



# **Lifestyle interventions and nursing interventions for type 2 diabetes**

**A literature Review**

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**Abstract**

Type 2 diabetes gradually become a major non-communicated disease in the world. Typically, patients who have type 2 diabetes choose the self-care methods to delay it. But sometimes they need accurate lifestyle interventions and professional nursing interventions for type 2 diabetes.

The aim of this literature review was to explore the useful lifestyle interventions and nursing interventions for type 2 diabetes. The purpose of this research was to enhance lifestyle interventions and nursing interventions for type 2 diabetes.

This article was proceeded as a literature review, and it retrieved from PubMed and CINAHL databases. Ten articles were selected for literature review. Using inductive content analysis to review the ten articles.

In this literature review, health habit support and obesity management were found as effective lifestyle interventions for type 2 diabetic patients. Patient education and medicine administration were found as useful nursing interventions for type 2 diabetic patients.

In conclusion, the lifestyle interventions such as obesity management and nursing interventions such as educating, medicine administration are both effective for type 2 diabetes. Sometimes, it will achieve better result when the kinds of interventions have a good combination. It is the cornerstone of all the kinds of treatment therapy.

**Keywords/tags (subjects)**

Type 2 diabetes, Lifestyle interventions, Nursing interventions

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# 1 Introduction

The people who have diabetes increased to 422 million in the last few decades. The low-developed and middle-developed countries have the highest prevalence. Type 2 diabetes gradually became the one of top 10 diseases which cause 1.5 million people death in 2019. Meanwhile, it is also decrease the type 2 diabetes patients medical insurance fee and work wages (CDC, 2022).

Type 2 diabetes accounts for a large proportion of diabetes types. Majority of people with diabetes have type 2 diabetes all over the world, nearly 5% percent is type 1 diabetes or others. The adult and aging people have more possibility to suffer type 2 diabetes. But in recent years, it generally developed in preschooler and teenagers (CDC, 2022). The cases have risen significantly from 2000 to 2016. The type 2 diabetes patients always have similar symptoms with other diabetes or no symptoms in a long time, so it is hard to find it during many years (WHO, 2021).

Majority of the onset and development of type 2 diabetes are largely the result of obesity and unhealthy diet. So, patients can manage type 2 diabetes in daily life. For instance, patients can have a healthy lifestyle. It plays an important role on preventing type 2 diabetes. It entails daily diet, physical activity, forbidding smoking. Type 2 diabetes also can be cured with diet, physical activities, regular screening, and drugs. Along with the growth in type 2 diabetes prevalence, there is increasing concern over how to proceed with life changes correctly and which situation should add nursing interventions timely. It is a challenge not only for patients who have type 2 diabetes, but also for the nurses and other healthcare workers (WHO, 2021).

Lifestyle change is a common but very essential way because it does not have any adverse effects or other drug interactions. Meanwhile, it is convenient for patients because any different age people can do it at any times, but if people glucose is too high to control by themselves, they must get nursing interventions by nurses according to the doctor's instructions. So, it is important to use this way, and sometimes it is very essential to use nursing intervention. If patients want to have a good effect, it is important for them to receive the combination of lifestyle interventions and nursing interventions treatment (Knowler et al., 2018).

## 2 Type 2 diabetes

### 2.1 Definition of type 2 diabetes

Type 2 diabetes has been admitted universally that it is the common disease which can often happen in adults and aging people. This disease means that pancreas have some problems. The result is that pancreas cannot manufacture sufficient insulin, so the body cannot use insulin effectively and continuously. There can also be insulin resistance in the body tissues, it will cause glucose level raise up a lot in the body. Majority of patients almost feel fatigue and increase of hungry, sometimes their weight loss a lot. They always feel very tired even though they do not do much work. It also led to increase patients desire for drinking water, and patients will drink a lot of water but still feel thirsty. When the situation become worse, they will also suffer visual disturbances (WHO, 2021).

Diagnosing diabetes requires one of the following measurements is met. One criterion is the result of fasting blood glucose test whether more than 7 mmol/L or not. Fasting glucose test which means patients cannot eat during 12 hours before blood test. Another criterion is that if patients' measurements of blood glucose with results 11 mol/L during the 2 hours. In oral glucose tolerance test, patients should not eat anything after night, and patients' blood sugar level are tested. If the patients have some symptoms such as thirsty, weight changes, a single measurement more than 11mmol/L is sufficient for diagnosing diabetes (WHO, 2021).

And type 2 diabetes can be treated with pharmacology treatment and non-pharmacology treatment, such as medication, insulin, and lifestyle changes, depending on personal situation. Medication refers to the metformin. It is oral medication. It is the first line of drugs in the treatment of type 2 diabetes. It can reduce glucose levels by decreasing purpose of treatments is to prevent high blood sugar to cause further organ damage and relax symptoms to avoid severe cardiovascular disease (Asif, 2014). (Masuo, 2013) identified that people can maintain their blood sugar level by achieving diet-balance, good combination of physical therapy, drug therapy and reducing weight. These ways can prevent diabetes effectively. For example, people can eat low-sugar, low-calorie, low-fat food at three meals and take Vitamin D.

Non-pharmacology treatment refers to some interventions which do not need the medicine use to treat disease. It also means that patients need to adjust their lifestyle in the daily life. For examples, high fiber food is effective non-pharmacology treatment of maintain glucose level. In addition, a cause for the growing prevalence of type 2 diabetes and its associated diseases is a reduction in daily physical activity performed by people over the past decades. Weight management also play an important role on type 2 diabetes prevention. Most of the onset and development of type 2 diabetes are largely the result of obesity , un-healthy diet and lack physical exercise (WHO, 2021).

Metformin is the first choice of the type 2 diabetes pharmacology treatment medicine. Doctors also recommend the other drugs to have a good combination with Metformin. Typically, type 2 diabetes do not use the insulin at the first time because it will have severe side effect. But it will be needed if other drugs are not useful (CDC, 2022).

## **2.2 Lifestyle interventions for type 2 diabetes**

Lifestyle interventions mean that any intervention that included physical exercise, diet, and at least one other factors. Type 2 diabetes is a long-life effecting disease, it means that it can be delayed and treated by lifestyle interventions. Indeed, the effect of lifestyle interventions have proved successfully at reducing the prevalence of Type 2 diabetes from 58% to 28.5% in Europe and Asia (Masuo, 2013).

Above 90% of people with type 2 diabetes are obesity. Obesity is one of the most important risk factors in the prevention for type 2 diabetes because it will cause imbalance between energy and expenditure (Danaei et al., 2011). Active lifestyle interventions such as running, swimming for type 2 diabetes patients can effectively reduce body weight, thereby reducing risk factors and better controlling blood sugar. When a person is overweight, it can increase insulin resistance, and the glucose is difficult to control, thus it is difficult to maintain normal body weight. People should take low sugar diet and low-carbohydrate diet so that control weight changes. It can be adjusted according to different situations of individual (Bassuk & Manson, 2005).

Physical activity refers to sustained physical activity through skeletal muscle contraction that results in increased energy expenditure in daily life. For instance, patients can choose to run, walk,

during the treatment of type 2 diabetes. Physical activity can avoid cardiovascular disease and strengthen mental health, it can also reduce inflammation and insulin resistance, so it is beneficial to diabetes patients. According to WHO, healthy lifestyle habits are very essential on preventing or delaying type 2 diabetes, such as avoiding smoke, alcohol, monitoring the weight changes on time, having a balanced diet, and joining in physical exercise regularly (CDC, 2022).

Healthy diet refers to patients should intake more fruits, vegetables, low-fat, low-salt, low-sugar food every day. This new approach to diabetes is very simple and effective. This kind of diets have a low level of energy, it can avoid type 2 diabetes to deteriorate. The goal is to restrict excessive fat, sugar and energy intake. Because almost every type 2 diabetes patients have the same problems which their diet contain plentiful fat and sugar, but if the fatter food patients have in their diet, it is harder for pancreas to absorb glucose into their cells. Conversely, reducing fat intake and sugar intake helps weight loss and insulin work better (Masuo, 2013).

### **2.3 Nursing interventions for type 2 diabetes**

Nursing interventions are the effective action which designed to help the patient to achieve the setting goals. Nurses use his or her knowledge, experience, and critical-thinking skills to help the patient and adapt suitable nursing intervention plan according to their situation, improving their health, enhancing their quality of life.

Nursing interventions are very important not only in the prevention of type 2 diabetes but also in the treatment of type 2 diabetes. Nursing interventions mean that nurses should provide the counseling, encouragement, education to type 2 diabetes patients so that they can relax their nervous mood (WHO, 2021).

Further clinical nurses' interventions for patients were found to be effective in promoting patients' life quality. Recently, the Type 2 Diabetes Assessment Program for young adults conducted a study to identify people at risk for diabetes through a detecting system. Then supervisor gave the grade according to their performance. The grades were based on measurements such as BMI, medications, smoking, blood pressure level and blood sugar levels. The result was that the nursing interventions groups blood sugar level, blood-lipid levels, weight have significantly reduction

comparing to the non-nursing interventions group. Then Interventions which be provided by nurses according to the patient's level of risk and patients' condition can be controlled (Yang et al., 2016).

In conclusion, nursing interventions are pivotal factors for type 2 diabetes. It is useful not only in the prevention of type 2 diabetes, but also reduce many risk factors of type 2 diabetes and no adverse effect.

### **3 Study aim, purpose**

The aim of this literature review was to explore the useful lifestyle interventions and nursing interventions for type 2 diabetes.

The purpose of this research was to enhance the lifestyle interventions and nursing interventions for type 2 diabetes.

Research questions: What are effective lifestyle interventions and nursing interventions can be used for type 2 diabetes?

## **4 Methodology**

### **4.1 Literature review**

Literature review is a summary of the literature and help focusing the topic. The research has been proceeding as a literature review. Literature review seeks through reading latest research and different findings. The information is synthesized to collect relevant data of the research. The objective of a literature review is to help readers on the contemporary background and new knowledge of the topic. It also can help improve awareness of nursing and nursing interventions (Whittemore & Knafl, 2005). Literature review requires a constant search to find contemporary literature and findings to maintain the evidence base and make sure the update of knowledge, useful methods are available and correct decisions are made. When the research question has

been confirmed, keywords were gained. Interrelated research data was sought out through the key points. This thesis was written as a literature review to surmise lifestyle interventions of type 2 diabetes and explore the nursing interventions for type 2 diabetes. This research adopted nine steps from the table below (Rew, 2011) (see Table 1).

Table 1 Steps of systematic literature review (Rew, 2011)

Steps of systematic literature review
1 Identify topic to answer.
2 Glean information.
3 Ensure aims. What are its purposes?
4 Choose search terms to use.
5 Make sure the correct databases and websites.
6 Identify inclusion and exclusion criteria.
7 Recognize the outcome.
8 Data collection, retrieve data from every articles systematically.
9 Illustrate the paraphrase of evidence.

## 4.2 Literature search

The articles in this review were extracted from two databases, respectively PubMed and CINAHL. The following research terms used for literature research. Boolean operators "AND" and "OR" were used along with the key word, "lifestyle interventions for type 2 diabetes", "nursing interventions", "type 2 diabetes mellitus", "type 2 diabetes". The inclusion criteria composed of having full text access JAMK students, English language, peer-reviewed research articles, published between 2005 and 2022. Normally, researchers should choose the articles within 10 years. But the relevant articles were scarce, hence it was prolonged to 15 years. The exclusion criteria consisted of articles without full text access; not English language, not peer-reviewed, published before year 2005. It was shown below in Table 2.

Table 2 PICOS Criteria

<b>P</b> (Problem)	Type 2 diabetes
<b>I</b> (interest)	Lifestyle interventions OR nursing interventions
<b>CO</b> (Context)	Intervention OR type 2 diabetes management
<b>S</b> (Study)	Full text access to JAMK students, English language, published between 2005 and 2020, peer-reviewed research articles, including literature reviews.

A total of 122 articles were identified in the PubMed and CINAHL databases after the use of the key words and Boolean operators. After removing 3 duplicate articles, a total of 119 articles were left, these articles were examined first by title, abstract and introduction, considering the relevance about the main topic, from which 25 studies were selected, and 15 articles were removed because they do not answer the research questions. Finally, 10 articles were selected.

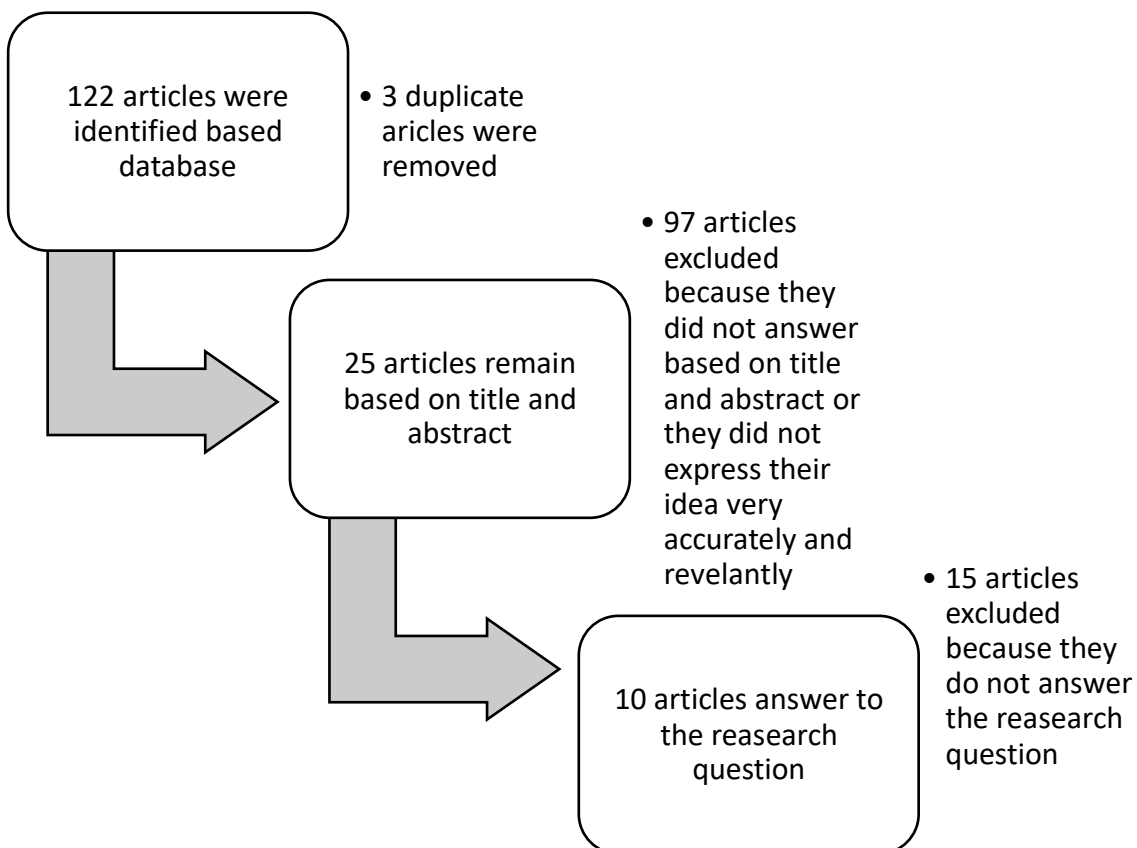


Figure 1 The detailed research process

### 4.3 Data analysis

The selected data was analyzed by using content analysis. It is a common way to analysis. This approach also can quantify the data in a systemic way. It can also allow researcher to better understand it. Under the assistance of content analysis data was designed to gather information on nursing methods which can help to delay the development of type 2 diabetes (Whittemore & Knaf, 2005). For this research, the author uses inductive analysis because of the lacking experience which associated with the topic.

The data analysis started by selecting all the chosen articles, examining the idea, the purpose, and the research questions of this literature review then summarize many words in the figure. An example of the process can be seen in Figure 2 below.

Original quotation	Sub-theme	Theme	Main theme
Observational and clinical trial data suggest that as little as 30 min/day of moderate-intensity physical activity can reduce the incidence of type 2 diabetes and cardiovascular events (Bassuk & Manson, 2005).	Physical activities	Health habit support	Lifestyle interventions

Figure 2 Data analysis process

## 5 Results

Four themes were identified in this literature review, these are Health habit support, Obesity management, Patient education, Medicine administrations. The themes represent the main areas of health care which associate with lifestyle interventions and nursing interventions for type 2 diabetes. It shows as in the figure 3 below.

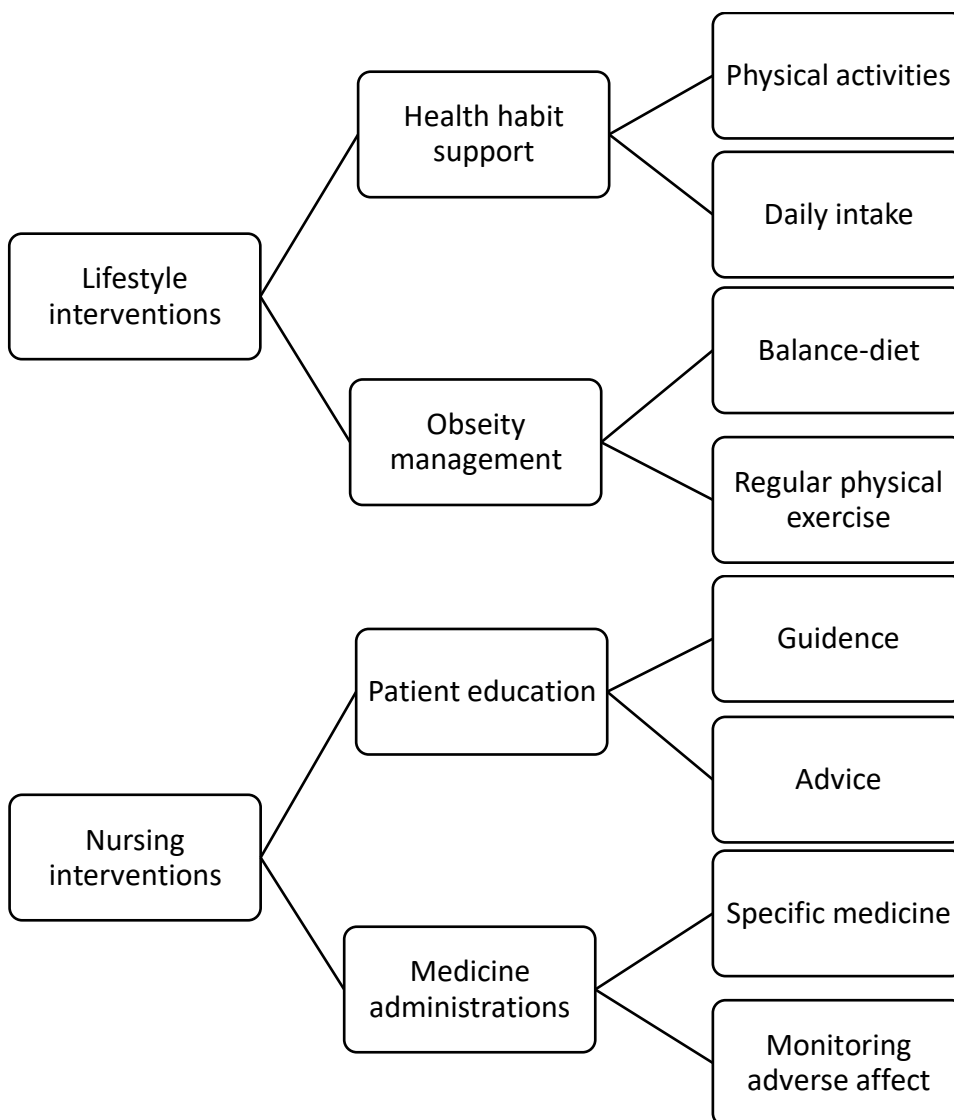


Figure 3 Lifestyle interventions and nursing interventions for type 2 diabetes

## 5.1 Lifestyle interventions

### 5.1.1 Health habit support

When it comes to health habits, people need to have regular physical exercise every day because this action has a good effect on type 2 diabetes. Physical exercises are useful not only for treatment of type 2 diabetes, but also they are effective for the rehabilitation with patients. Most of patients should accept every type of activities which is beneficial to them. Regular physical activity can also help the body cells consume glucose so that lower blood glucose levels as well as maintaining blood pressure level (Knowler et al., 2018).

It was demonstrated that physical activity can reduce 30% to 50% in the onset of type 2 diabetes. It can decrease glucose level and reduce the risk of type 2 diabetes occurs. It is better to do it under the provision of healthy workers or nurses. Nurses have a significant meaning in patients non-pharmacology treatment even though patients can do exercises by themselves. For instance, physical activities such as walking is the most popular way, and it has been proving that when people walk 150 minutes every week, it can reduce 60% risk of type 2 diabetes at least. And people can also choose other activities such as swimming, jogging and so on (Bassuk & Manson, 2005).

And another factor is daily intake. There is a little bit difference between balance diet and healthy diet, balance diet is more like a nursing plan for the treatment or rehabilitation for type 2 diabetes patients. But latter one is more like a choice which people can choose it voluntary. It is also worth mentioning that even though habit is so different due to country, culture, and personal preferences. There is no controversy about patients should eat low sugar, low fat, low salt food, high fiber food and greater whole grain, high intake of vegetables and fruits intake in order to maintain glucose level, meanwhile they need to control alcohol abuse because it is very harmful for patients (Colberg et al., 2010).

Daily intake is very important in type 2 diabetes patients' life and patients can adjust many kinds of diet patterns which can meet their healthy needs. Their diet should also be sustainable and adjustable. It is not necessary that they must follow a very rigorous diet plan because they mostly cannot stick in the long time. They just need every day change a little or no according to their idea and situations (WHO, 2021).

### **5.1.2 Obesity management**

Obesity is one of the most important risk factors of type 2 diabetes which cause is an imbalance between energy intake and output and balanced diet is an essential factor in obesity management and delay the development of type 2 diabetes. Balance diet design principles for people with type 2 diabetes: patients should intake moderate calorie, optimal content of protein, appropriate amount of carbohydrates, low fat, low sugar, low salt food and eat more vegetables, fruits, and legume food (Ley et al., 2016).

Patients' diet should intake according to the patient's age, height, weight, then calculate the necessary daily energy. It has specific food to provide microelement, it has more kinds of nutrition and more accurately than health habit diet need. Patients should ensure that more than 1/3 of their protein intake every day because it is a very important part. At the same time, patients should also choose foods with low glycemic index. Carbohydrates should take up 50-60% of the total food intake. Reducing or avoiding intake of high sugar food, meanwhile, using potato and other Coarse grains and grain products with high natural fiber content. Restricting the intake of unhealthy fatty acids in patients. Because the main complications of diabetes are hypertension and other cardiovascular diseases, it is most logical that fat accounts from 20% to 25% of the total energy (Wu et al., 2014).

An analysis suggested that energy imbalance from 50 to 100 kcal per day may contribute to the gradual weight gain. However, lifestyle modest changes could reverse this status. It is more acceptable for people to change gradually in daily life such as diet or physical exercise rather than

changing their other aspects dramatically. However, it still requires further supplement for the establishment of efficient prevention and control of type 2 diabetes (Wu et al., 2014).

People also always use BMI (The body mass index) to evaluate their weight. BMI is a standard which use people height and weight to calculate to judge whether they are overweight or not. It divides an adult's weight in kilograms by their height in meters squared and patients should learn to measure their weight and height independently and ask nurses gave some guidance to them. In addition, they can do some physical exercises effectively and need to know these advantages of kinds of exercise in order to control the index of BMI. They can do more exercises or activities if their situations are stable, the best way is setting goals. For example, patients can set a series of short-term health goal and plan how to implement their health plan (Corbin et al., 2016). Among daily treatment, others like family members can encourage the patient to do simple exercises every day to reduce BMI score, strengthening patients' rehabilitation.

The various of lifestyle factors can avoid obesity risk, such as increasing intake of high dietary fiber, reduced intake of energy-dense, low sugar and salt foods and regular physical activity. Weight reduction probably have positive effects on diabetes incidence, each kilogram of weight loss is can lead to 16% reduction in type 2 diabetes risk (Masuo, 2013).

## **5.2 Nursing interventions**

### **5.2.1 Patient education**

One theme is related to education. It means nurses tell patients about the conception of type 2 diabetes and educate patient about lifestyle change to maintain patients' glucose level. It is a convenient way to help patients get more information to delay type 2 diabetes. As for the nurses themselves, they need to have enough basic knowledge hierarchy to provide correct lifestyle advice and guidance to patients (Wattanakorn et al., 2013). Thus, the specialist nurses training is the most important thing.

The nurses gave guidance to every group, especially risk groups. Patients who can receive a certified which contains health educator advice, the details about everyday diet, lifestyle changes, nutrition intake, blood liquid level, diverse physical exercise, and the basic concept of type 2 diabetes. Majority of group guidance included lifestyle modifications, concentrating on improving the quality of diet, raising physical activity, and drinking cessation (Shrestha et al., 2018). Group guidance had contributed to most patients, and they can emphasis on concept and education about diagnosis of pre-diabetes.

Individual advice means that nurses need to communicate with patient before visiting doctors, nurses need to motivate patients and provide what are the risk factors patients had, and nurses could help them understand more about what lifestyle changes and behavioral support affect. Tips on type 2 diabetes management pharmacotherapy and lifestyle changes were also essential part of education (Dalmau Llorca et al., 2003).

When providing any advice, nurses need to advise according to different patient's conditions and health issues. They also need to participate in local healthy institutions to strengthen the training of type 2 diabetes-related specialist nurses. Professional and effective health education needs to be offered to each patient at the first time of diagnosis, and the diverse levels of education of the patient should be taken in consideration (Burden, 2017).

### **5.2.2 Medicine administrations**

One theme was related to medicine administrations which are useful for patients who can't maintain their glucose level with diet and exercise, doctors may give type 2 diabetes medications to them to control their blood glucose level.

Metformin is the major medication for type 2 diabetes, and it always be the patients first drug to treat type 2 diabetes. It works by going down glucose production and improving body's sensitivity to insulin so that body uses insulin more effectively and continuously. It belongs to the biguanides group medicine. Metformin also could be used for delaying type 2 diabetes deteriorate. Nurses

also should notice the dose of metformin when doctor give it to patients, patients should take metformin at least 500 mg once a day after receiving doctors instructions (Moin et al., 2018).

Nausea, vomiting, heartburn, weight loss and diarrhea are the most common adverse effects people have when they first start taking metformin. These symptoms will disappear after long time taking. Patients can reduce these effects by taking metformin with a meal. Also, to help lessen their serve symptoms, doctor will probably begin with a low dosage of metformin and then increase it slowly. Nurses should observe the adverse effect on the patients all the time and make sure the accurate dosage which patients take in (Flory & Lipska, 2019).

## **6 Discussion**

### **6.1 Critical appraisal, ethical considerations, reliability and validity**

This appraisal tool was used to evaluate the quality of the literature review articles (Appendix 2.). The tool assesses the following aspects: abstract and title, introduction, aims, method, data, sampling, data analysis, ethics and bias, results, transferability, implications, and usefulness on a scale of 1 to 4 for a total score of 36. The minimum standard score was 30, and because of this rule, it cannot exceed ten articles. The goal is to keep an appropriate level of quality which the author chooses to include articles that met the mark.

Ethics is the most important factors in the behavior of nurses, and it can guide them, and the criterion to change the behavior of nurses. Moral principle is consisted of social, professional and philosophical aspects (Ingham-Broomfield, 2017). Ethical evaluations can improve the quality of research. However, from the perspective of institutional evaluation, traditional ethical evaluation undoubtedly plays a positive role in improving the overall quality and methodology of ethical research. However, ethical issues always change whenever and wherever, and their background and context are so wide that it is difficult to find a universal ethical classification standard (Vergnes et al., 2010).

In this thesis, author also think about ethical considerations. In my articles, research articles were all published on the website, and they are reality. All author's articles ethical thoughted to ensure general ethics was performed appropriately. The accuracy and safety are the most important factors of ethics issues in the literature review. The information for nurses in this analysis was that life and work should be ethical and follow the perfect life which is nice, relax, comfortable (Atkins, 2014).

Validity and reliability of the research means that the thesis uses the research results used in this paper have an ethical basis and it can be followed. The aim of this article is to show the relationship between lifestyle intervention and nursing intervention which associated with type 2 diabetes. The lifestyle of type 2 diabetes was an important concept in nursing. The articles selected for this article were obtained from two database: PubMed, CINAHL, scientific and peer-reviewed information. The two databases were chosen due to the reliability and accessibility. This research was restricted to the use of articles in the English language available for free to JAMK students and public free access.

These articles come from two different databases: PubMed, CINAHL. The two databases were chosen because of their dependability and accessibility. The articles were obtained from different countries and cultures; the materials were from Europe and 4 countries - USA, India, Australia, and China. Therefore, the main findings are not restricted to one ethnic or geographic group. And when searching for articles, only searching for articles in English may limit generalization.

## **6.2 Discussion of result**

This literature review managed to identify health habit support and obesity management were found as effective lifestyle interventions for type 2 diabetic patients. Patient education and medicine administration were found as useful nursing interventions for type 2 diabetic patients. Before they are lacking in these important areas of the care, and the lacking did not beneficial to patients.

(Masuo, 2013) identified similar themes in articles, they aware the importance of providing correct way to maintain patients' glucose level, these approaches are to be considered: weight management is the first option for type 2 diabetes and reducing sedentary behavior and more regular exercises are the basis of all treatment therapy. The lifestyle has play an important role in people self-care. It is also very important that health care professionals keep consultation and give education to patients, several articles which included in the review confirms it.

In this literature review, most of the method nurses used are giving education and monitoring because by this way nurses could understand people thoughts, information, and situation. Except for nurse's work, nurses could supervise patients' life, for example, nurses can monitor the patient's diet, physical activity and help patients to control weight.

Patients can also use glucometer to monitor their blood sugar level every day after they finish exercising or eating low sugar food during the unstable time. Observing whether it change or not, nurses can guide them online if the situation is normal. Or patient can straightly go to the hospital if it is emergency. The lifestyle interventions provided through mostly by patients themselves, so nurses need to give basic type 2 diabetes information to patients so that patients can do the quick and correct intervention (Joiner et al., 2017).

When people in the hospital or clinic, healthcare workers could provide them some details about type 2 diabetes. For people with type 2 diabetes, nurses should give them individual guidance according to the patient's situation. For instance, nurses provide professional advice mostly about how to maintain a good healthy life pattern and how many times to do regular exercise. In the patient's personal lifestyle process, nurses could communicate with patients and told them what adverse effects may be caused by excessive intake unhealthy diet. And nurses should tell patient what kind of habits is the most suitable. In this process, respect is the most important thing (Shrestha et al., 2018). In terms of medicine administrations, nurses should not provide patient pharmacological treatment without doctor prescriptions. Nurses' duty was to build a bridge between doctors and patients so that they can express their idea and thoughts more unambiguous and exactly.

## 7 Conclusion

It is essential to know how to delay type 2 diabetes and when to get involved lifestyle interventions or nursing interventions timely. Nurses should also give health education and guidance for patients when they need and provide professional advice according to monitoring patients daily life, such as exercise, diet.

There were many ways to prevent type 2 diabetes, but the crucial thing is that patients change lifestyle by themselves. Furthermore, sometimes it is necessary to need the cooperation between nurses and patients when patients are treated. This process could provide basic type 2 diabetes patient details effectively such as weight data, physical exercise frequency, and whether having healthy diet or not. Every patient with type 2 diabetes should accept type 2 diabetes education so that they can change it by lifestyle interventions to achieve the expected results. Patients should be awareness of type 2 diabetes. Patients need to solve maintain their glucose level by correct lifestyle interventions and nursing interventions so that it can have better effect.

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## Appendices

### Appendix 1. The result of literature review

Author	Publishing year and country	Title	Research methods	Main findings
Wu, Y., Ding, Y., Tanaka, Y., & Zhang, W.	2014 China	Risk Factors Contributing to Type 2 Diabetes and Recent Advances in the Treatment and Prevention	Literature review	The cause of the diabetes epidemic is respectively genetic and environmental risk.
Knowler, W. C., Crandall, J. P., Chiasson, J.-L., & Nathan, D. M.	2018 America	Prevention Of Type 2 Diabetes.	Literature review	Weight loss and exercise have proven effective in preventing type 2 diabetes, weight loss has the greatest effect. metformin can also prevent or delay type 2 diabetes.
Asif, Mohammad.	2014 India	The prevention and control the type-2 diabetes by changing lifestyle and dietary pattern	Literature review	Effective lifestyle modifications including counselling on weight loss, adoption of a healthy dietary pattern together with physical activity are the basic in the prevention of type-2 diabetes.
Ley SH., Ardisson Korat AV. Qi Sun, Tobias, DK., Cuijin Zhang, Lu Qi, Willett WC., Manson JE. & Hu, FB.	2016 USA	Contribution of the Nurses' Health Studies to Uncovering Risk Factors for Type 2 Diabetes: Diet, Lifestyle, Biomarkers, and Genetics	Literature review	Methods of preventing type 2 diabetes, changing lifestyle and know what to affect type 2 diabetes.

Shrestha A., Karmacharya BM.	2018 USA	Dietary interventions to prevent and manage diabetes in worksite	Meta-analysis	Importance of health promotion in change lifestyle in diet and exercise.
Masuo, K.	2013 Australia	Lifestyle Modification Is the First Line Treatment for Type 2 Diabetes. In <i>Type 2 Diabetes</i>	Literature review	Weight controlling is the first line of treatment for type 2 diabetes and hypertension associated with type 2 diabetes in obesity. Lifestyle modification such as a caloric restricted diet, reducing sedentary behaviour and increases in exercise form the basis of all therapy
Colberg, S. R., Sigal, R. J., Fernhall, B., Regensteiner, J. G., Blissmer, B. J., Rubin, R. R., Chasan-Taber, L., Albright, A. L., & Braun, B.	2010 America	Exercise and type 2 diabetes: the American College of Sports Medicine and the American Diabetes Association: joint position statement	Literature review	Exercising plays a important role in the prevention and control of insulin resistance, prediabetes, type 2 diabetes, and diabetes-related health complications
Bassuk, S. S., & Manson, J. E.	2005 America	Epidemiological evidence for the role of physical activity in reducing risk of type 2 diabetes and cardiovascular disease	Literature review	Physical activity can reduce the prevalence of type 2 diabetes and other coronary disease.

Moin, T., Schmittiel, J. A., Flory, J. H., Yeh, J., Karter, A. J., Kruge, L. E., Schillinger, D., Mangione, C. M., Herman, W. H., & Walker, E. A.	2018 America	Review of Metformin Use for Type 2 Diabetes Prevention	Literature review	Metformin is always use for diabetes prevention among higher-risk patients.
Corbin, L. J., Richmond, R. C., Wade, K. H., Burgess, S., Bowden, J., Smith, G. D., & Timpson, N. J.	2016 UK	BMI as a Modifiable Risk Factor for Type 2 Diabetes: Refining and Understanding Causal Estimates Using Mendelian Randomization	Literature review	It has the relationship between BMI and type 2 diabetes.

## Appendix 2. Critical Appraisal of the articles (Hawker et al. 2002)

author	Abstract/title	2 introduction and aims	3 methods and data	4 sampling	5 data analysis	6 ethics and bias	7 results	8 transferability/generalizability	9 Implications and usefulness	total
Wu, Y., Ding, Y., Tanaka, Y., & Zhang, W.	3	4	4	4	4	3	3	4	4	33
Knowler, W. C., Crandall, J. P., Chiasson, J.-L., & Nathan, D. M.	4	3	4	4	4	4	4	3	4	34
Asif, Mohammad.	4	4	4	4	4	4	4	4	4	36
Ley SH., Ardisson Korat AV. Qi Sun, Tobias, DK., Cuilin Zhang, Lu Qi, Willett WC., Manson JE. & Hu, FB.	4	3	3	4	4	4	4	3	4	33
Shrestha A., Karmacharya BM.	4	4	4	3	2	1	4	4	4	30
Masuo, K.	3	4	4	4	3	3	3	4	4	32
Colberg, S. R., Sigal, R. J., Fernhall,	3	3	3	3	3	4	4	4	4	31

B., Regenstei ner, J. G., Blissmer, B. J., Rubin, R. R., Chasan- Taber, L., Albright, A. L., & Braun, B.										
Bassuk, S. S., & Manson, J. E.	2	4	4	4	4	2	3	4	3	30
Moin, T., Schmittdie l, J. A., Flory, J. H., Yeh, J., Karter, A. J., Kruge, L. E., Schillinger, D., Mangione, C. M., Herman, W. H., & Walker, E. A.	4	3	3	4	4	3	4	3	2	30
Corbin, L. J., Richmond, R. C., Wade, K. H., Burgess, S., Bowden, J., Smith, G. D., & Timpson, N. J.	4	3	3	3	4	4	1	4	4	30