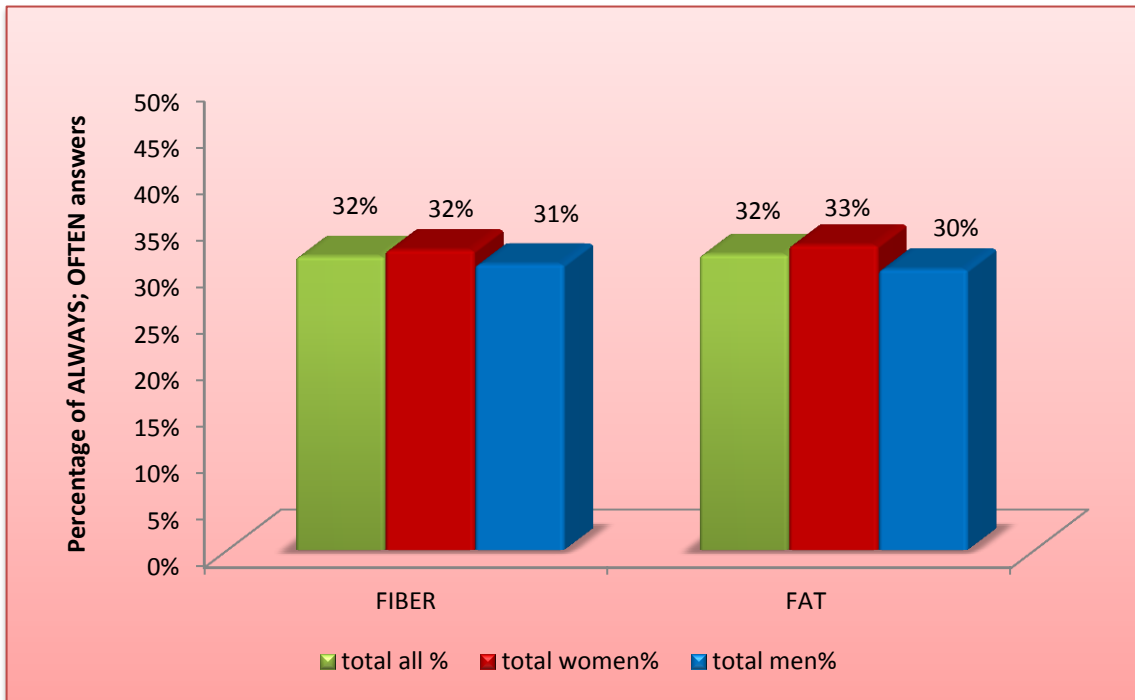
5.Discussion

5.1. PARTICIPANT SELECTION AND CHARACTERISTIC

The goal of this study was to analyze eating habits of DM2 patients in specific part of the United States; to see how DM2 patients are able to follow dietary advices. Many previous studies have shown medical nutrient therapy as essential part of treatment regimen for each diabetic patient. (33) (34) (41) (42)

The patient recruitment took place at the El Rio Health Center clinics in Tucson, Arizona under the supervision of clinical pharmacist Sandra Leal, PharmD, FAPhA, CDE.

207 patients were included into this study. Hispanic population in Tucson area is very high, which reflects on the percentage (52%) of Hispanic diabetes patients in this study. It was recommended by Dr. Leal to use bilingual tools for interviewing patients.

The Fat and Fiber- Related Diet Habits Questionnaire was used to obtain identical data to compare. The original version was slightly changed with the agreement of author. This version was translated into Spanish and modified to local habits.

The same tool, as in this study, for analyzing fat and fiber intakes was used in few previous studies. (43) (37) (44) Those found it to be reliable and sensitive indicator of analyzed dietary behaviors, although as a complex it was never used in DM2 patients. Long-term studies using this Fat- and Fiber- related questionnaire had proven some differences among various ethnic minorities, how they achieve significant reduction of fat intake, or increased fiber consumption. However, the total scores were about the same levels in all ethnic minorities. (45)

Our final sample consisted of 48 filled questionnaires in Spanish and 159 in English. Almost all participants were willing to complete the questionnaire with assistance. From this prospective we can presume their answers were honest, because they were ensured about anonymity, and that there are no wrong or right answers in the questionnaire. Thanks to the Dr. Leal´s attitude towards her patients, most of them are used to trusting pharmacists and speaking with them honestly, expecting the best provided information.

The final sample involved 62% women and 38% men of four ethnic groups. The most represented group was the Hispanic population (52%), followed by Native Americans (25%), American whites (18%), and American Asians (5%). Native Americans filled the questionnaires at the El Rio's Pascua Yaqui Clinic. The goal of having representative sample of population with DM2 living in this area was fulfilled.

The first part of this study describes all participants and focuses on the main risk factors such are age, BMI, race. The risk of DM2 increases as patients get older, especially after age 45. (7) That is probably because people tend to exercise less, lose muscle mass and gain weight, and their organism begins to be more insulin resistant.

The mean age of studied group is 56,8 ± 12,6 years. 46% of all participants belong to the group with the age range of 41-59 years. The mean age of the whole group of participants when diagnosed with DM2 was 45,3 ±12,7 years. Of special note, DM2 is also increasing dramatically among children, adolescents and younger adults. (2) This reflects the result of 8% patients first diagnosed with DM2 in the group with age range of 15-25 years.

Obesity is often considered as a dominant predisposition for developing DM. Obesity also complicates the management of DM2 by increasing insulin resistance and blood glucose concentrations. (39) It is usually expressed by BMI. The mean BMI of studied group was 33,2 ±7,8 kg/m^2. Female patients had mean BMI about one unit higher than male patients. The average BMI observed in this study refers to extreme obesity. Fat distribution primarily in

abdomen makes the risk of complications greater. This parameter was expressed by measuring waist circumference. The ideal waist circumference for women is less than 88 cm and for men less than 102 cm. (8) this ideal range reached 9% of women and 23% of men. The average waist circumference was 109,7 ± 19,7 cm. 59% of all participants had waist circumference higher than 103 cm.

As it was recorded before, our sample was created by ethnic minority groups. Belonging to one of the minorities could be an explanation for measured levels of BMI and waist circumference. The thrifty gene hypothesis gives us a possible explanation why ethnic minorities are more predisposed to suffer from obesity. (4) This hypothesis deduces that human body millions years ago, was supplied with genetically driven ability to store enough energy to survive during times of natural disasters. These thrifty genes were preserved till current era, when humans do not have to worry about inadequate food supply. Lifestyle changed from hunters and gatherers to sedentary workers and physical activity was reduced, at this time thrifty genes have become a handicap leading to the increased DM development and obesity related syndromes. Patients should be encouraged that moderate weight loss, physical activity and dietary advices are an important therapeutic strategy. (46)

Although, it is still unclear why people of certain races- including Hispanics/ Latinos, Blacks, Native Americans and American Asians- are more likely to develop DM2 than whites. (1) We can presume this could be caused by inadequate quality of care these minorities can afford. Also, individual factors such as improper nutrition, physical inactivity and obesity contribute to the high risk of DM2 in Hispanics. (47) Studies have found that Hispanics have lower levels of leisure time activity than non-Hispanics, and 40% of Hispanics of Mexican descent report leisure time inactivity. A large percentage of Hispanics of Mexican descent with DM2 does not participate in any leisure time activity. (48)

Environmental influence on Native Americans was monitored among USA and Mexican Pima Indians. (49) Two groups of Pima Indians living in drastically different environments (Arizona and Mexico) were compared. Mexican Pima Indians are still living a traditional lifestyle and USA Pima Indians are living a typical North American lifestyle. The Mexican group was more physically active and significantly leaner when compared with the American group. The study found that Mexican Pima Indians expend significantly more energy in physical activity, a factor which, in combination with a diet lower in fat and higher in fiber content, may protect this group of people against the development of obesity and DM2. (49)

5.2. TREATMENT STRATEGIES

Treatment strategies are adopted from the standards. (26) (33) In the studied sample 9,7% of patients were treated only by appropriate diet, those belong to the successful group of patients who already reached the A1C goal of 6,5 % and are able to maintain this level. We can presume that this group had adopted the dietary and physical activity advices and are highly motivated by managing their disease without necessity of taking DM medications. Remaining medication-free DM2 patient needs discipline, determination and complete change of life-style. How to success in this challenge is well described in article written by Dr. Leal´s patient, who had understood those conditions. (50)

The studied group was treated according to the algorithm for glycemic control, which was described above. (26)

48,8% of patients were using PADs and the stratification by mono-therapy (44%), dual therapy (48%), and triple therapy (9%) of this group of patients was consistent with the algorithm and their reached treatment A1C goals.

Metformin is considered, according to all guidelines, as the most appropriate agent to start the treatment of DM2. Our findings had proven this

strategy and 67% patients using PADs were treated by this agent. The second most common (49%) were agents from the SU group.

We also had focused on other pharmacotherapy agents used for prevention and management of diabetes complications. Recommendations for health-care providers are summarized in the document by American Diabetes Association (ADA). (51) Main field for prevention is cardiovascular disease- hypertension/blood pressure control; dyslipidemia; coronary heart disease screening. Pharmacologic therapy for patients with diabetes and hypertension should contain a regimen that includes either an ACE inhibitor or AT1 inhibitors. If one class is not tolerated, the other should be substituted. Multiple drug therapy (two or more agents at maximal doses) is generally required to achieve blood pressure targets. In patients with a prior myocardial infarction beta-blockers should be continued for at least 2 years after the event. Our results showed that 44% of patients were taking angiotensin-converting-enzyme inhibitor (ACEi), 26% of patients were using beta blockers, 20% of patients were taking diuretics (such as hydrochlorothiazide, or furosemide) and calcium-channel blockers were used in 11% of patients.

Considered should be aspirin therapy (75–162 mg/day) as a primary prevention strategy in those with type 1 or type 2 diabetes at increased cardiovascular risk (includes most men >50 years of age or women >60 years of age who have at least one additional major risk factor) In our studied group 50% of patients had additional treatment by aspirin.

To improve lipid profile in patients with diabetes recommended is lifestyle modification and statin therapy should be added to reach therapy targets. If those are not reached on maximally tolerated doses of statins combination therapy using statins and other lipid lowering agents may be considered to achieve lipid targets. This recommendation is consistent with our finding, 51% of study participants were using statins to achieve better lipid profiles.

5.3. Dietary behaviors

It was mentioned previously that relatively short and easy-to-understand dietary assessment instrument was used in this study to describe the specific types of behaviors that affect fat and fiber intake. Our study shows the percentage of patients, who are following dietary recommendations "Always and Often" in their regular diet.

Results from previous studies provide support for the hypothesis that increased fiber intake is inversely associated with the risk of DM2. (52) (53) (42)

Overall, both men and women scored best on food changes that require increasing intake of fruit and vegetables. Increased intake of whole grains and cereals appeared about 10% less favorable in both men and women. We can presume this trend results from cultural traditions in the studied area, and that fruit and vegetables are more available and less priced than whole-grain products.

American Whites scored the best among all ethnic minorities in Fiber-related section of this study; we consider this finding as a result of overall promotion of cereals as the best breakfast option in the U.S.

Those 32% of patients who had adopted the fiber advices to their daily dietary behaviors probably belong to the highly motivated group of patients who actively participate in diabetes educating classes and understand the importance of diabetes self-management in achieving treatment goals and preventing disease-related complications.

The Fat-related section focuses on the behaviors that would lead to a reduction in the dietary fats. Questions were thematically divided into six groups of different ways how fat reduction can be performed.

Both men and women scored best on food changes that required "modifying meats". That is very important behavior which shows patients´ willingness to improve their diet. Choosing lean meat and taking off the skin from chicken are the easiest ways for them how to decrease fat intake. But

changes such as avoiding frying as a preparation method which could be implemented without an overall change in the foods consumed, had the lowest scores. We can presume that could be influenced by traditional cuisine, where frying belongs to the main methods of food preparation. This argument is supported by the previous study, which used only the Fat-related section of the questionnaire to study fat behaviors among Whites, Native American, and African American adults. Patients in this study had the best results in avoiding frying. (54)

The second highest scores reached our patients in "different ways of food preparation". The finding that women were more likely to practice healthier behaviors in this group of questions can be affected by the fact that men might be less involved in food preparation and may therefore be unaware of the use of fat during the preparation of their foods. However, it is stereotypic to assume that women always have responsibility for food purchase and preparation within families; this is quite common among older adults.

This suggests that women may be more knowledgeable than men with diabetes about how their food has been prepared and any modifications made to reduce the fat levels. However, this is consistent with our other findings regarding the fact that prevailing percentage of patients (62%) were women.

5.4. STUDY LIMITATIONS

This study has a number of limitations which should be considered in interpreting these findings. First, this is a short-term study, so we are unable to determine the impact of these behaviors on future health outcomes. We presume that using a relatively simple instrument such as food frequency questionnaire could be used repetitively to compare improvements in fat and fiber intake, because it gives participant skills and knowledge how to change their personalized nutrition plan.

Second, ethnic minorities in these communities have higher rates of poverty and their socio-economic status may contribute to lower rates of adopting recommendations from health care providers, despite living in the same communities and having generally similar access to diabetes education.

The most important limitation to this study is that results may not be generalizable to representative samples of involved ethnic minorities. Participants claimed to be interested in nutrition recommendations, but dietary modifications may be difficult to achieve because they often require changes in long-term food consumption and food- preparation habits especially in older patients

6.Conclusion

One third of all participants adopted dietary interventions in both Fat- and Fiber- related sections of the used questionnaire. This number of patients is promising, but it gives us information that the remaining two thirds still need professional help with their diabetes-management. Pharmacists, diabetes educators and other health care providers should focus on those patients and encourage their attitude to self-management.

Ethnic minorities appear to be particularly vulnerable to poor eating behaviors. Diabetes education should be oriented on these minorities and their culture, customs and food composition and give positive suggestions how to change life- style without denying them. Cultural identity should be preserved and supported by tailored advices consistent with general treatment guidelines.

As the best solution how to reduce fat intake seems modifying meats, slight changes in food-preparations and increasing vegetables. We presume that patients are able to change those, because according to their habits and cultural beliefs are less complicated than radical consumption change.

We are concluding these strategies can help reduce the risk of DM2 complications and help patients to achieve their self-management goals and to obtain decent quality of life despite suffering from such a complex and affecting disease.

7.Abbreviation list

WHO   World Health Organization

ADA   American Diabetes Association

DM   Diabetes mellitus

DM2   Type 2 diabetes

U.S.   The United States

CDC   Centers for Disease Control and Prevention

A1C   Glycosylated hemoglobin test

FPG   Fasting plasma glucose

oGTT   Oral glucose tolerance test

DCCT   Diabetes Control and Complications Trial

IFCC   International Federation of Clinical Chemistry

CDE   Certified diabetes educators

AADE   the American Association of Diabetes Educators

NCBDE   the National Certification Board for Diabetes
Educators

DSME   Diabetes Self-Management Education

AACE/ACE   American Association of Clinical Endocrinologists/
American College of Endocrinology

TZDs   Thiazolidinediones

DPP-4 i   Dipeptidyl-peptidase-4-inhibitors

AGIs   α-glucosidase inhibitors

GLP-1 agonist Incretin mimetic

DPP-4 i.   Dipeptidyl-peptidase-4-inhibitors

SU   Sulfonylureas

FDA   The Food and Drug Administration

MNT   Medical nutrition therapy

BMI   Body mass index

PAD   Per-oral anti-diabetics

ACEi   Angiotensin-converting-enzyme inhibitor

AT1 i.   Angiotensin II receptor antagonists

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9. Appendixes

INFORMED CONSENT

I………………..…………………………………. give my consent to participate in the pharmacy student project:

The analysis of eating habits of diabetes type 2 patients.

This part of the project we will assess whether the intake of fat and fiber influences, and how, the compensation of diabetes in type 2 diabetics.

The project will use data from the medical records to complete the questionnaires. The only data which refer to the patient are: diagnosis, age and sex. The questionnaire will never use your name or ID number, so all the data in our database are completely anonymous.

It is necessary to emphasize the fact that your inclusion in the project is entirely voluntary.

I have been informed in an intelligible form on the reasons, the importance and extent of the project. I have read and understood the text of informed consent. My questions have been answered in an intelligible form and in sufficient detail.

I also reserve the right to cancel my consent at any time, without giving reason. And there will be no sanction for me, after that decision.

I am aware that all data is processed anonymously without using the names of customers. All the information about me be stored with the utmost confidence and will not be provided to third parties.

Patient signature:………………………………..   Date:…………………

EATING PATTERNS QUESTIONNAIRE

These questions are about the way you ate over the past 3 months. Please mark off your response.

In the past 3 months…

1. **Did you eat fish?**

   ☐ NO (if not, continue to the question 2)   ☐ YES (if yes, continue to the question 1a)

   1a. When you ate fish, how often was it broiled, baked or poached?

   ☐ always   ☐ often   ☐ sometimes   ☐ never

   1b. When you ate fish, how often was it fried?

   ☐ always   ☐ often   ☐ sometimes   ☐ never

2. **Did you eat chicken?**

   ☐ NO (if not, continue to the question 3)   ☐ YES (if yes, continue to the question 2a)

   2a. When you ate chicken, how often was it broiled or baked?

   ☐ always   ☐ often   ☐ sometimes   ☐ never

   2b. When you ate chicken, how often was it fried?

   ☐ always   ☐ often   ☐ sometimes   ☐ never

   2c. When you ate chicken, how often did you take off the skin?

   ☐ always   ☐ often   ☐ sometimes   ☐ never

3. **Did you eat pasta or noodles?**

   ☐ NO (if not, continue to the question 4)   ☐ YES (if yes, continue to the question 3a)

   3a. When you ate pasta or noodles, how often did you eat them plain or with a tomato sauce without meat?

   ☐ always   ☐ often   ☐ sometimes   ☐ never

   3b. When you ate pasta or noodles, how often did you eat whole-wheat types?

   ☐ always   ☐ often   ☐ sometimes   ☐ never

4. **Did you eat red meat (beef, pork, lamb)?**

   ☐ NO (if not, continue to the question 5)   ☐ YES (if yes, continue to the question 4a)

   4a.When you ate red meat, how often did you trim all the visible fat?

☐ always   ☐ often   ☐ sometimes   ☐ never

5. Did you eat ground beef (hamburger)?

☐ NO (if not, continue to the question 6)   ☐ YES (if yes, continue to the question 5a)

5a. When you ate ground beef, how often did you choose extra lean (very low fat) ground beef?

☐ always   ☐ often   ☐ sometimes   ☐ never

6. Did you eat bread, rolls, muffins or crackers?

☐ NO (if not, continue to the question 7)   ☐ YES (if yes, continue to the question 6a)

6a. When you ate bread, rolls, muffins or crackers, how often did you eat them WITHOUT butter or margarine?

☐ always   ☐ often   ☐ sometimes   ☐ never

6b. When you ate bread, rolls, muffins or crackers, how often were they whole grain types (whole-wheat, pumpernickle, rye) ?

☐ always   ☐ often   ☐ sometimes   ☐ never

7. Did you eat breakfast cereal?

☐ NO (if not, continue to the question 8)   ☐ YES (if yes, continue to the question 7a)

7a. When you ate cereal, how often did you eat Fruit ´N Fiber, a bran cereal (raisin bran) or other special high-fiber cereal?

☐ always   ☐ often   ☐ sometimes   ☐ never

7b. When you ate cereal, how often did you add bran?

☐ always   ☐ often   ☐ sometimes   ☐ never

8. Did you drink milk or use milk on cereal?

☐ NO (if not, continue to the question 9)   ☐ YES (if yes, continue to the question 8a)

8a. When you had milk, how often was it very low fat (1%) or nonfat, skim milk?

☐ always   ☐ often   ☐ sometimes   ☐ never

9. Did you eat cheese (include on sandwiches or in cooking) ?

☐ NO (if not, continue to the question 10)   ☐ YES (if yes, continue to the question 9a)

9a. When you ate cheese, how often was it specially-made, low fat (diet) cheese?

☐ always   ☐ often   ☐ sometimes   ☐ never

10. Did you eat frozen desserts (ice cream, sherbet..) ?

☐ NO (if not, continue to the question 11)   ☐ YES (if yes, continue to the question 10a)

10a. When you ate frozen desserts, how often were they ice milk, nonfat ice cream,frozen yogurt, or sherbet?

☐ always   ☐ often   ☐ sometimes   ☐ never

11. Did you eat cooked/steamed vegetables?

☐ NO (if not, continue to the question 12)   ☐ YES (if yes, continue to the question 11a)

11a. When you ate cooked/steamed vegetables, how often did you add butter, margarine, or other fat?

☐ always   ☐ often   ☐ sometimes   ☐ never

11b. When you ate cooked /steamed vegetables, how often were they fried?

☐ always   ☐ often   ☐ sometimes   ☐ never

12. Did you eat potatoes?

☐ NO (if not, continue to the question 13)   ☐ YES (if yes, continue to the question 12a)

12a. When you ate potatoes, how often were they fried- (french fries, hash browns etc.)?

☐ always   ☐ often   ☐ sometimes   ☐ never

13. Did you eat boiled or baked potatoes?

☐ NO (if not, continue to the question 14)   ☐ YES (if yes, continue to the question 13a)

13a When you ate boiled or baked potatoes, how often did you eat them WITHOUT butter, margarine, or sour cream?

☐ always   ☐ often   ☐ sometimes   ☐ never

14. Did you eat rice?

☐ NO (if not, continue to the question 15)   ☐ YES (if yes, continue to the question 14a)

14a. When you ate rice, how often did you eat brown instead of white rice?

☐ always   ☐ often   ☐ sometimes   ☐ never

15. Did you eat green salads?

☐ NO (if not, continue to the question 16)   ☐ YES (if yes, continue to the question 15a)

15a. When you ate green salads, how often did you use NO dressing?

☐ always   ☐ often   ☐ sometimes   ☐ never

15b. When you ate green salads, how often did you use low calorie, diet dressing?

☐ always ☐ often ☐ sometimes ☐ never

16. At dinner- How often did you have NO meat, fish, eggs or cheese?

☐ always ☐ often ☐ sometimes ☐ never

17. At dinner- How often did you eat two or more vegetables (not potatoes or salad)?

☐ always ☐ often ☐ sometimes ☐ never

18. Did you eat lunch? (regularly)

☐ NO (if not, continue to the question 19) ☐ YES (if yes, continue to the question 18a)

18a. When you ate lunch, how often did you have one or more vegetables (not including potatoes or salad)?

☐ always ☐ often ☐ sometimes ☐ never

19. Did you eat breakfast? (regularly)

☐ NO (if not, continue to the question 20) ☐ YES (if yes, continue to the question 19a)

19a. When you ate breakfast, how often did you eat fresh fruit (not juice)?

☐ always ☐ often ☐ sometimes ☐ never

19b. When you ate breakfast, how often did you eat hot or cold cereal?

☐ always ☐ often ☐ sometimes ☐ never

20. Did you eat dessert?

☐ NO (if not, continue to the question 21) ☐ YES (if yes, continue to the question 20a)

20a. When you ate dessert, how often did you put cream or whipped cream on top?

☐ always ☐ often ☐ sometimes ☐ never

20b. When you ate dessert, how often did you eat only fresh fruit for dessert?

☐ always ☐ often ☐ sometimes ☐ never

21. Did you eat snacks?

☐ NO (if not, continue to the question 22) ☐ YES (if yes, continue to the question 21a)

21a. When you ate snacks, how often did you eat raw vegetables?

☐ always ☐ often ☐ sometimes ☐ never

21b. When you ate snacks, how often did you eat fresh fruit?

☐ always ☐ often ☐ sometimes ☐ never

22. Did you sauté or pan fry any foods?

☐ NO (if not, continue to the question 23)   ☐ YES (if yes, continue to the question 22a)

22a. When you sautéed or pan fried, how often did you use non-stick spray instead of oil, margarine, or butter?

☐ always   ☐ often   ☐ sometimes   ☐ never

23. Did you cook red meat (beef, pork, lamb) ?

☐ NO (if not, continue to the question 24)   ☐ YES (if yes, continue to the question 23a)

23a. When you cooked red meat, how often did you trim all the fat BEFORE cooking?

☐ always   ☐ often   ☐ sometimes   ☐ never

24. Did you use mayonnaise or mayonnaise- type dressing?

☐ NO (if not, continue to the question 25)   ☐ YES (if yes, continue to the question 24a)

24a.When you used mayonnaise or mayonnaise- type dressing, how often did you use low fat or nonfat types?

☐ always   ☐ often   ☐ sometimes   ☐ never

25. Did you bake cookies, cakes or pies?

☐ NO (if not, continue to the next question)   ☐ YES (if yes, continue to the question 25a)

25a. When you baked cookies, cakes or pies, how often did you change the recipe to use less butter, margarine or oil?

☐ always   ☐ often   ☐ sometimes   ☐ never

Additional information:

Gender: ☐ Male   ☐ Female

Age: …………… years

Your age when diagnosed with Diabetes type 2:   ………………years

Type of treatment DM2:	☐ Diet
	☐ PAD (peroral antidiabetics)
	☐ Insulin

height ....

weight ....

A1c (HbA1c) ....

waist circumference ....

Medication:

CONSENTIMIENTO INFORMADO

Yo …………………………………………… otorgo mi consentimiento a participar en el proyecto de doctorado:

El análisis de los hábitos alimenticios de la diabetes tipo 2 pacientes.

En esta parte del proyecto queremos valorar si la ingestión de grasas y fibra influye, y de qué modo, en la compensación de diabetes en diabéticos de tipo 2.

En el proyecto se utilizarán los datos de su documentación médica y los cuestionarios que ha cumplimentado. Los únicos datos que harán referencia a su persona son: el diagnóstico, la edad y el sexo. En el cuestionario nunca se utilizará su nombre o número de identidad, por lo que todos los datos en nuestra base de datos son totalmente anónimos.

Es necesario hacer hincapié en el hecho que su inclusión en el proyecto es totalmente voluntaria.

He sido informado/a con detalle y de forma inteligible sobre los motivos, la importancia y la extensión del proyecto. He leído y entendido el texto del consentimiento informado. Mis preguntas han sido respondidas de forma inteligible y con suficiente detalle.

Asimismo, me reservo el derecho a cancelar en cualquier momento mi consentimiento, sin que ello dé origen a ningún tipo de sanción.

Soy consciente de que todos los datos se procesarán de forma anónima sin la utilización de los nombres de los clientes. Todos los datos sobre mi persona serán almacenados con la más absoluta confidencialidad y no serán facilitados a terceros.

Firma del paciente:………………………………..   Fecha: …………………….

CUESTIONARIO SOBRE LA INGESTIÓN DE GRASAS Y FIBRA EN LA DIETA

Le rogamos que reflexione unos instantes sobre su dieta en los últimos 3 meses y marque su respuesta a cada pregunta.

En los últimos 3 meses…

1. ¿Ha comido pescado?

☐ no (si responde no, pase a la pregunta 2) ☐ sí (si responde sí, pase a la pregunta 1a)

1a. Cuando ha comido pescado, ¿con qué frecuencia estaba hecho a la plancha, al horno o hervido?

☐ siempre ☐ a menudo ☐ a veces ☐ nunca

1b. Cuando ha comido pescado, ¿con qué frecuencia se trataba de pescado frito?

☐ siempre ☐ a menudo ☐ a veces ☐ nunca

2. ¿Ha comido pollo?

☐ no (si responde no, pase a la pregunta 3) ☐ sí (si responde sí, pase a la pregunta 2a)

2a. Cuando ha comido pollo, ¿con qué frecuencia estaba hecho a la plancha o al horno ?

☐ siempre ☐ a menudo ☐ a veces ☐ nunca

2b. Cuando ha comido pollo, ¿con qué frecuencia se trataba de pollo frito?

☐ siempre ☐ a menudo ☐ a veces ☐ nunca

2c. Cuando ha comido pollo, ¿con qué frecuencia le retiraba la piel?

☐ siempre ☐ a menudo ☐ a veces ☐ nunca

3. ¿Ha comido pasta (por ejemplo espaguetis, fideos, galletas)?

☐ no (si responde no, pase a la pregunta 4) ☐ sí (si responde sí, pase a la pregunta 3a)

3a. Cuando ha comido pasta, ¿con qué frecuencia la ha comido sola, en sopa o con salsa, con queso o con quétchup, sin carne?

☐ siempre ☐ a menudo ☐ a veces ☐ nunca

3b. Cuando ha comido pasta, ¿con qué frecuencia se trataba de pasta integral?

☐ siempre ☐ a menudo ☐ a veces ☐ nunca

4. ¿Ha comido carne roja (por ejemplo, ternera, cerdo, cordero)?

☐ no (si responde no, pase a la pregunta 5) ☐ sí (si responde sí, pase a la pregunta 4a)

4a. Cuando ha comido carne roja, ¿con qué frecuencia ha retirado toda la grasa visible?

☐ siempre ☐ a menudo ☐ a veces ☐ nunca

5. ¿Ha comido carne picada (por ejemplo, picadillo de carne, albóndigas, hamburguesas)?

☐ no (si responde no, pase a la pregunta 6) ☐ sí (si responde sí, pase a la pregunta 5a)

5a. Cuando ha comido carne picada, ¿con qué frecuencia ha elegido en particular carne magra (con un reducido contenido de grasa)?

☐ siempre ☐ a menudo ☐ a veces ☐ nunca

6. ¿Ha comido pan, bollos, panecillos o tostadas?

☐ no (si responde no, pase a la pregunta 7) ☐ sí (si responde sí, pase a la pregunta 6a)

6a. Cuando ha comido pan, bollos, panecillos o tostadas, ¿con qué frecuencia los ha comido sin mantequilla o margarina?

☐ siempre ☐ a menudo ☐ a veces ☐ nunca

6b. Cuando ha comido pan, bollos, panecillos o tostadas, ¿con qué frecuencia eran integral o de centeno?

☐ siempre ☐ a menudo ☐ a veces ☐ nunca

7. ¿Ha comido para desayunar cereales, copos de avena o muesli?

☐ no (si responde no, pase a la pregunta 8) ☐ sí (si responde sí, pase a la pregunta 7a)

7a. Cuando ha comido para desayunar cereales, copos de avena o muesli, ¿con qué frecuencia contaban con un mayor contenido de fibra o frutas secas?

☐ siempre ☐ a menudo ☐ a veces ☐ nunca

7b. Cuando ha comido para desayunar cereales, copos de avena o muesli, ¿con qué frecuencia contenían salvado o ha añadido algún otro tipo de fibra (por ejemplo, Psyllium, fibra soluble)?

☐ siempre ☐ a menudo ☐ a veces ☐ nunca

8. ¿Ha bebido leche o ha acompañado con ella los cereales?

☐ no (si responde no, pase a la pregunta 9) ☐ sí (si responde sí, pase a la pregunta 8a)

8a. . Cuando ha bebido leche, ¿con qué frecuencia era semidesnatada o desnatada?

☐ siempre ☐ a menudo ☐ a veces ☐ nunca

9. ¿Ha comido queso, incluyendo queso como ingrediente de otros platos?

☐ no (si responde no, pase a la pregunta 10)   ☐ sí (si responde sí, pase a la pregunta 9a)

9a. Cuando ha comido queso, ¿con qué frecuencia era queso con un bajo contenido en grasas (dietético)?

☐ siempre   ☐ a menudo   ☐ a veces   ☐ nunca

10. ¿Ha comido postres helados, por ejemplo helados ?

☐ no (si responde no, pase a la pregunta 11)   ☐ sí (si responde sí, pase a la pregunta 10a)

10a. Cuando ha comido postres helados, ¿con qué frecuencia ha elegido yogurt helado, zumo de frutas o helado con un bajo contenido en grasas o exento de ellas?

☐ siempre   ☐ a menudo   ☐ a veces   ☐ nunca

11. ¿Ha comido verdura cocinada?

☐ no (si responde no, pase a la pregunta 12)   ☐ sí (si responde sí, pase a la pregunta 11a)

11a. Cuando ha comido verdura cocinada, ¿con qué frecuencia ha añadido mantequilla, margarina u otra grasa?

☐ siempre   ☐ a menudo   ☐ a veces   ☐ nunca

11b. Cuando ha comido verdura cocinada, ¿con qué frecuencia se trataba de verdura frita?

☐ siempre   ☐ a menudo   ☐ a veces   ☐ nunca

12. ¿Ha comido papas?

☐ no (si responde no, pase a la pregunta 13)   ☐ sí (si responde sí, pase a la pregunta 12a)

12a. Cuando ha comido papas, ¿con qué frecuencia eran fritas o en forma de tortas de patata fritas con aceite?

☐ siempre   ☐ a menudo   ☐ a veces   ☐ nunca

13. ¿Ha comido papas hervidas o asadas?

☐ no (si responde no, pase a la pregunta 14)   ☐ sí (si responde sí, pase a la pregunta 13a)

13a Cuando ha comido papas hervidas o asadas, ¿con qué frecuencia eran sin mantequilla, margarina o nata fermentada?

☐ siempre   ☐ a menudo   ☐ a veces   ☐ nunca

14. ¿Ha comido arroz?

☐ no (si responde no, pase a la pregunta 15)   ☐ sí (si responde sí, pase a la pregunta 14a)

14a. Cuando ha comido arroz, ¿con qué frecuencia era integral, semiintegral (natural), es decir moreno?

☐ siempre   ☐ a menudo   ☐ a veces   ☐ nunca

15. ¿Ha comido ensaladas de verdura?

☐ no (si responde no, pase a la pregunta 16)   ☐ sí (si responde sí, pase a la pregunta 15a)

15a. Cuando ha comido ensaladas de verdura, ¿con qué frecuencia NO ha añadido salsas (aderezos)?

☐ siempre   ☐ a menudo   ☐ a veces   ☐ nunca

15b. Cuando ha comido ensaladas de verdura, ¿con qué frecuencia ha utilizado salsas (aliños) con bajo contenido en grasas o exentos de ellas (dietéticos)?

☐ siempre   ☐ a menudo   ☐ a veces   ☐ nunca

16. ¿Con qué frecuencia ha tomado comida vegetariana (es decir SIN carne, pescado, huevos o queso) para cenar?

☐ siempre   ☐ a menudo   ☐ a veces   ☐ nunca

17. ¿Con qué frecuencia ha tomado para cenar 2 o más tipos de verdura (EXCEPTO patatas)?

☐ Siempre   ☐ a menudo   ☐ a veces   ☐ nunca

18. ¿Ha almorzado?

☐ no (si responde no, pase a la pregunta 19)   ☐ sí (si responde sí, pase a la pregunta 18a)

18a. Cuando ha almorzado, ¿con qué frecuencia ha comido 1 y más tipos de verdura (EXCEPTO patatas)?

☐ siempre   ☐ a menudo   ☐ a veces   ☐ nunca

19. ¿Ha desayunado?

☐ no (si responde no, pase a la pregunta 20)   ☐ sí (si responde sí, pase a la pregunta 19a)

19a. Cuando ha desayunado, ¿con qué frecuencia ha comido fruta fresca (EXCEPTO zumos/jugos de fruta)?

☐ siempre   ☐ a menudo   ☐ a veces   ☐ nunca

19b. Cuando ha desayunado, ¿con qué frecuencia ha tomado cereales o copos calientes o fríos?

☐ siempre ☐ a menudo ☐ a veces ☐ nunca

20. ¿Ha tomado postre (tarta, pasteles o fruta después de comer)?

☐ no (si responde no, pase a la pregunta 21) ☐ sí (si responde sí, pase a la pregunta 20a)

20a. Cuando ha tomado postre, ¿con qué frecuencia le ha añadido crema, helado o nata montada?

☐ siempre ☐ a menudo ☐ a veces ☐ nunca

20b. Cuando ha tomado postre, ¿con qué frecuencia ha comido sólo fruta?

☐ siempre ☐ a menudo ☐ a veces ☐ nunca

21. ¿Ha ingerido alimentos entre las comidas principales?

☐ no (si responde no, pase a la pregunta 22) ☐ sí (si responde sí, pase a la pregunta 21a)

21a. Cuando ha ingerido alimentos entre las comidas principales, ¿con qué frecuencia se trataba de verdura cruda?

☐ siempre ☐ a menudo ☐ a veces ☐ nunca

21b. Cuando ha ingerido alimentos entre las comidas principales, ¿con qué frecuencia se trataba de fruta fresca?

☐ siempre ☐ a menudo ☐ a veces ☐ nunca

22. ¿Ha cocinado algunos alimentos friéndolos en el sartén?

☐ no (si responde no, pase a la pregunta 23) ☐ sí (si responde sí, pase a la pregunta 22a)

22a. Cuando ha frito los alimentos, ¿con qué frecuencia ha utilizado aceite de oliva en lugar de mantequilla, margarina, tocino u otro tipo de aceite?

☐ siempre ☐ a menudo ☐ a veces ☐ nunca

23. ¿Ha cocinado carne roja (res, cerdo, cordero) ?

☐ no (si responde no, pase a la pregunta 24) ☐ sí (si responde sí, pase a la pregunta 23a)

23a. Cuando ha cocinado carne roja, ¿con qué frecuencia le ha retirado ANTES de cocinarla toda la grasa?

☐ siempre ☐ a menudo ☐ a veces ☐ nunca

24. ¿Ha utilizado mayonesa o algún otro tipo de salsa con ella?

☐ no (si responde no, pase a la pregunta 25) ☐ sí (si responde sí, pase a la pregunta 24a)

24a. Cuando ha utilizado mayonesa o algún otro tipo de salsa con ella, ¿con qué frecuencia se trataba de mayonesa o salsas con bajo contenido en grasas o exentas de ellas (dietéticas)?

☐ siempre ☐ a menudo ☐ a veces ☐ nunca

25. **¿Ha comido bollería dulce casera o pasteles (incluyendo de fruta)?**

☐ no (si responde no, pase a las otras preguntas) ☐ sí (si responde sí, pase a la pregunta 25a)

25a. Cuando ha comido bollería dulce casera o pasteles (incluyendo de fruta), ¿con qué frecuencia habían sido preparados con una cantidad de mantequilla, margarina o aceite menor a la indicada en la receta?

☐ siempre ☐ a menudo ☐ a veces ☐ nunca

Información complementaria:

Sexo: ☐ hombre ☐ mujer

Edad: …………… años

¿A qué edad le diagnosticaron diabetes de tipo 2? A los………………años

Tipo de tratamiento DM2:
☐ Dieta
☐ PAD (peroral antidiabetics)
☐ Insulina

Altura …………………………………………………………

Peso ………………………………………………………

A1c (HbA1c) …………………………………………………………

Circumferencia de la cintura ……………………………………………………

Medicacion: