

PRIMARY PREVENTION OF TYPE 2 DIABETES MELLITUS

Descriptive literature review

Abstract

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Title of publication Primary prevention of type 2 diabetes mellitus Descriptive literature review		
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Abstract <p>The current prevalence of type 2 diabetes mellitus is critical and a vast number of people have a high risk for its onset. One of the main reasons for disease are poor nutrition and sedentary lifestyle. Therefore, patient becomes obese and it usually induces different comorbidities, including diabetes. The role of nurse as a health professional who can guide patients to prevent the disease, is still underestimated. Nonetheless, nurse can be one of the first people in health care who can recognize the possible risks for disease onset.</p> <p>The aim of the thesis is to find out the methods of primary prevention of type 2 diabetes mellitus by conducting a literature review. The purpose is to decline the appearance of disease among patients with obesity, prediabetes or gestational diabetes and to improve nurses' knowledge about their role in primary prevention of disease. The thesis has two questions concerning the issue: How can type 2 diabetes be prevented? What is the nurses' role in primary prevention of type 2 diabetes?</p> <p>The author selected a descriptive literature review as a method. The database search was conducted through PubMed, CINAHL and SAGE. A total of 8 articles were relevant for thematic analysis. Findings determined three themes: patients' role in primary prevention, nurses' role in primary prevention and nursing qualification.</p> <p>In summary, the author discovered that there are studies where nurses help to prevent type 2 diabetes through group or individual educational interventions and worksite settings. Unfortunately, studies demonstrated that in real life it is problematic for nurses to help patients and in spite of having a theoretical knowledge, they do not use the skills in practice. Further research is required for improving nurses' skills concerning primary prevention and encouraging them to deal with patients who are at risk group.</p>		
Keywords type 2 diabetes mellitus, primary prevention, risk factors, nurses' role, nutrition		

Tiivistelmä

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Tiivistelmä <p>Tyypin 2 diabeteksen nykyinen esiintyvyys on huolestuttava ja monilla ihmisillä on korkea riski sairauden puhkeamiseen. Yleisimpiä syitä sairaudelle ovat huono ravitsemus ja paikallaan pysyvä elämäntapa. Niiden vuoksi potilas lihoo ja se aiheuttaa yleensä lisäsairastavuutta, diabetes mukaan lukien. Sairaanhoitajan rooli terveydenhuollon ammattilaisena, joka voi ohjata potilaita estämään sairautta, on edelleen aliarvioitu. Siitä huolimatta sairaanhoitaja voi olla yksi ensimmäisistä terveydenhuollon ihmisistä, joka tunnistaa sairauden puhkeamisen mahdolliset riskit.</p> <p>Opinnäytetyön tavoitteena on selvittää tapoja tyypin 2 diabeteksen primaariin preventioon, tekemällä kirjallisuuskatsaus. Tarkoituksena on vähentää sairauden esiintyvyyttä ylipainoisilla ihmisillä, prediabeetikoilla, raskausdiabeetikoilla ja parantaa sairaanhoitajien tietoa heidän roolistaan sairauksien ennaltaehkäisyssä. Opinnäytetyössä on kaksi tutkimuskysymystä: Kuinka tyypin 2 diabetes voidaan estää? Mikä on sairaanhoitajien rooli tyypin 2 diabeteksen ennaltaehkäisyssä?</p> <p>Kirjoittaja valitsi menetelmäksi kuvaavan kirjallisuuskatsauksen. Tietokantahaku on suoritettu PubMedin, CINAHL: n ja SAGE: n kautta. 8 artikkelia valikoitui temaattiseen analyysiin. Havainnot määrittelivät kolme teemaa: potilaan rooli ennaltaehkäisyssä, sairaanhoitajien rooli ennaltaehkäisyssä ja sairaanhoitajan pätevyys.</p> <p>Johtopäätöksenä kirjoittaja on löytänyt, että on olemassa tutkimuksia, joissa sairaanhoitajat auttavat estämään tyypin 2 diabetesta ryhmä- tai yksilöllisten interventioiden ja työpaikan asetuksien avulla. Valitettavasti tutkimukset osoittivat, että tosielämässä sairaanhoitajille on ongelmallista auttaa potilaita ja vaikka heillä on teoreettisia tietoja, he eivät käytä näitä taitoja käytännössä. Jatkotutkimusta tarvitaan sairaanhoitajien ensisijaisen ehkäisyn taitojen parantamiseksi ja rohkaisemaan heitä käsittelemään riskiryhmän potilaita.</p>		
Avainsanat tyypin 2 diabetes, primaari preventio, riskitekijät, sairaanhoitajan rooli, ravitsemus		

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LIST OF ABBREVIATIONS

Abbreviation	Definition
BMI	Body mass index
CT	Computerized tomography
FINDRISK	Finnish Diabetes Risk Score
GDM	Gestational diabetes mellitus
LADA	Latent autoimmune diabetes of adults
LDL	Low-density lipoprotein
MODY	Maturity onset diabetes of the young
MRI	Magnetic resonance imaging
NPH insulin	Neutral protamine Hagedorn insulin
SGLT-2	Sodium-glucose co-transporter-2
T1DM	Type 1 diabetes mellitus
T2DM	Type 2 diabetes mellitus

1 INTRODUCTION

In general, diabetes is a group of diseases, which have in common high level of blood sugar for a long time and impairment of insulin production. Type 1 diabetes mellitus (T1DM) usually occurs at the young age. It is caused due to destruction of cells which secrete insulin in pancreas, therefore insulin cannot be produced. The reason of it is still unknown. People who do not receive the right treatment on time can die. Gestational diabetes occurs during pregnancy and as a rule, it disappears after giving a birth. Nevertheless, it increases the risk of developing of type 2 diabetes mellitus in future, especially if woman is obese. Latent autoimmune diabetes of adults (LADA) is a form of type 1 diabetes mellitus which is diagnosed after age of 35 and it also requires treatment such as in T1DM. (THL 2019.) Maturity onset diabetes of the young (MODY) is a genetic type of diabetes which can appear if parents of children have diabetes. Sometimes it can be treated only by nutrition and physical activity, in other cases it can also require insulin medications. (Diabetes ("sokeritauti") 2018.)

Type 2 diabetes mellitus (T2DM), which is the subject of the thesis work, is one of the most common chronic endocrine diseases which has a disorder with insulin secretion. Pancreas does not produce enough insulin or body does not use insulin in a proper way. It appears in approximately 75-80% of all cases of diabetes in Finland. (Ilanne-Parikka 2018.) Nowadays the disease is common world-wide and its appearance is connected with inactive lifestyle which often leads to obesity or malnutrition. Moreover, there is a genetic factor, however it can be prevented or delayed by modifying the lifestyle. T2DM usually develops in the middle age or later, but now there are many cases when children are diagnosed with it due to radical changes in nutrition and physical activity. Even though, disease is a life-long, it is feasible to manage for patient without many difficulties in daily life. (WHO 2018.)

Nowadays diabetes is spread all over the world, both in developed and developing countries. WHO stated that there were 422 million adults having a disease. Approximately 90-95% of all cases have type 2 diabetes. The number of people had grown from 4.7% to 8.5% in 2014. It is estimated that by 2045 there will be 629 million people who have some form of diabetes. (Classification of diabetes mellitus 2019, 6, 14.) In Finland the amount of people with diabetes also has been persistently growing. Currently there are approximately 500 000 people diagnosed with disease and 75-80% of them have a T2DM. The number of diseased people has grown rapidly at the beginning of 21st century. The treatment costs of diabetes require around 15% of budget in Finnish health care system. FINRISKI 2012 research showed that average body mass index (BMI) of people was 27,1 kg/m² and 20,4% of men and 19% of women had obesity. (Diabetes ("sokeritauti") 2018.)

Due to huge prevalence, nurses have to be familiar with basic knowledge about type 2 diabetes mellitus. Their role can be to educate patients to prevent the appearance of disease. Majority of people with type 2 diabetes mellitus are suffering from obesity or being overweight and therefore it is obvious that obesity is strongly associated with T2DM and it can lead to its comorbidity. (Tyypin 2 diabetes 2018.) Educating people to prevent being overweight can reduce the chance of developing disease. WHO stated that nurses have an influential role in preventing of many noncommunicable diseases, including also T2DM. Prevention of diseases is based on four risk factors such as bad-quality nutrition, low physical activity, tobacco and alcohol usage. By establishing health care organizations, nurses can implement better diseases prevention for patients. (WHO 2012, 5.)

As a result, nurses, depending on their responsibilities, have a direct access to prevent diseases and educate people about it. It means that nurses can have a meaningful role in improvement of population health. (WHO 2012, 6.) In the studies it is shown that nursing students in general have a good knowledge about diabetes mellitus, however not many of them are concerned about following recommendations about healthy lifestyle. Therefore, some students have an increased risk of T2DM. It is stated that it would be beneficial not only to learn the theory, but also use the skills in life. (Anastasiou et al. 2019, 1848.)

The aim of the thesis is to find out the ways of primary prevention of type 2 diabetes mellitus by conducting a literature review. The purpose is to decline the appearance of disease among patients with obesity, prediabetes or gestational diabetes and to improve nurses' knowledge about their role in primary prevention of disease. The thesis has two questions concerning the issue: How can type 2 diabetes be prevented? What is the nurses' role in primary prevention of type 2 diabetes? To find the answers for thesis question, a descriptive literature review is conducted. Thematic analysis is used as a method in the research process.

2 TYPE 2 DIABETES

2.1 Symptoms, diagnosis and treatment

The disease starts to develop slowly and not everyone knows about having the diabetes. Its symptoms can be confused with some other disease or stress situation. Sometimes patient does not have any noticeable signs of disease. In this case it is important to be aware of risk factors to understand if there is a chance of T2DM. (CDC 2019.) It is not rare that disease is diagnosed only when person notices serious health problems. Tiredness which often comes after meal is one of those symptoms that is not taken into consideration because it can be confused with normal condition after work or stress. The most suspicious symptoms of type 2 diabetes are feeling sleepy, sudden weight loss or gain, frequent urination, also known as a polyuria, slow wound healing, being thirsty many times and eyesight decline. Besides that, there are other signs which can be confused with other health conditions. It includes itchy or/and dry skin, nausea, vomiting and numbness in the feet. (Tyypin 2 diabetes 2018.) Vaginal or yeast infections point to the possible disease if other symptoms also occur (CDC 2018a).

Patients with type 2 diabetes normally do not need an insulin treatment, since nutrition changes and its maintenance, is usually enough. Nevertheless, treatment can be used to prevent some serious complications. The diabetes can be diagnosed if blood sugar shows that fasting plasma glucose is $\geq 7.0\text{mmol/l}$ (126mg/dl) or 2-h plasma glucose $\geq 11.1\text{mmol/l}$ (200mg/dl). There are tests for glycemic status: measurement of glucose in blood by portable devices, laboratory blood tests; oral glucose tolerance test and glycated haemoglobin. (WHO 2006, 1.) Since type 2 diabetes is a chronic disease, the main principles of treatment are healthy nutrition, physical activity, prevention of stress, weight loss and medications if needed. Following instruction recommendations will help to prevent complications and life can be still normal. As a rule, healthy nutrition and physical activity help to avoid a high level of sugar. (THL 2019b.)

During insulin or drug therapy the goal of HbA1c is to be less than 53 mmol/mol (7.0%). After 2 hours of meal the fasting plasma glucose is supposed to be 8-10 mmol/l. Besides that, there are other factors which have to be considered to ensure that there is no risk of complications. Low-density lipoprotein (LDL) cholesterol should not be more than 1.8 mmol/l . Blood pressure has to be less than $140/80\text{ mmHg}$. If patient loses at least 5% of weight, it can also lead to positive changes in blood sugar level and therefore improve insulin resistance. (Tyypin 2 diabetes 2018.) Nutrition treatment for people with T2DM is similar to general nutritional recommendations. Nevertheless, there are few factors which have

to be careful about. First of all, the sugar intake should not be more than 50 g a day. Moreover, it is better to keep the dosage around 25 g per day. (WHO 2015, 2.) If rates of measuring are higher than it is supposed to be, then there is a medication treatment. Patient can be prescribed with different types of medicine, depending on his/her current condition and doctor's view. There are oral medicines (biguanides, gliptins, sodium-glucose co-transporter-2 (SGLT-2), glitazones) and insulin injections (insulin degludec, insulin detemir, insulin glargine, neutral protamine Hagedorn insulin (NPH insulin), etc.). Prescriptions must be strictly followed because all those medications have different actions, dosages and side effects. (Mustajoki et al. 2018, 452-454.)

2.2 Risk factors

There are some risk factors which contribute to development of T2DM. The primary driver of T2DM is being overweight or having obesity. There are different factors associated with high body mass. For instance, increased abdominal fat percentage often demonstrates that person overconsumes sugary food and therefore increases the chance of raised up blood sugar. As a matter of fact, people do not always consider high abdominal fat as a problem because their weight can be normal according to BMI. However, people often underestimate this factor and abdominal obesity can be diagnosed if woman's waist circumference is more than 90 cm and man's one is more than 100 cm. The limit value is 80 cm for females and 90 cm for males. (Lihavuus (lapset, nuoret ja aikuiset) 2020.) Nowadays studies show that mental problems such as depression, schizophrenia, personality disorders, eating disorders, anxiety or alcoholism often contribute to overweight and possibly to T2DM in the future (Diabetes Mellitus 2010; Rajan & Menon 2017).

After age of 45 it is common that production of insulin weakens and thereby those people have a higher risk of type 2 diabetes. Regular monitoring and following doctor's recommendations help to prevent the occurrence of disease. (Cowap 2015, 21.) If woman gave a birth to a child who is more than 4 kg, then woman has to monitor her blood sugar. Ethnic populations such as Native Americans, Pacific Islanders, and populations in the Middle East and South Asia are in a higher risk of disease. Close relatives with type 2 diabetes increase the chance of disease, nevertheless it can be usually prevented by staying physically active and eating healthy. (CDC 2019a.) Metabolic syndrome is a combination of conditions such as high blood sugar, hypertension, high cholesterol and abdominal obesity which often cause complications such as type 2 diabetes. Insulin resistance can occur also during severe obesity or acanthosis nigricans which can contribute to T2DM. (NHLBI 2020.) Moreover, regular alcohol intake can lead to pancreas diseases which can develop diabetes in

the future (Cowap 2015, 22). Image 1 demonstrates the most common risk factors for type 2 diabetes mellitus.

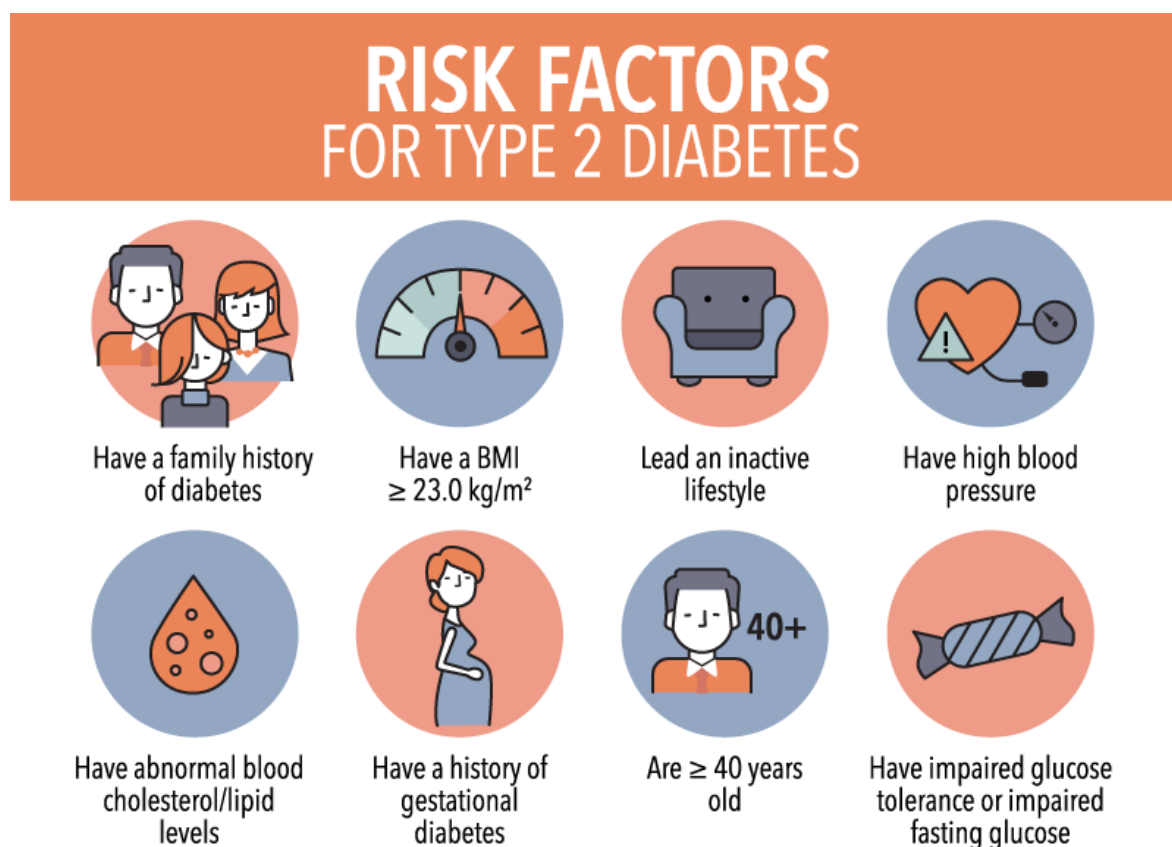


Image 1 Risk factors for type 2 diabetes (GOV.SG 2017)

Obesity

Obesity is one of the most predisposing risk factors which lead to T2DM. It is a severe stage of overweight which is a complex neuroendocrine and behavioral disorder. It occurs due to imbalance of food intake and energy expenditure. Overweight can be defined if BMI is from 25 to 29.9 kg/m² and obesity starts from 30 and above. The condition is divided by stages where severe obesity has BMI from 35 to 40 and more than 40 is a morbid one. (Lihavuu 2019.) However, it is essential to consider that some muscular people have higher body mass index, therefore visual assessment and obesity symptoms are compulsory. When BMI is around 25 kg/m² there is a high risk of developing related diseases. In addition, some ethnic groups are in risk of T2DM if the BMI is more than 22 kg/m². Besides BMI there are other methods which can help to confirm if there is obesity. For example, it can be a

skinfold caliper to measure the thickness of fat tissue. Other possible ways are magnetic resonance imaging (MRI), Computerized tomography (CT scan), bioelectrical impedance, ultrasound or infrared. (Aro, Mutanen & Uusitupa 2017, 359-360.)

Obesity or overweight cause many diseases in the future if it is not treated on time. Type 2 diabetes is one of the most common comorbidities with severe adverse effects. Being overweight can lead to induction of insulin resistance. Besides T2DM it can cause an abundance of diseases such as sleeping apnea, fatty liver disease, pulmonary embolism, endometrial cancer, urinary incontinence, childlessness, high blood pressure, cirrhosis, renal cell carcinoma, etc. (Mustajoki 2019.) Therefore, obesity can affect on many parts of organism and knowledge of prevention of this condition can help to minimize the risk of many diseases and also avoid possible disorders for the future generation (WHO 2018c).

Obesity is a medical condition which is spread extensively both in developed and developing countries. WHO stated that in 2016 there is more than 1.9 billion adults who have extra weight and over 650 million people of them have obesity. The number is 3 times higher than in 1975. Even though, obesity is stated as a condition which appears mainly in the adulthood, nowadays there are approximately 41 million of children under age of 5 years and 340 million of children between 5 and 19 years who are overweight or obese. It is estimated that the number of them will grow rapidly. (Obesity and overweight, 2018.) The adult lifestyle is one of the main factors that lead to weight gain. Nevertheless, childhood habits and genetic factors can also lead to issues connected with being overweight or obese. For instance, it can be leptin or insulin resistance. Lifestyle changes are mainly caused by worldwide changes in daily life. (CDC 2020a.)

The food, particularly junky one is more available nowadays due to huge development in industry and business and low prices comparing to healthy food. The consumption of many products is more attractive because it became an essential part of spending free time or celebrations. Eating outside the home can be risky as portions in restaurants are usually bigger than meant to be. Same happens with ready snacks. (CDC 2020a.) Due to developed industry, nowadays children consume bigger portions of meals and, there is still lack of knowledge for parents about proper cooking and the size of portion (Syra et al. 2016). Children whose parents are overweight can be afflicted by the disorder mainly because of wrong family eating habits. It is common that children cannot always choose what to eat and instead they can acquire a low-quality food. It is necessary to improve cooking skills for adults and teach their children to cook, otherwise people consume ready meals from shops. The basic understanding of nutrients such as carbohydrates, proteins and fats helps to evaluate if person receives a good quality food. (CDC 2020a.)

Eating disorders which appear often among young women can also lead to obesity. Those people can be influenced by society where they convince people to be slim and therefore people try diets but later, they fail and gain weight back. Other consequences of eating disorders can be depression or low self-confidence. (Eating Disorder Hope 2012.) People started to be busier at work and therefore they do not always find time to cook food and ready meals can be a way out in this situation. Also due to work or other stressful factors they have less sleeping. Besides high intake of food, another issue is a sedentary life style due to low-physical work and inactive leisure such as surfing the internet or TV instead of being physically active outside. Despite many benefits of public transport and cars, it also worsens severely the health of many people. (Terveyskirjasto 2019.)

There are different forms of obesity treatment. Depending on the stage and comorbidity with other diseases patient can be prescribed with certain recommendations. Before starting changes or any interventions it is important to treat or control disease which are related with obesity. For instance, binge eating disorder have to be treated to prevent the degradation of obesity. Some chronic diseases have to be monitored thoroughly to avoid complications. (Lihavuus (lapset, nuoret ja aikuiset) 2020.) Nutrition and regular physical activity are the main keys to treat the condition. Every stage requires changes in daily life. If BMI is from 25 kg/m² to 35 kg/m², then diet and being physically active are usually enough to reduce weight. Patient should be instructed how to control eating and changes should be gradual. In order to succeed in weight loss, person should consume 500-1000 kcal less than he used to eat. According to that, patient should lose 0,5-1 kg per week, depending on how much extra weight he/she has. At the average, it is recommended that man consumes approximately 1500-1600 kcal and 1200 kcal for woman. The amount of each nutrients should be following: 40-55% of carbohydrates, 25-35% of fats and 15-20% of proteins. (Aro, Mutanen & Uusitupa 2017, 361.) This recommendation is both for overweight and healthy people. Fiber, fruit and vegetables should be considered as because they reduce the hunger. The recommended amount of fiber for adults and 25-35 g per day and vegetables/fruit is 500 g. (Ruokavirasto 2014.)

During the first stage of obesity it is recommended to maintain physical activity constantly. Despite the weight loss it can fortify health condition. For instance, it reduces insulin resistance and risk of cardiovascular diseases. 45-60 min daily of moderate-intensity physical activity help to lose and control weight. Patients can combine different activities such as walking, swimming, cycling or skiing. Weight training for muscles can be practiced sometimes on first stages of obesity, however it mainly affects on body composition, but not weight loss. It means that muscles grow and amount of fat reduces. (Liikunta 2016.) Medical treatment can be also required especially if person has severe obesity. Orlistat is one of the

most common medications in Finland nowadays. As a rule, it does not have side effects because orlistat does not absorb. However, if patient consumes too much fat, he can contract a steatorrhea. In average, people can lose around 10 kg during the treatment. The normal dosage is 120 mg x 3 times a day. (Aro, Mutanen & Uusitupa 2017, 366.)

Another way of obesity treatment is a bariatric surgery. It is advised to do if patient's BMI is 40 kg/m² and more or at least 35 kg/m² if he has some disease related to obesity, such as T2DM or sleep apnea. The surgery is performed to patient from 18 to 65 years old. There are few types of surgery: gastric bypass surgery, sleeve gastrectomy and gastric banding. (Lihavuusleikkaus 2019.) According to HUS data, patients usually lost 20% of extra weight during the year after the surgery was conducted. However, some patients gained weight back after 2 years. (Paljonko leikkaus laihduttaa? 2017.) Nutrition plays a big role after bariatric surgery and requires special recommendations to prevent complications. One month after it, patient has to eat at least 6 times a day and only 1 dl per meal. After one more month it can normal food 5-7 times a day and still small portions. D-vitamin and multivitamins have to be taken for the rest of life. Meals have to be eaten slowly and it is better to avoid drinks while eating. Other than that, patient should follow normal nutrition recommendations (Lihavuusleikkaus 2019.)

Prediabetes

Prediabetes is a condition when the glucose blood level is higher than it is supposed to be, but still cannot be identified as a sign of type 2 diabetes mellitus. Due to its difficulty to recognize the disease, many people are in high risk of developing T2DM in the future or other comorbidities such as stroke or heart diseases. One of the predisposing factors of prediabetes onset is BMI more than 25. The fact of having the disorder does not necessarily mean that diabetes will occur, although measures to decline the risk of disease are necessary. (Cowap 2015, 4-5.) It is reported that in 2015 in USA prediabetes was spread among 84.1 million of people aged 18 and older (CDC 2018).

Patients with prediabetes often do not even suspect that they have prediabetes as it does not always show symptoms. However, there can be a chance of having it if patient has similar symptoms to diabetes. (CDC 2019a.) Prediabetes can be diagnosed if the level of HbA1c is between 5,7% and 6,4%. However, the glucose intolerance can be improved by lifestyle interventions. The basic recommendations are the reduction of calorie daily consumption (1200-1800 kcal per day) and at least 180 min of physical activity per week. For better out-comes dietitians are recommended who can monitor the progress of treatment. (Prediabetes: Why Should We Care 2018, 294.)

Gestational diabetes

Gestational diabetes mellitus (GDM) is a disease when woman during the pregnancy is diagnosed with insulin impairment for the first time in her life (Raskausdiabetes 2019). Around 5% of pregnant women are diagnosed with GDM. (Gestational diabetes: A clinical update 2015). Disease disappears after the pregnancy, although there is a bigger risk of T2DM development if woman did not make an effort to prevent the disease. Being overweight is the main risk factor leading to gestational diabetes. (Raskausdiabetes 2019.) Disease usually appears between 24 and 28 weeks of pregnancy. Usually to manage with gestational diabetes is enough to eat healthy, be physically active and monitor blood sugar at home. Sometimes insulin has to be taken, if it is prescribed by doctor. (CDC 2020.) Recommended daily calorie intake should be reduced up to 1600-1800 calories per day and approximate weight gain is 7-8 kg (Raskausdiabetes 2019).

The best way to prevent the development of gestational diabetes before and/or during pregnancy is to maintain healthy weight or lose it if needed. Overconsumption of animal fats, heme iron and cholesterol are the feasible risks of GDM. On the contrary, following of nutrition recommendations helps to avoid the disease. (Raskausdiabetes 2013.) Moreover, it might be possible that deficit of vitamin D can be associated with larger risks of gestational diabetes due to affect on the glucose metabolism (Gestational diabetes: A clinical update 2015).

3 PREVENTION OF TYPE 2 DIABETES

3.1 Definition of prevention and its methods

There are three types of diseases' prevention: primary, secondary and tertiary. In other words, primary prevention can be executed before disease comes, at the first stage or when it is developed but possible to treat it or decrease the progress of it. Primary prevention can be provided effectively by health care workers who are educated in their field. (CDC 2017, 1-2.) In primary health care centers nurses can provide such type of help where they motivate patients to change their lifestyle by improving diet and increasing physical activity. Guiding can be executed individually or in a group of people. (NICE 2018, 4.) The implementation of primary prevention focuses on providing information about certain disease risk factors and how to avoid them to patient individually or on the level of population (CDC 2017, 1-2). This thesis work is mainly focused on primary prevention of type 2 diabetes mellitus. In general, primary prevention comprises interventions for health promotion such as prevention programs where patients receive guidance about diseases, its risks and prevention, education about nutrition and oral hygiene and vaccination which prevents certain dangerous diseases. In case of T2DM, counselling for people about disease, health risks and nutrition are the main preventative measures. (WHO 2018b.)

Secondary prevention means that disease is already diagnosed, but it does not induce severe symptoms. It requires to monitor the situation regularly to stop the impairment of disease or to treat it totally. (CDC 2017) As a rule, symptoms cannot be diagnosed at doctor's appointment, although changes can be found through diagnostic methods. (Kisling & Das 2019.) Tertiary prevention is an actual treatment of disease which progressed far and requires medical interventions such as rehabilitation or screening to prevent possible complications. (CDC 2017, 1.) In this case patients usually have symptoms, which affect on quality of life (Kisling & Das 2019).

3.2 Nutrition

Prevention of type 2 diabetes is one of the most important steps to maintain health. Despite the availability of different materials about nutrition, physical activity and diseases, there are many people who suffer from T2DM and they do not always realize what to do to avoid the appearance of disease. As it was mentioned above, the prevalence of people with disorder has been growing significantly and the number of sick people will continue to grow. Therefore, it means that many people have to be educated about healthy lifestyle in

advance to escape the appearance of disease and decrease the risk for future generations. There are many factors which may contribute to T2DM such as overeating, low physical activity, wellbeing, etc. which were mentioned above. Mainly, healthy nutrition and physical activity and the methods to educate people will be discussed. (WHO 2018.) Being familiar with nutrients and its needed daily intake and meanings of each component is key to maintain healthy weight and avoid or postpone many diseases, including type 2 diabetes mellitus. It is needed to eat regularly and have 1-2 snacks a day. (Ruokavirasto 2014.) By planning meals, first of all, person should pay attention on the value of carbohydrates, fats and proteins. Person needs 45-60% of carbohydrates (4 kcal/g), 25-40% of fats (9 kcal/g) and 10-20% of proteins (4 kcal/g). (Ruokavirasto 2014, 47.) To understand the nutritional needs better visually, there are many eating plates, such as Eatwell Guide shown on image 2. It shows nutrients' necessary amount during the day and examples of foods. (GOV.UK 2016.)

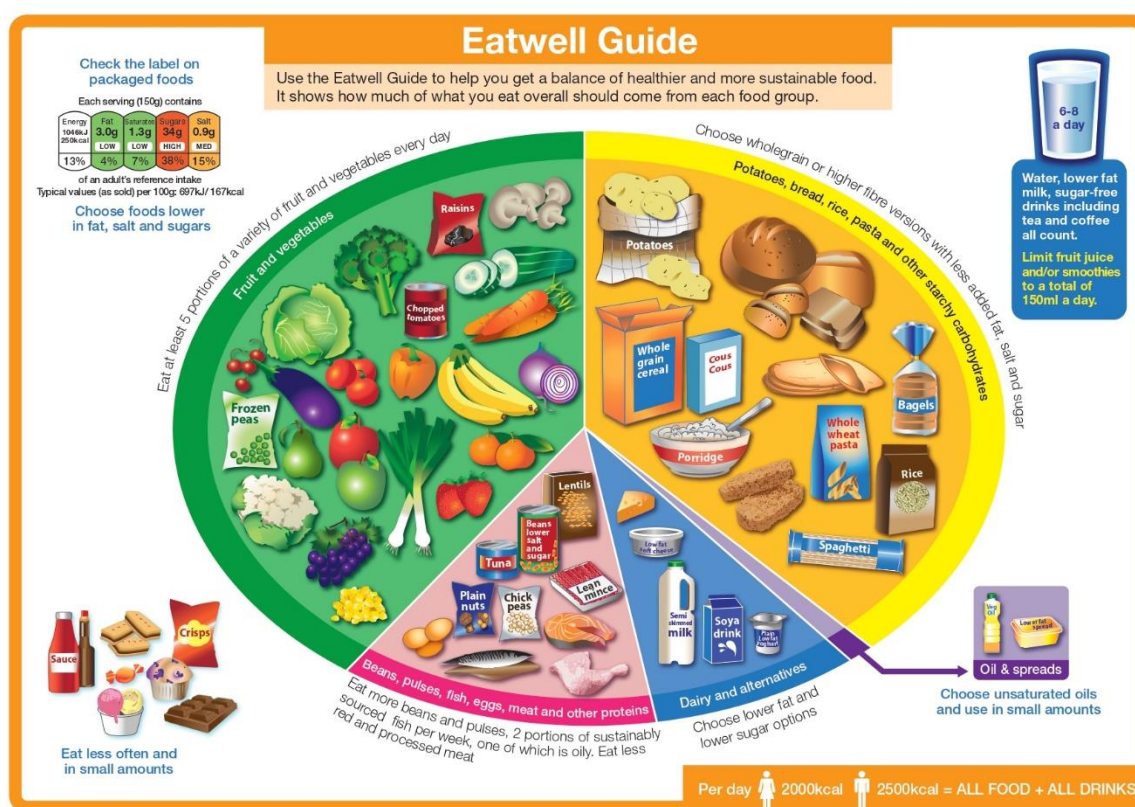


Image 2 Eatwell Guide (GOV.UK 2016)

Carbohydrates are found in from vegetables, fruits, whole grain products (e.g. pasta or bread), grains (e.g. wheat, rye, oats, etc.) and legumes. To fill up with daily intake recommendations it is advised to consume approximately 500 g or 6 handfuls of vegetables and

fruit per day. They can be raw or somehow cooked. This food group contains a lot of fiber, minerals and vitamins. (Ruokavirasto 2014.) Besides fruit and vegetables, there are other groups of carbohydrates which are rich in fiber, such as legumes and grain products. For instance, 1 dl of legumes is enough to fulfill daily needs, if person consumes enough of other groups of food. (Ruokavirasto 2014, 21.)

It is recommended to eat 19-38 g of fiber per day, depending on gender, weight and age. It has many benefits on person's health such as maintaining healthy level of cholesterol, prevention of different types of cancer, reducing the risk of stroke, hypertension and heart diseases. (Quagliani & Felt-Gunderson 2017.) Moreover, fiber intake improves the functioning of bowel (e.g. reduced risk of bowel cancer, providing gut bacteria, less constipation issues), helps to feel satiety faster and regulates the level of blood sugar (British Nutrition Foundation 2018). Due to those advantages it is easier for person to lose weight or maintain it. In Finland, to simplify the search of high-fiber products, there is a Sydänmerkki sign which means that some certain food (particularly grains) contains at least 6 g/100 g of fiber. Mainly, fiber can be found from legumes, vegetables, fruit, nuts, seeds and whole-grain pasta, bread or flour. Person who wishes to improve health by changing nutrition, should replace refined grains with whole grains to increase the daily intake of fiber. (Pusa 2019.)

Another step to improve the quality of carbohydrates is to reduce sugar intake. It is recommended to consume max. 10% of sugar for adult person. For example, if person eats approximately 2000 kcal per day, he/she should not consume more than 50 g of sugar. Moreover, WHO stated that it is beneficial to decrease the amount of sugar up 5% per day as it can provide more advantages for health. This can be followed as a further step, when person achieved the level of 10% of sugar. Person has to notice, that there is no necessity to avoid sugar which is natural in milk, fruit and berries. (WHO 2015, 2.) Fats help to improve many body conditions such as nervous system, blood pressure, eyesight, brain functioning, hormones function, kidneys function, blood coagulation, immune system, skin condition, etc. Hormones function and blood pressure are related with type 2 diabetes; therefore, it is also important to control the quality and amount of fats. Fish, vegetable oils, olives, avocado, nuts and seeds are the best sources of fat. Food such as high-fat cheese, pastries, ghee, high-fat meat, some sweets, butter and coconut/palm oils have a lot of saturated fats which have to be limited. (WHO 2018a, 2.)

Protein can be mainly found in meat, fish, sea food, dairy products, legumes and nuts. As it was mentioned above, it is recommended to consume 10-20% of proteins. Another way to measure the needed amount is to multiply 0,8 g/1 kg of protein and person's current weight. (Guoyao 2016.) To ensure that person eats enough protein, he/she should take into

account that red meat (beef, pork, lamb, processed meat) should be limited up to 500 g per week. Nevertheless, it has benefits, as consuming red meat person receives a lot of iron and B vitamins. Although, there is a risk of type 2 diabetes, if person eats too much. It is worthwhile for health, if person consumes most of protein from poultry (chicken, turkey), fish (at least 2 times a week) and plant-based proteins (legumes, soya). (Ruokavirasto 2014.)

3.3 Physical activity

Physical activity is a process of body movements where skeletal muscles are involved. Physical activity does not mean only doing sport, but it is also any activity that person does during the day. As it stated by WHO, regular physical activity is compulsory to stay healthy and prevent diseases such as T2DM. It is estimated that nowadays 25% of adults do not have enough of physical activity. (WHO 2018d.) As it shown in the image 3, adults from the age of 18 to 64 have to include sport exercises, routine activity and some hobbies into daily life. Aerobic physical activity is a main way to stay active. It includes walking, games, house work, cycling, Nordic walking, walking on stairs, swimming, running, other routine physical activities, etc. Moderate aerobics are prioritized and they should take approximately 2,5 h per week. Vigorous aerobic activity should last 1 h 15 min a week. Besides that, there is muscle-strengthening and balance trainings which have to be executed 2 times a week. for instance, it consists of strength training, dancing, balance trainings, ball games, etc. Finding favorite types of physical activity and increasing of routine movements will make easier to maintain these recommendations. (UKK Institute 2019.) Similar recommendations can be also applied for other age groups. However, for disabled people over 65 with difficulties in mobilities, it is recommended to do exercises which can prevent falls at least 3 times per week. (WHO 2018d.)

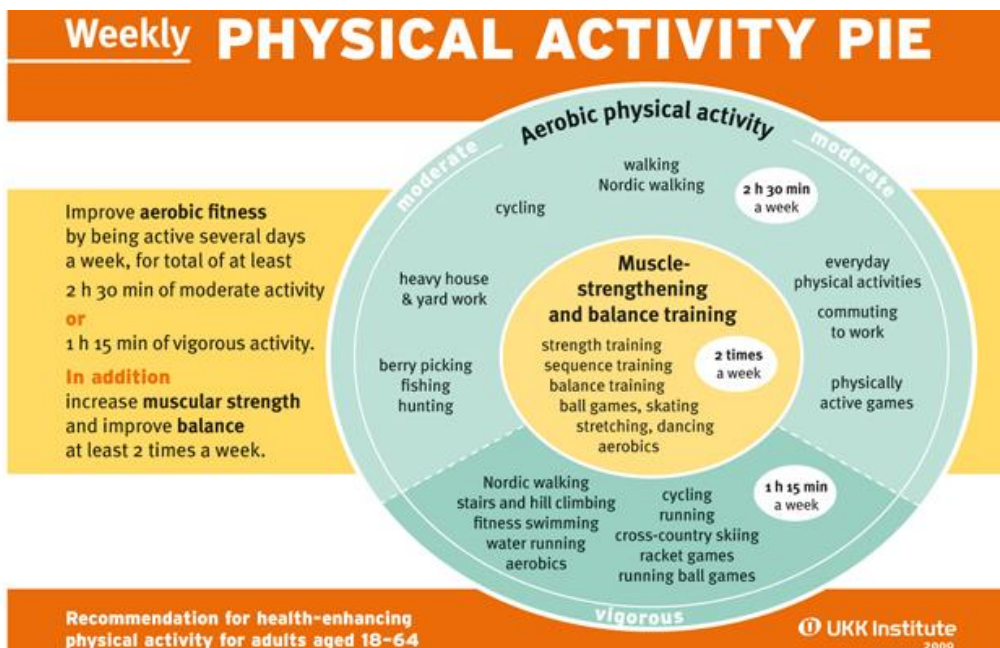


Image 3 Physical Activity Pie (UKK Institute)

Daily physical activity lasting at least 30 min per day can decrease the risk of appearance of T2DM. The effect of exercises can be more visible if they are combined with nutrition changes. (Liikunta 2016.) For example, due to regular walking person can improve the level of metabolism, blood pressure, LDL-cholesterol, glucose and weight loss (Liikunta ja tyypin 2 (aikuistyypin) diabetes).

4 AIM, PURPOSE AND RESEARCH QUESTION

The aim of the thesis is to find out the ways of primary prevention of type 2 diabetes mellitus by conducting a literature review. The purpose is to decline the appearance of disease among patients with obesity, prediabetes or gestational diabetes and to improve nurses' knowledge about their role in primary prevention of disease.

The thesis has two questions concerning the issue: How can type 2 diabetes be prevented?
What is the nurses' role in primary prevention of type 2 diabetes?

5 METHODOLOGY

5.1 Definition of literature review and descriptive literature review

To understand the principles of the thesis work, it is important to define the literature review in general and a descriptive type. Literature review is a study of a certain subject which has an overview and analysis of researches which already exist. (Aveyard 2014, 2.) Since researches, literature and guidelines in the nursing field are constantly increasing, it is beneficial to gather actual information and combine it in a logical order. Its purpose is to make clear the specific topic for readers. Furthermore, it can lead to other researches' idea in the future. (Coughlan, Cronin & Ryan 2013, 3.)

Literature review can help for readers to avoid reading a dozen of studies which for example focus on the same topic or they have a lack of information to understand the whole field of certain theme. Literature review simplifies the search of needed information, as it has a compilation of many studies which are necessary to understand the subject of interest better. Literature review is especially beneficial for health care professionals because they have to be familiar with fresh studies regularly to provide a better treatment for patients. Information, gathered from previous researches in literature review helps them to save the time. (Aveyard 2014, 4.) Descriptive literature review, also called as a narrative literature review is executed to provide the answer for questions of the thesis, by summarizing found key ideas from previous researches (Coughlan 2008, 2). This type of review is beneficial in health and social care due to its informativity (Aveyard 2014, 13).

The lack of nurses' knowledge in primary prevention of type 2 diabetes mellitus preceded to choose the topic (Severinsson & Holm 2012). The author of this thesis resolved to conduct a descriptive literature review as it is convenient for the theme of work. To refine the patients' care it is essential obtain new skills about preventative measures of the disease. The process of this method requires a detailed familiarization with the newest data about primary prevention of T2DM and it helps to enhance the skills in nursing which can be used extensively in different types of nursing work.

5.2 Inclusion and exclusion criteria

Adherence of inclusion and exclusion criteria helps to search for literature related to the main question of research. By viewing at these criteria, readers can easily understand which subjects are determined in the literature review and which ones are not relevant. By establishing inclusion and exclusion criteria, executor of research specifies the theme of the work.

Criteria is settled individually in each literature review according to the cornerstone of the thesis subject. (Aveyard 2014, 77.)

In inclusion and exclusion criteria concerning the thesis work about primary prevention of T2DM, foremost is important to concretize the type of disease. In the database search T1DM is excluded from the consideration due to the huge differences from type 2 diabetes. For the literature review recent articles from 2015 to 2020 were used to provide the analysis with the latest recommendations about prevention and prevalence data. Also, original studies were chosen as they give more convenient outcome. Only data in English language is considerable, since the studies are also in English language. Moreover, English language data usually has more information about worldwide prevalence of T2DM. The information about treatment of disease is not suitable in this case because T2DM is a chronic disease which cannot be treated totally and after-wards prevented. During the search of articles there were still many of them concerning the treatment of disease. Also, keywords such as diabetes prevention often included wrong topics such as ulcer prevention or gestational diabetes prevention. The criteria list is demonstrated in the table 1.

Table 1 Inclusion and exclusion criteria

INCLUSION	EXCLUSION
Studies published in 2015-2020	Studies published more than 10 years ago
Original studies and peer-reviewed articles	Literature reviews
English language	Other languages than English
Type 2 diabetes	Type 1 diabetes
Diabetes primary prevention	Diabetes treatment

5.3 Database search

Data search was executed from different reliable databases such as PubMed, CINAHL and SAGE. They were chosen due to their suitability for the nursing field studies. The results of the search can be seen in the table 2. PubMed is a database established online in 1996, consisting of different articles which are verified and mainly about medical topics. In the

search readers can find evidence-based literature from biomedical and life sciences. (PubMed Overview 2020.) The main goal is to improve a worldwide situation with health. To find the most applicable publications needed for thesis work, “Best Match” tool was used to sort articles in order that possibly the most suitable ones are shown at the beginning of search. This method simplified in this database the search a lot as it helped to avoid checking articles for example about pressure ulcer prevention or T2DM treatment which are not relevant for the thesis work. Sidebar filters in PubMed helped to reduce the amount of articles by choosing years of publication, removing not full available articles, type of articles, etc.

Table 2 Data search

Database	Keywords	Found articles	Used articles
PUBMED	Prediabetes nutrition, diabetes prevention guidelines, gut microbiota	656	3
CINAHL	Diabetes prevention AND nursing, primary diabetes prevention, primary care AND prediabetes, diabetes type 2 AND life style changes	134	4
SAGE	Obesity management AND nursing	57	1
TOTAL		847	8

Another database which is useful for nursing materials is CINAHL. There is access to the diversity of different articles and journals which comprises many themes useful for nurses. The search tool can be basic or advanced. (CINAHL Database 2020.) In the most of cases basic search was functional enough to find needed materials. After typing and searching the keyword it is suggested to choose the year range, full text availability, type of source, subject of article, language, etc. The main difference in advanced search is that besides one key word, person can put few other ones in the same search. It can be beneficial, if it is needed that few topics are included in one article.

The last database SAGE has many differences in varieties of available studies and its search. It has very different disciplines from business and engineering to nursing and health sciences. The search was conducted from nursing and health science areas. There are two methods to find the literature. In the first one is needed to choose the subjects which are represented in alphabetic order or to type the necessary subject in the search area. The second method is similar to the previous databases, where are also chosen years of publications and type of literature. Besides that, it is possible to choose the subjects which are used as categories in the first method. In the case of this thesis work, the article for analysis was found from the Western Journal Of Nursing research. Research articles were chosen as a criteria for data search.

5.4 Thematic analysis as a method

Among all analyzing methods, thematic analysis is the simplest one to implement during research process. It functions as a basic method because it does not need too deep investigation about some specific subject. (Javadi & Zarea 2016, 2, 7.) In the nursing research this method has been extensively applied, although there is no strict rule about conducting it yet (Vaismoradi, Turonen & Bondas 2013).

Thematic analysis has six stages of its implementation. It includes acquaintance with the data, coding, searching for themes, themes' scrutiny, definition and naming execution of themes and finally summarizing of gathered data by writing a report. In other words, the process of analysis starts with familiarization of data and its careful reading to understand it correctly. (Clarke & Braun 2013.) After that, the next stage is to implement coding by doing groups of found data (Javadi & Zarea 2016, 4). When codes are ready, it is needed to search the themes from them. The themes of this thesis work are illustrated in the table 3. Those themes have to be reviewed with its explanations and given names to them. As a

final stage, written report has to be done. It requires to be an analysis where readers can understand the process and outcomes of analysis. (Clarke & Braun.)

Nowadays the prevalence for primary prevention of type 2 diabetes mellitus researches has been noticeable growing. Even though, there was complications with relevance of articles, as there are not many studies conducted about nursing role in primary prevention of T2DM. As it was mentioned above, there are 8 chosen articles for the analysis. However, first there were more articles, but in the process, it was decided that they are not suitable for the topic of analysis and one other article was found instead. Articles' hallmark had to be the subject concerning T2DM primary prevention and nurses' role about it. After reading of all the articles, there was a list of codes which were modified into themes. Nevertheless, some codes were not answering the question of the thesis and therefore, they were excluded from the further analysis. After coding, the author familiarized with key moments from articles for every theme. After careful reading of articles, there was found three main themes for analysis. Subsequently, the written report about articles was executed. The first theme "Methods for T2DM primary prevention" introduces to readers how the prevention of disease can be succeeded. Based on the studied articles, codes were made for this theme, demonstrating that constant lifestyle changes are mainly needed to postpone the disease onset. For the theme "nurses' tasks" it was important to find the information from articles about the different types of interactions with patients that help to control the health of patient. "Nursing qualification" theme contains the information about necessary skills for nurses, which they usually obtain as an extra education.

Table 3 Main themes and codes

Main themes	Codes
Methods for T2DM primary prevention	sustained weight loss; behavior change; being physically active; lifestyle intervention by changing habits consistently; workplace interventions; smoking cessation; stress management;
Nurses' tasks	group and/or individual patient health education; community-based adaptation; nutrition principles; goal setting; written resources for patients;

	nutrition primary care by its assessment, intervention and monitoring; FINDRISK; gut microbiota improvement;
Nursing qualification	trained dietitian nurses (learning to give nutrition advice, check height, weight and waist circumference); nurse takes the lead for lifestyle advice with the GP (general practitioner) in a supportive role;

6 RESULTS

6.1 Methods to prevent the onset of T2DM

Article has shown what kind of interventions patients have to do to prevent type 2 diabetes. Besides dietitians' and nurses' guidance, they have to improve many lifestyle habits on their own. Even though, many studies show some improvements and delay for T2DM diagnosis, in real life there are still challenges in primary care settings to help patients to manage with risks. In the study conducted by Coppell et al. it is suggested for patients to lose 0.5-1 kg per week, be physically active at least 30 min per day, improve eating and check HbA1c. After 6 months program, patients did not have significant outcomes. For instance, 65% of patients lost some weight and only 18% managed to lose at least 5% of extra weight. Also, there were small decrease in waist circumference, HbA1c and BMI from 35.1 to 34.5. Intervention lasted 6 months. After receiving the help from primary care nurses, many patients were thankful about help provided for them. Many people enjoyed being in a group of people because they felt that they are not alone and there are other people who have similar issues. However, some people stated that they felt unpleasant to share their experiences with others and therefore they have not completed the intervention program. After the sessions, many patients noted that there were not enough appointments, thus some people lost their motivation to lose weight. More meetings or phone calls from nurse were suggested. (Coppell et al. 2017, 2,4,8-10)

In reference to study of Gilis-Januszewska et al., it is stated that better weight loss is possible in population groups such as elderly people or people in high risk of developing T2DM. It is stated that also lower budget lifestyle is not obstacle for successful weight loss. As a result, 23.4% lost $\geq 5\%$ of weight and many of those people set 4-5 goals such as physical activity and control of fat consumption. (Gilis-Januszewska et al. 2018, 2,3) In the studies about the linkage between gut microbiota health and T2DM risk, it was found that elderly obese people with T2DM risk can decrease their chance of disease onset by improving diet and therefore gut microbiota protects from disease. It is needed to consider, since weight loss by reducing calories can be often dangerous and even lead to death. (Díaz-Rizzolo et al. 2020, 524,530.)

In other interventions, where people had help from an occupational health nurse, patients had physical activity 3 times a week during 16 weeks. It was done because workers did not have enough time and skills to maintain healthy daily routines and during intervention, they had education about dieting, physical activity and health in general. In average, workers decreased BMI from 28.24 to 26.61. (Sok, Kim & Park 2019, 732,736,738.) In studies about

worksite settings, the positive outcomes were more prevalent among women and those people who had individual interventions. It was stated, that female participants were concerned more about their own health. Therefore, there was a 0.20% decline in glycated hemoglobin and fasting glucose. (Shrestha et al. 2018, 39.)

In studies about prediabetes treatment, it is demonstrated that both individual and group interventions have been beneficial for patients. Although, individualization for each patient is an important factor in successful weight loss. (Early & Stanley 2017, 349.)

In the research concerning the issue of T2DM risk among adolescents, there were 2 groups of people. One of them received individual education, another had a group one. Results showed that participants of both groups made changes in lifestyle, however only students from group intervention increased their physical activity. Moreover, it is noted that in both groups there were adolescents who were not motivated at all to make changes. However, participants enhanced their knowledge about risk factors contributing to type 2 diabetes mellitus. (De Moura et al. 2015, 25, 28,29.)

6.2 Nurses' responsibility for patients with high risk of T2DM

Patients who are at risk of T2DM can attend different type of educational programs concerning diabetes prevention. In the article of Coppell et al. it was found that patient education was helpful for patients as they appreciated the effort from nurses, even though the weight loss was not significant. In these studies, it was suggested before group appointments to have private meetings to assess diet of patient, set goals and give advice about nutrition. Moreover, nurses encouraged to participate with family members. Primary care nurse checked the budget of family, food choices and did measurements such as height, weight and waist circumference. After that patients also had meetings 3 weeks later, then after 3 and 6 months. All the educational interventions were executed by nurse. During appointments patients were provided with information about nutrition from magazines, pamphlets, posters, etc. Group intervention courses were done once a week lasting 1-1.5 h within 6 weeks. (Coppell et al. 2017, 3.)

In the article where different studies about diabetes prevention were collected, in some of them nurses took a role in helping to patients. In one of the studies there was a certified diabetes nurse and, in the meetings, people learned about nutrition, lifestyle changes and also improving the level of cholesterol, HbA1c and blood pressure. The appointments were organized with a group of people who are at risk. In other studies people had individual interventions where an educated nurse asked patients about their possible reasons of

weight gain and their lifestyle. Together they tried to set goals such as diet and physical activity and achieve them within 6 months. For instance, occupational health nurse advised to increase the intake of vegetables, fruit and dairies. Another counseling was also individual and patients were trying to enhance eating habits, physical activity, quit smoking and reduce the stress. The duration of program was 18 months. (Shrestha et al. 2018, 36-38) In other study, trained nurses had an aim to focus on losing weight more than 5%, different eating habits such as eating less saturated fat, total fat and increasing amount of fiber from vegetables, fruit, cereal and additionally they encouraged to do regular physical activity. (Gilis-Januszewska et al. 2018, 2.)

Based on the article, there are many factors of patients' background and health which have to be taken into account for successful prevention of T2DM. In the study where nutrition therapy for people with prediabetes were executed, registered dietitian nutritionists organized an individual treatment plan for each patient. To participate in nutrition therapy, patients were chosen by screening tool named American Diabetes Association Type 2 Diabetes Risk Test. The next step is nutrition assessment where nutritionist checks the level of glycemia, lipid and blood pressure risk factors. Other factors that have to be assessed are nutrition, physical activity, food security, medications, supplements and anthropometrics. Besides, there are important background circumstance which can lead to T2DM such as depression history, corresponding environment and socio-economic status. After assessment, registered dietitian nutritionist prescribes an eating plan, where its main goal is to lose weight, particularly if person is overweight or obese. Nutrition plan should be individualized, for example according to medications and its interaction with food. Also, nutritionist encourages patients to include fiber and whole-grain foods into diet and be physically active. At the end of therapy, they check from patients anthropometrics, dietary factors, physical activity, glycemia, lipid profile and blood pressure. (Early & Stanley 2017, 346.)

Results of the articles have shown that to guide patients for preventing T2DM, nurses are educated about basics of nutrition, obesity and diabetes. Nurses have possibilities to provide guidance for people in different ways. For instance, for some workers who have little time to be physically active or cook healthy food, occupational nurse was educated to manage the obesity during the working time. However, health promotion at worksite concerning obesity issue is not prevalent yet. (Sok, Kim & Park 2019, 732,737,738.) Besides that, there is a health care in primary health care centers where patients attend to group or individual meetings at their free time. This case was found in one of the articles, describing the effectiveness of nurses in prediabetes treatment. Nurses working in primary care attended 6-h theoretical and practical studies where they found out the basics of nutrition, dietary assessment and how to set goals with patients. Also, they practiced to measure weight, height,

waist circumference and anthropometry. In the nutrition studies nurses learned about food choice aspects, how culture affects on eating and behavior change. Nurses were taught that factor leading to successful weight loss is a proper communication with patient. Course was provided by dietitian, who controlled nurses' progress once a month as well. (Coppell et al. 2017, 3,4.) In the research article conducted by Gilis-Januszewska et al., it is described, that certified nurses in diabetes prevention worked with patients who have risk factors leading to T2DM. Those patients were chosen by FINDRISK questionnaire. (Gilis-Januszewska et al. 2018, 2.)

The results from article demonstrate that in general, the feedback was positive. After working with patients, nurses were interviewed about experiences of program and what has to be improved. They were encouraged about their new tasks and highly-responsible about attending courses. They have done their roles properly, also it was controlled by dietitian and liaison nurse. Nurses managed to learn the theory, although they did not always have enough time due to their other responsibilities at workplace. Primary care nurses received good enough guidance from dietitian and found themselves enjoying to work with patients to treat the prediabetes. The relationship between nurse and patients were quite trustful. Nevertheless, some guidance from dietitian to nurses in some cases was too directive, not considering details about different patients' details. Also, it was stated that intervention between workers and patients has to be more intensive to succeed better in weight loss. In spite of having a positive outcome and nurses' suitability for such programs, many of them claimed that they did not enough knowledge about nutrition principles. (Coppell et al. 2017, 5,6,9-12.)

7 DISCUSSION

7.1 Findings

Results from found literature demonstrate that primary prevention concerning type 2 diabetes mellitus has many inaccuracies and challenges to implement it in real life. Both nurses and patients have misunderstandings during the process. The efficacy of disease cannot be enhanced enough due to lack of nurses' knowledge about T2DM and how to postpone it with healthy diet and physical activity. Different interventions with patients such as group or individual education show that patients indeed become more educated theoretically about the issue.

However, many results of found literature show that people attain only slight changes in weight loss or even lose motivation for improving their health. Despite of small effect during interventions, many patients are still thankful about effort and they shared different feedback which can possibly lead to the further improvements in primary prevention of T2DM. Both patients and nurses claim that more regular meetings with can help to maintain the progress in weight loss (Coppell et al. 2017, 10). Lifestyle interventions are applicable for many population groups. Consideration of budget, age and daily routine of patient can lead to success in primary prevention of type 2 diabetes. For instance, it is often challenging and dangerous for aged people to lose weight safely. Nevertheless, knowing that gut microbiota affects on health, including the risk of T2DM, can contribute to results as good, as it could be achieved in some other cases (Díaz-Rizzolo et al. 2020, 524). According to results, patients have different outcomes in prevention due to their own preferences. Some people succeed more when their work with those who have the same situations, other ones prefer to progress individually. However, in both cases patients have to be considered individually due to different backgrounds.

In the most of the cases nurses were controlled by nutritionist or dietitian. At the moment patients get advice about T2DM prevention mostly from the specialized centers or research groups who provide interventions to decrease the risk of disease onset. Those nurses who have regular work tasks usually do not have enough time or they are not educated at all about prevention of diseases and its importance. Therefore, nurses' role is still underestimated and has to be increased in the future. Those nurses, who are educated about prevention and basics of nutrition, have a vast range of tasks which have an impact on patients' health at some point. During sessions nurses helped to improve nutrition and increase physical activity, gave different pieces of advice, set goals together with patients. Studies have shown that for nurses it was important not only to make basic tasks, but also to analyze

what could make patients gain weight and what life circumstances at the moment could improve the situation. Family and friends were welcome to motivate patients and observing patients' habits could help to make the process of changing lifestyle less stressful. For example, knowing what patient prefers to eat can help to make a diet plan better, because person will still have his/her food preferences, but in a manner that they are cooked healthily. To execute such interventions, it is compulsory for nurses to get extra education concerning primary prevention. (Coppell et al. 2017, 5-10.)

Nurses who were qualified about T2DM work mainly in primary health care centers or they are occupational nurses. Nevertheless, there are not enough studies about prevention of diseases in work environment, since that there is a limited amount of workplaces where they provided a possibility for lifestyle interventions. (Sok, Kim & Park 2019, 738-739.)

Nurses were educated about the basics of nutrition, measurements for following the progress and also, they learnt about behavioral aspects which affect on success of prevention intervention. Without a proper goal setting, mental support and patient's self-motivation, it is impossible to prevent the disease successfully for a long period of time. Although many nurses are satisfied with quality of education that they obtained, many studies show that interventions do not give often give the results which were planned beforehand. One of the reasons about low results can be that dietitians who give guidance to nurses, do not consider the details about patients since they do not know much about them. Results show that intervention between nurse and patient should be more intensive, in order that there is still motivation to improve the health. (Coppell et al. 2017, 6-10.)

7.2 Ethical considerations

The main principles of ethics such as accuracy of information, reliability and anonymity are considering during the execution of the work. TENK national guidelines give a main information about ethical principles in Finland and its significance to follow them in universities of applied sciences. (TENK 2019.) Since that, guidelines of LAB University of Applied sciences were also taken into account during implementation of the thesis.

The executor of this thesis work is informed with the meaning of ethical considerations and its principles. Guidelines, particularly from TENK are properly studied to ensure there is no ethical risk during the thesis process. The writer of the thesis is acquainted that every committee has own responsibility upon the work. The supervising teacher has been following the process of thesis according to instructions and helped to avoid possible inaccuracies. Scientific writing was followed during the process of writing. The author of thesis is

acquainted with the material data about the topic of work. The theme was chosen according to the convenient studies at university of applied sciences. The author consulted with coordinator teacher about the suitability of topic before the start of process. The applicable resources were discussed with the supervising teacher. Avoiding plagiarism is another important issue about ethical principles and the rules about it were followed. (ARENE 2018, 1-3, 8.)

The results of the literature analysis are shown from the nursing perspective. The main purpose is to try to find possible solutions how nurses can possibly improve the quality of health care, concerning health issues such as type 2 diabetes risks. It is important to pay attention that nurses have to understand difficulties in prevention and apply the knowledge for patients carefully and without judging.

7.3 Trustworthiness

Trustworthiness of the thesis work means that it is executed with usage of validity and reliability principles. It is possible to ensure that thesis work is valid if previous researches were taken from reliable and good reputation sources. However, person who writes a thesis should also read the material carefully to recognize if needed some inaccuracies (Oliver 2012, 71). Although, through the Internet nowadays there is a possibility to find a vast amount of information, but the system of literature search is chaotic. (Gerrish, Lacey & Cormack 2010, 66.)

The principles of validity and reliability are considered during the execution of the thesis work. During the process of thesis conduction, writer has used only reliable medical sources. It means that the data which was gathered is recommended to use for medical staff, students and people who are looking for reliable information. The author has been accurate with literature used for analysis, in order that all information is interpreted correctly and mistakes are avoided.

The process of thematic analysis was executed accurately by following the concepts of trustworthiness. It consists of criteria such as credibility, transferability, dependability and confirmability. These terms were suggested by Lincoln and Guba. In terms of this thesis work, credibility means that the analysis and its data were obtained from reliable sources and critically checked. Transferability of analysis shows that the gathered data is suitable for the purpose and aim of the thesis work. By following the concept of dependability, it can be stated that findings from analysis are compatible and connected with the data. Confirmability as another trustworthiness criteria, demonstrates that the findings have the results

concluded from the collected data, but not due to own opinions or interests of the thesis writer (Amankwaa 2016, 121).

To simplify the data search for analysis, inclusion and exclusion criteria were applied in order to avoid the studies which are not relevant for the thesis question. In the first stage of search there were many combinations of key words, all of them were related to the theme of thesis, but still there were many inaccuracies in search results. Final key words helped to avoid the studies which for instance cannot be related with nursing, even though they are about the topic of thesis work. However, in some cases there was still a huge number of articles which were not related to the topic. It can be explained that many studies had few themes and at least one of them were irrelevant for the analysis. Although, the topic of the thesis work is in general common, there are little studies which can be related to the nursing role and therefore there were some issues and lack of materials for the execution of the analysis. Despite that, following the criteria for convenient articles for analysis was primarily considered.

7.4 Conclusions and further research

As it is demonstrated in this thesis work – the prevalence of type 2 diabetes mellitus has been dramatically growing and it is estimated that the number of diagnosed cases of diseases will be more enormous. There are many risks factors affecting on the diabetes onset, however most of them are preventable by person himself. Nowadays environment plays a vital role on people's choices and life circumstances. Industry development, less physical activity and stress has a negative affect for health. The first stage consequence is usually overweight and its issue is not always contemplated as a serious as not everyone realizes that obesity predispose to many diseases. One of the most common ones is T2DM. Due to huge prevalence of disease between every age groups, this topic is considered to be often discussed in researches to stop the growth of disease. In spite of that, it was still challenging to find relevant literature, mainly because the prevalence of disease developed quite recently. Also, there was less of needed materials due to inclusion and exclusion criteria which narrow the search results. Nonetheless, the number of studies about primary prevention of T2DM will apparently grow, since the issue is actual.

The role of nurses in primary prevention has to be influential. Although they are provided with strong theoretical knowledge, particularly about prevention, but they do not use much the skills in reality. Usually nurses do their straight tasks which are planned by doctor, but do not always see the possible risks for some disease. Findings show that it is problematic

for nurses to help patients during their worktime. In those articles, where nurses provided educational programs for people with type 2 diabetes risks, it was stated that outcomes were not that often as good as it was planned beforehand. In the literature it was claimed that the role of nurse in primary prevention of T2DM is not prevalent worldwide yet, except those studies where nurses were prepared to do it deliberately. In articles used for analysis it was suggested that there is a necessity for significant measure in prevention of T2DM.

At the moment nurses can start themselves to improve the situation. They can improve a theoretical knowledge about type 2 diabetes risks factors and basics of nutrition, physical activity and behavioral factors. Later on, there should be more possibilities for primary prevention of disease, leaded by dietitians, nutritionists and psychologists. In this case the role of nurse should be is a person who approaches patients regularly. The capacities should not be confused with dietitians or nutritionists. Although nurses have to know the basics of nutrition and diabetes, but their task should be being on the same level with patients, in order to see the progress of weight loss, help mentally and understand what has to be improved still. In the studies there was not much discussion about mental support, whereas it is an important aspect for a successful weight loss and long-term prevention for disease. Giving only direct instructions for changing lifestyle can give a progress for a period of time, but patients can lose motivation because there can be still some factors which contribute to sedentary lifestyle and overeating. The help of psychologists can be helpful for patients.

The process of diabetes prevention is a group work. It means the work between patient, nurse and specialists and sometimes additionally other patients who have the same problem. Family members and close people can also impact positively. Nevertheless, as it is shown in studies, individualization for each person is important, since everyone has different reasons of having diabetes risks and solution for every person can be different, depending on personality and habits. In this case the work of nurse can be meaningful as he/she can have regular private guidance and has basic skills from different fields.

The thesis work can be used for further researches. To achieve needed goals the author suggests different investigations in future researches. It would be beneficial to conduct studies about possible changes in bachelor nursing programs, in order that nurses obtain a deeper knowledge about primary prevention and its significance, common preventable diseases such as T2DM and how to provide it to patients in real life. The improvements in diabetes prevention could be also achieved, if there would be additional study programs for nurses where they can specialize for primary prevention and work in this sphere where they can help patients directly. Another useful subject of research could be focused on how

nurses can be connected with dietitians, nutritionists or psychologists to attain better results for patients.

Patient is first of all responsible for his/her consequences which can lead to T2DM. However, it is not always possible that person can handle alone with the issue. In real life, special programs for weight loss and disease prevention are not available for many people. In this case nurse can be one of the first people who recognizes that there is a risk for disease. Nurse can encourage patient to change a lifestyle and also try to deal with dietitians and psychologists to solve the problem. Statistics about the prevalence of common diseases such as type 2 diabetes mellitus, justify that primary prevention will be a significant part of medicine where nurses will have a role of person who identifies the symptoms of possible disease.

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APPENDICES

Appendix 1. The summary of articles

1.

Reference: Shrestha, A., Karmacharya, B. M., Khudyakov, P. et al. 2018. Dietary interventions to prevent and manage diabetes in worksite settings: a meta-analysis

The objectives of articles: To gather the data about interventions in worksite settings and its effectiveness to decrease the blood sugar.

Methodology: The search for articles about workplace interventions from 1969 to December 2016 in different databases.

Results: 17 articles out of 1663 were chosen for meta-analysis. The outcomes were more positive where there was a bigger number of female participants and for those who received an individual guidance.

Conclusion: Dietary interventions in worksite can be considered as effective for prevention of diabetes. It is important to mention for future interventions that men need more guidance.

2.

Reference: Early, K. B. & Stanley, K. 2017. Position of the Academy of Nutrition and Dietetics: The Role of Medical Nutrition Therapy and Registered Dietitian Nutritionists in the Prevention and Treatment of Prediabetes and Type 2 Diabetes

The objectives of articles: To examine the level of efficiency of medical nutrition therapy and registered dietitian nutritionists in the prevention and treatment of obesity, prediabetes and T2DM.

Methodology: Analysis of research concerning the efficiency of medical nutrition therapy and registered dietitian nutritionists.

Results: Individual and group interventions show a positive progress, however individualization plays also a vital role in successful prevention/treatment of T2DM, obesity or prediabetes.

Conclusion: Medical nutrition therapy is considered to be effective.

3.

Reference: Díaz-Rizzolo, D. A., Kostov, B., López-Siles, M. et al. 2020. Healthy dietary pattern and their corresponding gut microbiota profile are linked to a lower risk of type 2 diabetes, independent of the presence of obesity

The objectives of articles: To understand how the gut microbiota condition can affect on development of T2DM for elder obese and non-obese people.

Methodology: A cross-sectional studies in three primary care centers from 2014 to 2016. 182 males and females over 65 years old were chosen to participate. Their glucose level is between 100 and 125 mg/dl. They do not have a diagnosed T2DM. Those who participated in educational programs before, took antidiabetic drugs or had prescribed antibiotics, were excluded from studies.

Results: Obese people have a high risk of diabetes onset. Also, it was found that prediabetes has a negative impact.

Conclusion: Healthy diet helps to improve the amount and quality of bacteria in the gut and therefore, aged people can decline the risk of T2DM without limiting the calorie intake.

4.

Reference: Ackermann, R. T., Liss, D. T., Finch, E. A. et al. 2015. A Randomized Comparative Effectiveness Trial for Preventing Type 2 Diabetes

The objectives of articles: Evaluation of the weight loss effectiveness for the Diabetes Prevention Program.

Methodology: Starting from July 2008 until November 2010, 509 obese or overweight people with low incomes were chosen. They were over 18 years old with BMI>24 and at least one blood test (fasting plasma glucose, 2-h post-load glucose or HbA1c) that proves the risk of T2DM development.

Results: 161 people completed one or more lessons and 103 completed 9 or more lessons. Those who attended 9 or more lessons lost in average 5.3 kg.

Conclusion: Low-income adults managed to succeed to lose weight.

5.

Reference: De Moura, I. H., E Silva, A. N., Dos Anjos, J. S. et al. 2015. Educational strategies with adolescents at risk from diabetes mellitus: a comparative study

The objectives of articles: To see if adolescents have enough knowledge about risk factors for type 2 diabetes mellitus.

Methodology: Adolescents were chosen for a comparative and intervention study from 2011 to 2012. 60 adolescents, both males and females from two different schools participated in educational intervention. Their age is between 11 and 19 years. Those who at least one risk factor predisposing to T2DM such as being overweight, low physical activity, high blood sugar, high waist circumference and low-quality diet were included for the intervention. Students were divided into groups GA and GB. The first group was meant for individual educational interventions and the second for group one.

Results: In both groups adolescents improved their knowledge about risk factors of type 2 diabetes. However, only in group GB students managed to increase the level of physical activity. Some children failed to progress due to lack of motivation for improving lifestyle.

Conclusion: Both educational interventions for T2DM prevention are beneficial to use in schools in the future. In general, it is deemed that lifestyle changes should be promoted in different schools to improve the health of population.

6.

Reference: Gilis-Januszewska, A., Piwonska-Solska, B., Lindström, J. et al. 2018. Determinants of weight outcomes in type 2 diabetes prevention intervention in primary health care setting (the DE-PLAN project)

The objectives of articles: To find what can influence on successful weight loss in order to prevent type 2 diabetes with lower budget in a primary health care center.

Methodology: The studies were commenced by the DE-PLAN project (Diabetes in Europe: Prevention using Lifestyle, physical Activity and Nutritional intervention) in Primary Health Care General Practitioners' practices. 175 participants with high risk of T2DM were chosen by FINDRISC scale. Educated nurses performed a ten months intervention. The goal is to lose ≥ 5 kg of body weight by improving nutrition, adding physical activity and motivating people to change their lifestyle.

Results: 23.4% of people managed to lose ≥ 5 kg. Those participants added 4-5 new habits for healthy lifestyle. Regular physical activity helped to decrease the fat consumption.

Conclusion: It is important to understand patients' behavior to prevent the factors which can impede the weight loss in further studies. There should be an insight why some people succeed to lose weight, but others do not.

7.

Reference: Coppell, K. J., Abel, S. L., Freer, T. et al. 2017. The effectiveness of a primary care nursing-led dietary intervention for prediabetes: a mixed methods pilot study

The objectives of articles: A pilot study about lifestyle intervention for people with prediabetes by nurses. Its aim is to inspect how primary care nurses with help from dietitian can manage to prevent T2DM during 6 months.

Methodology: A 6 months non-randomized pilot study with a convergent mixed methods design, where thematic analysis was used as a method. Patients were with diagnosed prediabetes, non-pregnant from 18 to 70 years old with BMI ≥ 25 kg/m². They were divided into control group and intervention group. Participants had four educational interventions implemented by a primary care nurse.

Results: 157 participants were chosen for the study, where 85 were in intervention group and 72 in control group. First group in average lost 2.2 kg, however second one gained 0.8 kg. 65% of participants from intervention group lost some weight and 18% lost 5% or more. Comparing to that, in control group it was 32% and 5%. During study 4 participants from intervention group and 8 participants from control group were diagnosed with type 2 diabetes. In general, the experience of intervention was positive both for primary care nurses and patients.

Conclusion: The study proved the effectiveness of primary care nurses' guidance to treat prediabetes and therefore to prevent the onset of T2DM. Moreover, participants and nurses had trustful relationship which led to better results. In general weight loss was not significant, but it improved patients' health at some point. Experience showed that interventions should be more regular for better results in weight loss.

8.

Reference: Sok, S. R., Kim, O. S. & Park, M. H. 2019. Effects of Obesity Management Program Provided by Occupational Health Nurse in Worksite

The objectives of articles: To explore if a 16-week program for obesity men at worksite, executed by an occupational health nurse can be effective. The tasks of nurse include improving the quality of nutrition, increasing physical activity and change the quality of life.

Methodology: A non-randomized pretest and posttest study by occupational health nurse intervention. 60 male participants were chosen.

Results: After intervention program men demonstrated general improvement in eating habits, physical activity and quality of life. Body weight from 86.3 kg decreased to 80.64, BMI decreased from 28.24 to 26.61.

Conclusion: Obesity management program showed positive results for male workers and considered to be beneficial for using it at worksite.