



12-2013

Mediterranean Diet is an Effective Method for Treating Type 2 Diabetes in Adults

Amy Bois

Sacred Heart University, boisa@mail.sacredheart.edu

Follow this and additional works at: http://digitalcommons.sacredheart.edu/healthsci_sp

 Part of the [Dietetics and Clinical Nutrition Commons](#), and the [Endocrine System Diseases Commons](#)

Recommended Citation

Bois, Amy, "Mediterranean Diet is an Effective Method for Treating Type 2 Diabetes in Adults" (2013). *Health Sciences Undergraduate Publications*. 1.

http://digitalcommons.sacredheart.edu/healthsci_sp/1

This Essay is brought to you for free and open access by the Health Sciences at DigitalCommons@SHU. It has been accepted for inclusion in Health Sciences Undergraduate Publications by an authorized administrator of DigitalCommons@SHU. For more information, please contact ferribyp@sacredheart.edu.

Mediterranean Diet is an Effective Method for Treating Type 2 Diabetes in Adults

Amy Bois

Sacred Heart University

Abstract

Type 2 diabetes has been a health issue for many years, and as more people throughout the world become obese or overweight this issue becomes more serious. Type 2 diabetes is called insulin resistance which means the body does not use insulin properly. At first the pancreas will make extra insulin, but over time the pancreas is not able to keep up and cannot make enough insulin to keep blood glucose at normal levels. Type 2 diabetes is most common in adults who are obese or overweight, and this health problem can be life-threatening. There is no cure for type 2 diabetes, but eating well, exercising, and maintaining a healthy weight can help manage the condition. The Mediterranean diet was tested in these studies, and all of them had the same result; these studies had a variety of adult participants and these studies were tested in a variety of countries from the United States to Israel. The studies required the participants to make lifestyle changes by altering their diet and adding physical activities. All of these studies concluded the Mediterranean diet helped the participants and is recommended for all diabetic patients.

Table of Contents

Abstract..... 2

Review of Literature.....4-13

Methods.....14-16

Results.....17-18

Discussion.....19-20

Conclusion.....21

References.....22-23

Introduction

Type 2 diabetes has been a problem for many years, and as the population grows this problem has been growing throughout the United States and other countries around the world. Diabetes has been a disease for many years that has affected people. With the help of the Mediterranean diet, adults can control their diabetes and live health life's; Mediterranean diet includes consumption of fruits, vegetables, fish, whole grains, nuts, legumes, cereals, olive oil, low intake of saturated fatty acids, low to moderate consumption of dairy products, low consumption of red meats, and regular to moderate consumption of alcohol. These studies from Health and Wellness Resource Center, CINAHL, and MEDLINE helped determine whether Mediterranean diet helps treat type 2 diabetes in adults.

Review of Literature

Type 2 diabetes has been an enormous health problem throughout the world for many years, and there has been more and more cases every year; researchers have projected that there will be 380 million cases by 2025. The American Diabetes Association recommends for patients to be treated with pharmacotherapy or drugs, but many of these methods fail to work do to risks. Lifestyle changes such as diets have been seen to work when it comes to losing weight. The Mediterranean diet which includes low-carbohydrate and low-fat calorie provides cardiovascular benefits and increase insulin sensitivity. A randomized trial was put together to test if the Mediterranean diet was effective, durable, and safe towards overweight and obese type 2 diabetes people.

Among these participants, the study found that the participants who were on the Mediterranean diet helped lower their weight more than the participants on the low-fat diet. In the Mediterranean diet participants, changed in fasting plasma glucose and insulin levels were a

higher percentage than the low-fat diet participants. Also the Mediterranean diet participants lost more weight especially in their waist line. The study showed that the more consumption of fruits and vegetables which were the main components of the Mediterranean diet, were associated with lower hazards of diabetes. Also the study showed that the Mediterranean diet improved coronary risk factors. Type 2 diabetics are known for chronic inflammation, and the study has shown that the Mediterranean diet prevents and protects against inflammation. Altogether the Mediterranean diet showed a positive outlook on the type 2 diabetes participants. People with type 2 diabetes should not overlook diets and not go straight to drugs and pharmacotherapy; it is important for people to try changing their lifestyles which include diets and physical activities.

Barrera, M, Dp MacKinnon, La Strycker, and Dj Toobert. "Social-ecological Resources as Mediators of Two-year Diet and Physical Activity Outcomes in Type 2 Diabetes Patients." *Health Psychology* 27, no. 2 (March 2, 2008): S118–25.

Type 2 diabetes is a serious and large problem that continues to grow as the population begins to grow. The American Diabetes Association is trying to promote and encourage for healthy lifestyle changes, and assist individuals in managing the illness. This in time will result in less serious problems in the future for people with this illness. The true challenge for type 2 diabetes is if people can change their life for an extended period of time or even a life time. This study compared participants who were in the Mediterranean Lifestyle Program to participants just going to their physician for the usual diabetic care.

The Mediterranean Program included not just change in diet, but also changes in relationships and social support from family and friends. The results of this study showed that both theory and practice are of importance, and both offered influences of health behavior. People who have supportive social relationships are more opted to take care of themselves better

physically, mentally, and emotionally. The participants with those strong supportive social relationships resulted in better diets and being more physically active. Research did mention in future studies they would expand the assessment of social-ecological resources that support healthy diets and physical activity practices. Overall, the study proved that the Mediterranean Lifestyle Program showed positive outcomes, and that people with type 2 diabetes can change their lifestyle not just for short-term, but also for long-term.

Díez-Espino, Javier, Pilar Buil-Cosiales, Manuel Serrano-Martínez, Estefanía Toledo, Jordi Salas-Salvadó, and Miguel Ángel Martínez-González. "Adherence to the Mediterranean Diet in Patients with Type 2 Diabetes Mellitus and HbA1c Level." *Annals Of Nutrition & Metabolism* 58, no. 1 (2011): 74–78. doi:10.1159/000324718.

There are three main components with helping to prevent type 2 diabetic patients which include diet, leanness, and physical activity. One diet that seems to work on type 2 diabetic patients is the Mediterranean diet which includes high consumption of fruits, vegetables, and low red meat products. This diet type has been studied many times, and has suggested that there are beneficial effects including loss in body weight and reduction of inflammation and plasma insulin. This study focused on the association between glycaemic control and adherence to the Mediterranean diet using a defined pattern.

This study tested to see if the Mediterranean diet works with these participants. The results of this study showed that there was a potential inverse association between adherence to the Mediterranean diet and the levels of the participant's blood sugar. The study showed and researchers calculated specific percentages of how much fat and specific food groups should be eaten by type 2 diabetics. For example 25-35% of fats should be eaten and 10-20% of protein should be eaten. Participants took a low amount of carbohydrates, moderate level of protein, and

a high consumption of monounsaturated fat. The consumption of these fatty acids improves the lipidic profile by reducing the total cholesterol, and LDL cholesterol levels while increasing HDL cholesterol. This Mediterranean diet also showed that people had better glycaemic control rather than having a low-fat diet. Overall the participants showed a better metabolic control which eventually could lead to a reduction in the magnitude of the inverse association. This study concluded that Mediterranean diets help with type 2 diabetics, but there is always more research to be done and more studies to be performed.

Elhayany, A, A Lustman, R Abel, J Attal-Singer, and S Vinker. "A Low Carbohydrate Mediterranean Diet Improves Cardiovascular Risk Factors and Diabetes Control Among Overweight Patients with Type 2 Diabetes Mellitus: a 1-year Prospective Randomized Intervention Study." *Diabetes, Obesity & Metabolism* 12, no. 3 (March 2010): 204–209. doi:10.1111/j.1463-1326.2009.01151.x.

According to the Centers of Disease Control and Prevention, the prevalence of diabetes in the USA in 2004 was 5.1%. Weight reduction in overweight patients with type 2 diabetes has proven to be an effective treatment plan. Proper diets can restore insulin sensitivity and prevent complications with the illness. The American Diabetes Association recommended that carbohydrates and monounsaturated fats together should provide 60-70% of energy intake; these recommendations were based on the quantity of carbohydrates consumed rather than the type of carbohydrates. This study wanted to compare the American Diabetes Association diet with a traditional Mediterranean diet and a low carbohydrate Mediterranean diet. The main outcome measures were glycaemic control and the cardiovascular risks.

Each diet whether it was the American Diabetes Association diet, the Traditional Mediterranean diet, or the low carbohydrate Mediterranean diet had their positives and their

negatives. The low carbohydrate Mediterranean diet had improved cardiovascular risk factors compared to the other two diets. Also this diet had the best results for weight loss over a period of one year, and this diet reduced LDL levels by an extra 8%. This diet however resulted in an increase in HDL-C levels and it was the only diet that led to this increase. Both traditional and low carbohydrate Mediterranean diets had a greater decrease in glycated hemoglobin than the American Diabetes Association diet. The study found that Mediterranean diets are high in MUFA which are monounsaturated fatty acids, and these fatty acids help improve insulin sensitivity. Both of the Mediterranean diets showed the reduction of postprandial hyperglycaemia which likely lowers LDL. Overall the study showed that the Mediterranean diet whether the traditional or the low carbohydrate reduced weight, LDL levels, and glycated hemoglobin levels. This study resulted in a recommendation for Mediterranean diet for overweight diabetic patients.

Esposito, K, M I Maiorino, C Di Palo, and D Giugliano. "Adherence to a Mediterranean Diet and Glycaemic Control in Type 2 Diabetes Mellitus." *Diabetic Medicine: A Journal Of The British Diabetic Association* 26, no. 9 (September 2009): 900–907. doi:10.1111/j.1464-5491.2009.02798.x.

Epidemiological evidence suggests that several dietary patterns are associated with the prevention of type 2 diabetes. In a prospective analysis of overall diet and risk of type 2 diabetes in women, the consumption of a dietary pattern which includes fruits, vegetables, whole grains, and poultry resulted in a lower risk of type 2 diabetes. The traditional Mediterranean diet includes vegetables, fruits, nuts, cereals, low intake of meat and poultry, and a high intake of fish. This study closely explored the relation between glycaemic control, and the consumption of a Mediterranean diet in type 2 diabetic patients.

This study showed there was a significant reduction in the risk of developing type 2 diabetes. It showed that the Mediterranean type diet was associated with glycated hemoglobin and postprandial glucose levels. Within the Mediterranean diet, high-monounsaturated fat diet addresses an important component which helps with weight loss, changes in fasting glucose, and insulin levels. This diet also helped improve cardiovascular risk associated with metabolic diseases. Also epidemiological and interventional studies have revealed a protective effect of the Mediterranean diet against mild chronic inflammation and its metabolic complications. The researchers also found that the patients where adhered to the Mediterranean diet in which they took care of themselves, had better results in weight loss, and had lower glycated hemoglobin. Overall this study showed the Mediterranean diet is associated with lower risk factors in type 2 diabetes patients. The Mediterranean diet results in better glycaemic control than the current nutritional recommendation for Type 2 diabetes.

Salas-Salvado, J., M. Bullo, N. Babio, M. A. Martinez-Gonzalez, N. Ibarrola-Jurado, J. Basora, R. Estruch, et al. "Reduction in the Incidence of Type 2 Diabetes With the Mediterranean Diet: Results of the PREDIMED-Reus Nutrition Intervention Randomized Trial." *Diabetes Care* 34, no. 1 (October 7, 2010): 14–19. doi:10.2337/dc10-1288.

The increasing incidence of type 2 diabetes throughout the world which is closely linked to dietary patterns, physical inactivity, and raising rates of obesity is challenging health problem. Lifestyle changes are an effective measure to prevent diabetes, which weight loss is the most successful. This study observed that diets rich in vegetables, low in red meat, and whole-fat dietary products were associated with decreasing the risk of diabetes. The Mediterranean diet is widely recognized as a healthy dietary pattern. A randomized controlled trial was put together to compare the effect on diabetes incidence of three non-calorie-restricted nutritional interventions

which were a low-fat diet, a Mediterranean diet enriched with virgin olive oil, and a Mediterranean diet enriched with mixed nuts.

In this study, the researchers found that a non-calorie-restricted traditional Mediterranean diet enriched with high-fat foods of vegetable origin decreased the incidence of diabetes in individuals at high cardiovascular risk. Diabetes rates were reduced by 52% by the consumption of Mediterranean diet supplemented with virgin olive oil and mixed nuts. The patients also had advice on a calorie-restricted diet and physical activity. The results in this study showed evidence suggesting a protective effect of the Mediterranean diet against diabetes. Both the Mediterranean diet enriched with virgin olive oil and mixed nuts were associated with improved fasting glucose and decreased insulin resistance. Also a reduction in circulating inflammatory biomarkers resulted in the two Mediterranean diets. Further research needs to be done to clarify the mechanisms leading to diabetes risk reduction independently of weight loss. Overall a non-energy-restricted traditional Mediterranean diet high in unsaturated fat can be a useful tool for preventing diabetes.

The InterAct Consortium. "Mediterranean Diet and Type 2 Diabetes Risk in the European Prospective Investigation Into Cancer and Nutrition (EPIC) Study: The InterAct Project." *Diabetes Care* 34, no. 9 (July 25, 2011): 1913–1918. doi:10.2337/dc11-0891.

The Mediterranean dietary pattern is characterized by a high consumption of unrefined cereals, fruits, vegetables, olive oil, legumes, some dairy products, fish, and low consumption of meat products. The diet has shown to reduce chronic disease morbidity and mortality. This diet has also been hypothesized as an effective diet for the prevention and treatment of type 2 diabetes. This study was a randomized trial which was to assess the association between adherence to the Mediterranean diet and occurrence of type 2 diabetes.

This study showed the Mediterranean diet was associated with a lower risk of developing type 2 diabetes. Patients with a higher Mediterranean diet score were less likely to develop diabetes than individuals with low Mediterranean diet scores. The alcohol, meat, and olive oil components accounted for most of the observed association. The study found out that the Mediterranean diet was better than the low-fat diet; the Mediterranean diet had a high reducing rate of the risk of developing type 2 diabetes. Overall the results showed that the Mediterranean diet associated with small reduction in the risk of developing type 2 diabetes. These results highlight the potential of eating a healthy dietary pattern in the prevention of type 2 diabetes.

Toobert, Deborah J., Russell E. Glasgow, Lisa A. Strycker, Manuel Barrera, and et al. "Biologic and Quality-of-life Outcomes from the Mediterranean Lifestyle Program: A Randomized Clinical Trial." *Diabetes Care* 26, no. 8 (August 2003): 2288–93.

Diabetic adult women are at risk for coronary heart disease. Consumption of high-fat diet is a key modifiable coronary heart disease risk factor for women and men. Inactive habits meaning not having physical activity also causes people to have a higher risk of coronary heart disease. Behavior changes and lifestyle changes may promote healthful lifestyles, and reduce the incidence of type 2 diabetes. The Mediterranean lifestyle program is a randomized controlled trial to test if the program will reduce the development of type 2 diabetes.

The women who participated in this study viewed the Mediterranean lifestyle program as attractive and feasible. The fish consumption had been linked to a decrease risk of coronary heart disease in women; this is associated with the increase in plasma EPA and docosahexanoic acid content. The women showed improvements in lifestyle, BMI, fatty acids, and glycated hemoglobin levels. There were three major questions the researchers asked at the end of the study which would need further research. The first question was can successful outcomes be

achieved in a different and more representative setting. The second question was how could the structure and the theory be modified to make it more appealing to the population, and the third question was what are the costs and economic-implications of a program like this one. Overall the diabetic women had reduced the risk of developing coronary heart disease by eating the Mediterranean diet.

De Koning, L., S. E. Chiuve, T. T. Fung, W. C. Willett, E. B. Rimm, and F. B. Hu. "Diet-Quality Scores and the Risk of Type 2 Diabetes in Men." *Diabetes Care* 34, no. 5 (April 4, 2011): 1150–1156. doi:10.2337/dc10-2352.

Type 2 diabetes remains a major cause of morbidity and mortality worldwide. By 2030, nearly 400 million people will suffer from type 2 diabetes; the major cause of type 2 diabetes is obesity which is determined by energy imbalance. High-quality diets are rich in fruits and vegetables, and are associated with a reduced risk of cardiovascular disease. These diets help reduce inflammation, blood pressure, and lower diabetes risk. This study compared associations of diet-quality scores with men with type 2 diabetes which were Healthy Eating Index, the alternative HEI, the Recommended Food Score, the alternative Mediterranean diet score, and the Dietary Approaches to Stop Hypertension Score. It also tested whether age, smoking status, alcohol intake, family history, physical activity, and BMI altered these relationships when diabetes was the outcome.

In this study, there were several diet-quality scores that were associated with similar reductions in type 2 diabetes risk. High-quality diets were associated with greater reductions in the number of type 2 diabetes cases among individuals with a high BMI. Like the Mediterranean diet, whole grains, legumes, and nuts reduce glucose absorption. The magnesium from nuts and whole grains are a cofactor for cellular glucose uptake and oxidation. Polyunsaturated fats from

vegetable oils and nuts reduce postprandial triglycerides. Low-fat dietary helps reduce the intake of saturated fat. The Mediterranean diet specifically increases insulin sensitivity by an unknown mechanism. All of these mechanisms are associated with lower risk of type 2 diabetes. All of these dietary scores had their differences, but they were all associated with nearly identical risk reductions. These dietary scores reflect a common dietary pattern characterized by fruits, vegetables, whole grains, nuts, legumes, and unsaturated fats. High-quality diets may yield the greatest reduction in diabetes cases with those with a high BMI.

Method

Participants

The first two studies randomly selected around 270 postmenopausal women with type 2 diabetes. They also were living independently, have a telephone, able to read English, not developmentally disabled, and living 30 minutes from the facility where the study was taken place. A few of the studies had randomly selected over 250 adult participants who were overweight type 2 diabetic patients. Another study had a cross sectional study with 900 adult participants who were overweight type 2 diabetic patients. Another randomized study selected 400 adult participants who were overweight type 2 diabetic patients. There was a cohort study with 51,000 adults participants who were also overweight type 2 diabetic patients. The last study was a cohort study also which had 27,000 adult participants which were overweight type 2 diabetic patients. All of these studies had participants who were ages 19 to 80 years old.

Materials

There were many materials that were used throughout the studies. The studies used blood tests to measure cholesterol and triglyceride in whole plasma. In addition a nonsegmented continuous flow method which was used to quantify cholesterol into lipoprotein classes. The BioRad Variant II Instrument and the radioimmunoassay were to determine the hemoglobin levels. To measure the fatty acids and the monounsaturated fats, the researchers used a Hewlett Packard 5890 gas Chroma graph. Individual fatty acids were identified using eicosatrienoic acid as an internal standard. A digital scale, Detecto Electronics, was used to measure height and weight. A zero sphygmomanometer was used to determine resting blood pressure using the Heritage protocol. Trunk flexion and shoulder range-of-motions tests were conducted to assess changes in flexibility resulting from the yoga practices. A Short-Form General Health Survey

was administered which produces reliable valid scores on several important dimensions of functioning. The CIRS was used to measure an individual's frequency of using social-ecological resources over the months which the study took place. The percent of calories from saturated fat was assessed with the Food Frequency Questionnaire. The Community Healthy Activities Model Program for Seniors questionnaire reported the physical activity each participant performed during the months of the study. The semi quantitative food-frequency questionnaire was to assess the nutrient intake. The International Physical Activity Questionnaire was used for the ascertainment of physical activity status which measured the frequency, duration, and intensity of the sports or other habits related to physical activity. Blood and glucose and serum lipids were measured by enzymatic assays in the hospital's chemistry laboratory. The Minnesota Leisure Time Physical Activity Questionnaire was answered by the participants. The Mediterranean Diet score was used to score the participants on what they diet; each food was worth a certain point and in the end the points were add up. Questionnaires were taken to get information about smoking status, number of cigarettes smoker per day, and the educational level of the participant.

Procedure

Most of the studies had the participants go on the Mediterranean diet and they had to record how their diet was going and the physical exercise they were involved in. A few of the studies lasted for six months while other studies lasted to one to two years. Most of the studies also had the participants check in with the research ever one to two weeks. The researchers asked the participants to measure their blood glucose on three nonconsecutive days during the period of one month; they assessed blood glucose just before and every 30 minutes following the main meal of the day for two hours. The participants also were asked to measure fasting glucose level at least twice on two non-consecutive days during the month. The diet included low saturated

fats, and increased in breads, root vegetables, green vegetables, legumes, and fish. It also had less red meat and more poultry. There was no day without fruit and avoid butter and cream and substitute for oils instead. The participants were also taught to prepare their own meals, so after the study they could continue to make their own meals and eat healthy. The participants were advised to follow a physical activity program which included moderate aerobic activity which includes walking, dancing, and cycling for 30 minutes every day of the week, 10 strength training exercises performed twice per week, and formal warm-up and cool down routines, 10 minutes before and 10 minutes after all the activity sessions. They also looked at stress management, social support, and smoking; how many cigarettes or packs they smoked a day. To build a sense of community, a social support intervention delivered by professional or leaders. The program was a three day nonresident retreat followed by weekly meetings lasting six months and consisting of one hour of physical activity, stress management, Mediterranean dinners, and support groups. Participants were instructed to participate in stress management programs including yoga, progressive deep relaxation, mediation, and directed or receptive imagery. They encouraged participants to quit smoke with the help of support groups or programs.

Results

After the many months and years the diabetic participants were studied on, researchers concluded that the Mediterranean diet helped reduce risks and prevent type 2 diabetes in adults. Throughout the studies there were drops out which mostly did not affect the results, but no one died during the studies; the only serious incident was there was serious adverse event where someone got pneumonia. Many of the studies used the Mediterranean diet score which the higher the scoring the results indicated lower body mass index and waist circumferences, a lower prevalence of the metabolic syndrome and lower glycated hemoglobin, and post-meal glucose levels. Also participants BMI, blood pressure, plasma fatty acids, and flexibility changed for the better; there was a significant impact on the participant's quality of life. Participants resulted in high scores when they consumed higher intakes of alcohol, fish, fruit, legumes, nuts, vegetables, whole grains, higher ratio of monounsaturated to saturated fat, and less red and processed meat. Also decreasing or quitting smoking all together, higher physical activity, lower weight, improvement of social-ecological resource uses, and lower BMI resulted in a higher a Mediterranean diet score. The higher scoring participants had lower levels of one hour and two hour blood glucose values than the diabetic patients; there were no significant differences among the Mediterranean diet groups with respect to pre-meal blood glucose value. All of the studies assigned participants with other diet and compared them to the Mediterranean diet participants. The participants assigned to the Mediterranean-style diet lost more weight and experienced greater improvements in some glycemic control and coronary risk measures than did those assigned to the low-fat diet; the systolic and diastolic blood pressure decreased more in Mediterranean diet participants than the low-fat diet participants. Participants in the Mediterranean diet group experienced greater increases in insulin sensitivity and in adiponectin

levels that were statically significant in most trail years and greater declines in serum insulin levels that were not statistically significant in any trial year. A key note with the different groups was there was no significant difference among the ages, fasting insulin, hypertensive status, total cholesterol or use of anti-hypertensive or lipid-lowering drugs. With all the testing of the participants the end results in all the studies concluded that the Mediterranean diet helps change the lifestyle of diabetic patients to make them healthier and live longer.

Discussion

The researchers found that adherence to Mediterranean diet was inversely associated with glycated hemoglobin, and postprandial glucose levels measured during living conditions, independent of age, adiposity, energy intake, physical activity, and other potential confounders. The association between adherence to Mediterranean diet and glucose control was apparent even although no strong associations were evident for each of the components of the Mediterranean diet score. Individual components may have small effects that emerge only when components are integrated into an inclusive dietary score that can account for extremes of cumulative exposure in the absence of other major nutritional effects. Whole grains have been associated with reduced diabetes risk which may be mediated through their favorable association with insulin sensitivity. The Mediterranean diet has the ability to improve cardiovascular disease risk factors which accounts for the greater cardiovascular risk associated with metabolic diseases. Beyond this point, epidemiological and interventional studies have revealed protective effect of the Mediterranean diet against mild chronic inflammation and its metabolic complications. Social resources can influence health behaviors which leads social relationships to healthy outcomes through healthful dietary and physical activities. People who are embedded in supportive social relationships take better care of themselves. Participants also showed an acceptable metabolic control; participants whose nutritional habits were likely to change according to their diabetic status which might contribute to a reduction in the magnitude of the inverse association. The different consumption of foods helped the participants control their diet and their weight. Fish consumption has been linked to a decreased risk of coronary heart disease; it is associated with an increase in plasma EPA and docosahexaenoic acid content. A low glycemic load minimizes postprandial glucose spiking whereas fibers reduce glucose absorption; both many improve

insulin demand and B-cell function. Olive oil and nuts protective against diabetes risk which are both associated with improved fasting glucose with diabetic participants and decreased insulin resistance in those without diabetes after a three month follow up in the absence of weight loss. In general high-quality diets should have the greatest impact on type 2 diabetes; high-quality diets may yield the greatest reduction in diabetes cases when followed by those with a high BMI. The major strength of the studies were all of them had a large size population which they tested; the larger the population the more accurate the results will be.

Limitations

There were a few of the studies which only had one gender limiting the results; also limiting to adulthood restricted the study. Also many of the studies lacked an ethnically diverse population. The results of the studies reminded researchers that there are many challenges in people's lifestyle factors such as diet and physical activity; future research will help improve this problem. Some of the studies were cross-sectional which does not allow for cause and effect. Diabetics also have to be willing to change their lifestyle, and once they change it they have to stick to it by eating healthy and being involved in physical activity. If the participants in the studies are not motivated they will not keep up with the diet and the physical activities. A few of these studies took place in other countries which could cause different results than the studies which were taken place in the United States. Also how the researchers measure throughout the study such as the blood glucose levels, there could have been errors which could cause the results to be wrong. Some of the participants also refused to be measured which could cause the studies to be inaccurate.

Conclusion

In conclusion the Mediterranean diet should be recommended for overweight diabetic patients to decrease more health problems and complication in the future. Adherence to a Mediterranean diet is associated with lower glycated hemoglobin and postprandial glucose levels in type 2 diabetic patients, independent of anthropometric, lifestyle and other health-related variables. Also several diet-quality scores were inversely associated with type 2 diabetes; the scores reflect a common dietary pattern characterized by high intake of fruits, vegetables, whole grains, nuts, legumes, unsaturated fats, and low intake of red meats. High-quality diets may yield the greatest reduction in diabetes cases when followed by those with a high BMI. Diabetes risk reduction occurred in the absence of significant changes in body weight or physical activity. All of the studies suggested that Mediterranean diet has many advantages when it comes to helping treat type 2 diabetes in adults.

References

- Barrera, M, Dp MacKinnon, La Strycker, and Dj Toobert. "Social-ecological Resources as Mediators of Two-year Diet and Physical Activity Outcomes in Type 2 Diabetes Patients." *Health Psychology* 27, no. 2 (March 2, 2008): S118–25.
- De Koning, L., S. E. Chiuve, T. T. Fung, W. C. Willett, E. B. Rimm, and F. B. Hu. "Diet-Quality Scores and the Risk of Type 2 Diabetes in Men." *Diabetes Care* 34, no. 5 (April 4, 2011): 1150–1156. doi:10.2337/dc10-2352.
- Díez-Espino, Javier, Pilar Buil-Cosiales, Manuel Serrano-Martínez, Estefanía Toledo, Jordi Salas-Salvadó, and Miguel Ángel Martínez-González. "Adherence to the Mediterranean Diet in Patients with Type 2 Diabetes Mellitus and HbA1c Level." *Annals Of Nutrition & Metabolism* 58, no. 1 (2011): 74–78. doi:10.1159/000324718.
- Elhayany, A, A Lustman, R Abel, J Attal-Singer, and S Vinker. "A Low Carbohydrate Mediterranean Diet Improves Cardiovascular Risk Factors and Diabetes Control Among Overweight Patients with Type 2 Diabetes Mellitus: a 1-year Prospective Randomized Intervention Study." *Diabetes, Obesity & Metabolism* 12, no. 3 (March 2010): 204–209. doi:10.1111/j.1463-1326.2009.01151.x.
- Esposito, K, M I Maiorino, C Di Palo, and D Giugliano. "Adherence to a Mediterranean Diet and Glycaemic Control in Type 2 Diabetes Mellitus." *Diabetic Medicine: A Journal Of The British Diabetic Association* 26, no. 9 (September 2009): 900–907. doi:10.1111/j.1464-5491.2009.02798.x.
- Esposito, K, Mi Maiorino, M Ciotola, C Di Palo, P Scognamiglio, M Gicchino, M Petrizzo, et al. "Effects of a Mediterranean-style Diet on the Need for Antihyperglycemic Drug Therapy in

Patients with Newly Diagnosed Type 2 Diabetes: a Randomized Trial.” *Annals of Internal Medicine* 151, no. 5 (September 2009): 306–314.

The InterAct Consortium. “Mediterranean Diet and Type 2 Diabetes Risk in the European Prospective Investigation Into Cancer and Nutrition (EPIC) Study: The InterAct Project.” *Diabetes Care* 34, no. 9 (July 25, 2011): 1913–1918. doi:10.2337/dc11-0891.

Salas-Salvado, J., M. Bullo, N. Babio, M. A. Martinez-Gonzalez, N. Ibarrola-Jurado, J. Basora, R. Estruch, et al. “Reduction in the Incidence of Type 2 Diabetes With the Mediterranean Diet: Results of the PREDIMED-Reus Nutrition Intervention Randomized Trial.” *Diabetes Care* 34, no. 1 (October 7, 2010): 14–19. doi:10.2337/dc10-1288.

Toobert, Deborah J., Russell E. Glasgow, Lisa A. Strycker, Manuel Barrera, and et al. “Biologic and Quality-of-life Outcomes from the Mediterranean Lifestyle Program: A Randomized Clinical Trial.” *Diabetes Care* 26, no. 8 (August 2003): 2288–93.