Tampere University of Applied Sciences

Management of Gestational Diabetes Mellitus through Patient Education

Anupama K.C. Nurmi

Mahnaz Moradi

BACHELOR'S THESIS
November 2024

Degree Programme in Nursing

ABSTRACT

Tampereen ammattikorkeakoulu
Tampere University of Applied Sciences
Degree Programme in Nursing

ANUPAMA K.C. NURMI & MAHNAZ MORADI:
Management of Gestational Diabetes Mellitus through Patient Education

Bachelor's thesis 36 pages, appendices 13 pages
NOVEMBER 2024

Patient education plays a critical role in managing gestational diabetes mellitus (GDM), especially as the surge in GDM continues. This study aimed to describe various patient education strategies utilized among individuals with GDM.

A descriptive literature review was conducted using the CINAHL database, with ten articles analysed through thematic analysis. The study identified two primary strategies for managing GDM: intervention strategies and counselling strategies.

The findings could inspire healthcare professionals to explore diverse patient education approaches, fostering a culture of continuous learning and adaptation to improve overall patient care quality.

Key words: patient education, gdm, counselling, interventions

CONTENTS

GLOSSARY

ADA	American Diabetes Association
CDC	Centers for Disease Control and Prevention
GD	Gestational diabetes
GDM	Gestational Diabetes Mellitus
IDF	International Diabetes Federation
LGA	Large for gestational age
NAFLD	Non-alcoholic fatty liver disease
OGTT	Oral glucose tolerance test
PE	Patient education
T2DM	Type 2 Diabetes Mellitus
UNICEF	United Nations International Children's Emergency Fund
WHO	World Health Organization

1 INTRODUCTION

Diabetes is becoming a global health challenge, with almost 1 in 10 people affected, as reported by the International Diabetes Federation (2023). This health issue occurs during digestion when ingested food is transformed into glucose. Glucose is the sugar that manages to enter the bloodstream. The pancreas produces insulin to cater to the increasing blood sugar to assist the entry of glucose into the body's cells as an essential energy source. In diabetes, the body either fails to produce the required insulin or fails to use the produced insulin effectively, resulting in excess blood sugar and potential complications like heart disease, vision impairment, and kidney disease. Diabetes has three main types: type 1, 2, and gestational diabetes, which develops during pregnancy. (CDC 2024.)

According to the International Diabetes Federation (IDF), there were about 537 million adults between the ages 20 to 79 years affected by diabetes as of 2021 establishing diabetes as a serious global health concern. The projections are quite alarming as IDF anticipates the affected numbers to surge by additional 106 million in 2030 and by 246 million in 2045 compared to that in 2021. Moreover, 75% of the adults with diabetes are residents of low- and middle-income countries which underscores the socioeconomic disparities associated with the condition. (IDF 2021.)

The focus of this thesis is to explore different types of patient education strategies to manage gestational diabetes. Gestational diabetes is a type of diabetes that occurs in pregnant women who previously do not have such ailment before pregnancy. This condition is of great concern and has significant implications for maternal and fetal health. (IDF 2023.) In 2019, the oral glucose tolerance test revealed abnormal results in approximately 20.6 percent of expectant mothers in Finland (Gestational Diabetes, Current Care Guidelines Abstract 2022). As of 2021, IDF Diabetes Atlas (2023) has reported the occurrence of gestational diabetes mellitus (GDM) in roughly 16.7 percent pregnant women around the world.

Understanding the global prevalence of GDM and its implications for a healthy pregnancy is essential. Effective management techniques are crucial in ensuring

a healthy pregnancy, as GDM can severely affect both the mother and the fetus developing inside her. Patient education, therefore, can be pivotal in effectively managing a healthy pregnancy in GDM. Therefore, our research explores different strategies employed in patient education and their respective impact in managing Gestational diabetes mellitus.

2 THEORETICAL FRAMEWORKS

2.1 Gestational Diabetes Mellitus (GDM)

Gestational diabetes mellitus (GDM) is a serious global health concern for its potential to affect the outcomes for both mothers and babies during and after pregnancy. Since its first description in the early 1950s, gestational diabetes (GD) has been one of the most controversial syndromes in the field of diabetes. Glucose intolerance that arises during pregnancy in previously undiagnosed individuals with diabetes or high glucose levels is known as GD. However, it is essential to note that this term does not apply for women who had diabetes even before getting pregnant. (Petkov & Nikolov 2011.)

During a typical pregnancy, the body's sensitivity to insulin decreases as the pregnancy develops further. The factors responsible for such phenomenon are placental lactogen, estrogen, and progesterone. To maintain glucose levels, the body responds by increasing its insulin secretion. However, if the pancreas faces difficulties in producing adequate insulin to keep up with the body's demands, gestational diabetes can develop. This is because insulin resistance increases progressively during pregnancy. (McMicking, Yun Rui Lam, Lim, Lay-Kok Tan & Pasupathy 2021.)

2.1.1 Risk factors

According to Tiitinen, Terveyskirjasto (2023), pre-pregnancy risk factors for gestational diabetes are obesity (BMI > 25), PCOS (Polycystic Ovary Syndrome), oral corticosteroids, NAFLD (non-alcoholic fatty liver disease), being over 40 years of age, having given birth to a large child (> 4,500 g), or having gestational diabetes during previous pregnancy or pregnancies. Risk factors during pregnancy involve the occurrence of glucose (sugar) in the morning urine and the suspicion of a large-for-gestational-age fetus.

Unhealthy lifestyles are known to lead to many health issues, and smoking is still one of the unhealthiest behaviours. Despite a worldwide decrease in smoking, it remains a common cause of health problems. Even though expectant mothers would quit smoking, the risk of being affected by passive smoking remains including to women who are not actively involved in smoking. (Ntshauba, Ntuli, & Maimela 2022; Haijie, Xin, Lixia, Jianjun, Meng, & Jinzhu 2023.)

2.1.2 Screening and Diagnosis of Gestational Diabetes Mellitus

Although the rising occurrence of gestational diabetes mellitus (GDM), there are difficulties in finding a common consensus for the most effective screening strategies and guidelines. It is crucial to consider local factors and screening costs when deciding who should undergo screening for GDM. (Teh, Teede, Paul, Harrison, Wallace & Allan 2011.) According to the American Diabetes Association (ADA 2024), GDM is described as the abnormal amount of glucose often occurring during the second or the third trimester of pregnancy. In Finland, GDM is diagnosed by undergoing a test commonly called oral glucose tolerance test (OGTT). Regardless of the stage of pregnancy, the diagnostic limits of the glucose tolerance test are the same. One abnormal OGTT result is enough to diagnose gestational diabetes. The diagnosis is maintained despite normal self-monitored glucose levels. (Finnish Current Care Guidelines 2024.)

In a population-based study, the Early Diagnosis of Diabetes in Pregnancy (EDDIE) research team investigated whether diabetes screening test results change during pregnancy and whether the same reference values can be used in early and late pregnancy. The study showed significant differences between the results of the early and late pregnancy glucose stress tests. Gestational diabetes occurred more in early pregnancy than those in their late-pregnancy as only 15% of the women met the late-pregnancy criteria. Additionally, 58% of these diagnoses were based on abnormal fasting values alone.

According to the WHO guideline (2018), it is recommended to use universal diagnostic criteria for GDM to avoid testing based on risk factors, which may miss 50% of cases of total cases of GDM. WHO recommends screening in the first

trimester and repeating at 24-28 weeks if initially normal. If screening is done too early, the result may likely represent Type 1 or Type 2 diabetes. Table 1 shows the recommended cut-off values for plasma glucose according to Finnish Current Care Guidelines (2024).

TABLE 1. Cut-off values

Test	Cut-off values (mmol/l)
Fasting Plasma Glucose	➢ 5.3
One-hour Plasma Glucose	➢ 10.0
Two-hour Plasma Glucose	➢ 8.6

In Table 2 criteria for diagnosing GDM are explained. The OGTT is performed at 12-16 weeks' gestation if there is a previous record of gestational diabetes or NAFLD, BMI >30, glycosuria, oral glucocorticoid use, or a strong history of T2DM (Type 2 Diabetes Mellitus) in the family. Otherwise, under normal circumstances, OGTT is performed at all gestational weeks 24-28, except for first-time mothers under the age of 25 with a BMI of less than 25, women under 40 years of age giving birth for the second time with a BMI of less than 25 and no history of macrosomic infants.

TABLE 2. Criteria for diagnosing for GDM

OGTT Timing	Criteria
12-16 weeks gestation	- history of GDM or NAFLD - BMI >30 - Glycosuria - oral glucocorticoid use - Strong family history of T2DM
23-28 weeks gestation	Performed under normal circumstances
Exceptions for 24-28 weeks	- First-time mothers under 25 years of age with BMI <25

	- Women under 40 years of age giving birth for the second time with BMI <25 and no history of macrosomic infants

2.1.3 Complications for neonates and mothers

Gestational diabetes might create problems for both mother and baby if the blood sugar is not managed carefully (Centers for Disease Control and Prevention 2022). If the mothers have diabetes, their infants are prone to develop various health problems, including metabolic disorders such as newborn hypoglycemia, hematologic disorders, respiratory distress, cardiac complications, and neurological impairment. One of the most common problems is macrosomia, where the baby is larger than average. Prompt treatment of newborn hypoglycemia after birth is crucial. The severity of macrosomia and the mother's health can affect the frequency and severity of critical health issues for the baby, including metabolic disorders. (Mitanchez, Yzydorczyk & Simeoni 2015.)

Gestational Diabetes Mellitus increases the probability of C-section delivery, leading to longer recovery times. The risk of high blood pressure also increases for women having diabetes. Both mother and baby require regular monitoring and management to prevent, at worse, from preeclampsia which is a serious condition indicated usually by raising blood pressure, leaking protein through urine, and swelling fingers. (CDC 2024.)

Physical complications are not commonly observed in women with gestational diabetes, but they are more likely to experience symptoms of postpartum depression (Ahmed & Jia-Yi 2019). GDM also has psychological impacts, according to Karavasileiadou, Almegwely Alanazi, Alyami, and Chatzimichaili-dou (2022); when diagnosed with GDM, women commonly experience feelings of failure, despair, self-blame, anxiety, con-fusion, and worry. The diagnosis often brought with it feelings of uncertainty, guilt, and vulnerability. However, some women also saw it as an opportunity for positive lifestyle changes and the chance to take action to protect them-selves and their babies.

2.1.4 Prenatal care

Antenatal care, also known as prenatal care, is an important form of preventive health care for pregnant women and their unborn children. Pregnant women can receive guidance from skilled health professionals on maintaining healthy habits during pregnancy, recognizing warning signals during childbirth and pregnancy, and getting social, emotional, and psychological support during this critical period. Antenatal care also enables pregnant women to gain access to micronutrient supplements, hypertension treatment to prevent eclampsia and vaccinations. (UNICEF 2024.)

According to the WHO (2024), around 287 thousand women lost their lives during pregnancy or childbirth in 2020, most of them in the world's least developed countries. Based on evidence and informed practice, well-planned prenatal care reduces hospitalization, improves education, increases satisfaction, and reduces pregnancy-related complications and deaths (Ramirez 2023).

The establishment of maternity clinic services in the 1920s had a significant impact on the wellbeing of expectant mothers and their children. The first maternity clinic in Finland was founded in Helsinki during this decade, and in the surrounding area, child mortality rates decreased from 15% to 3% within three years. (Haata & Koskenvuo 2017.)

2.1.5 Treatment and prevention

Measures to prevent type 2 diabetes like focusing on healthy diet and exercising on a regular basis might also be effective in preventing gestational diabetes mellitus. However, according to Similä et.al (2023), there is insufficient research to determine the most effective dietary treatment for promoting the health of both the mother and the child during pregnancy; several studies have highlighted the benefits of diet and exercise regimes in case of pregnant women. Some observed benefits are lowered risk of gestational diabetes mellitus, lower probability of

need for cesarean delivery, and reduced weight gain issues during pregnancy. (Shepherd et.al. 2017.)

Insulin is the primary treatment option when blood sugar levels do not reach target levels through diet. Metformin or a combination of insulin and metformin may also be considered. Pregnant women are started on insulin therapy during hospitalization, and it is continued until delivery. However, drug treatment should be accompanied by diet and exercise. (Finnish Diabetes Association 2023.)

3 PATIENT EDUCATION (PE) ON GDM

Patient education is an emerging science in the healthcare field. In the past, it mainly has been about knowledge transfer and giving advice based on biomedicine. (Witting & Oosterhaven 2018.) Terveyskirjasto (2024) defines patient education as providing motivation, guidance, and support by healthcare professionals to help patients manage their health and health problems. Kaakinen (2013, p.69) states that high-quality patient education requires planning, interaction, and a patient-centered approach.

According to the World Health Organization (2023), human rights, including the right to health, are inherent to all individuals regardless of their background, and countries are legally obligated to ensure universal access to quality healthcare.
In Finland, patients are entitled to quality healthcare as defined by the law (17.8.1992/785). The Act guarantees patients the right to receive good care, treatment, and information about their health. Health care services are available in Swedish and Finnish, the two main languages spoken in Finland. Patients unable to understand either language have a legal right to an interpreter.

In a 2022 study that followed women with GDM using an app for guidance, the feedback expressed a desire for more lifestyle guidance including support related to physical activity and blood glucose levels monitoring possibilities on their own. Additionally, they requested guidance on dietary choices to help maintain balanced blood sugar levels. While the study focused on an app-based approach, these findings can also be applied to traditional patient management. (Kytö et.al.2022.)

3.1 Importance of patient education in managing GDM

There are many benefits to educating pregnant women about diabetes. Patient education has the possibility to impact and improve their quality of life, boost their confidence in health care, and reduce their risk of complications during childbirth. Educated pregnant women also tend to have significantly lower blood glucose

levels than uneducated women. Nutrition education has also been shown to impact dietary habits and health outcomes positively. (Akalper & Bagriacik 2023.)

The successful management of GDM during pregnancy requires healthcare professionals to work together collaboratively. One of the most essential aspects of this process is educating the patient. When pregnant women are empowered with knowledge about their condition, it can improve their overall well-being, better adherence to treatment, and reduce complications. (Radenković 2021.)

Management of gestational diabetes might not be easy for women. Successful management ofGDM might rely on effective communication practices adopted by healthcare providers with women diagnosed with gestational diabetes mellitus. However, women with GDM often experience rushed counseling, unclear roles of healthcare providers, and conflicting information, which can lead to confusion and anxiety. Although women rely on healthcare providers for monitoring and treatment, the support offered by the providers might be felt insufficient by the women. Therefore, it is essential to improve communication and education in healthcare settings to empower women to manage gestational diabetes mellitus effectively. Healthcare providers should assist women in navigating their journey with GDM by addressing communication challenges and providing comprehensive support. (Karavasileiadou, Almegwely Alanazi, Alyami, & Chatzimichaili-dou 2022.)

3.2 Nurses’ role in patient education

Patient education is quite important for nurses to improve their patients' understanding, knowledge, and willingness to manage their care. Patient education can positively impact the patient's health, but it requires good patient counseling by the nurse to ensure that the patient receives holistic care. Successful patient education requires the nurse to have good communication skills and be aware of the legislation relating to patient education and ethical and educational principles. (Huurre, Tervo-Heikkinen, Turunen & Saaranen 2018.) How the patient participates during the nurse’s care and how they perceive their relationship with the nurse are detrimental for the nurse’s approach in building a warm relationship

with the patient. Altering patient’s values and customs should not be the goal of the nurse-patient relationship. Instead, the nurse should act as a supportive observer of the patient’s health journey alongside their family. (Gallo-Estrada & Molina-Mula 2020.)

Promoting patient self-care has become necessary in today's healthcare system, which is increasingly focused on saving money. (Bergh, Friberg, Persson & Dahlborg-Lyckhage 2015.) Adequately educating the patients can equip them with the tools required to prepare and manage their lifelong health and medical treatment more effectively (Marcus 2014).

4 THE AIM, PURPOSE, AND RESEARCH QUESTION OF THE STUDY

Our study aims to research the positive impact of patient education on managing gestational diabetes. We will analyse existing research and literature to identify patient education strategies and potential factors that improve GDM outcomes. Our goal is to provide guidance to expectant mothers and healthcare providers on managing GDM through patient education to enhance maternal well-being.

This literature review explores different kind of patient education strategies for women in GDM. Therefore, the aim of this thesis is to answer, what are the patient education strategies in managing Gestational Diabetes Mellitus?

5 RESEARCH METHODOLOGY

5.1 Descriptive literature review

Descriptive literature review is considered the best research method for this thesis to summarize existing knowledge on one research topic. A descriptive literature review allows writers to use an immense variety of existing articles without limitations. Descriptive literature review differs from systematic literature review as descriptive literature review has a broader research question than a systematic literature review, which allows the writer to widely illustrate the research concept and, if necessary, classify the properties, thus, making it a general view. (Salminen 2011.)

Descriptive literature examines the literatures by focusing on to a specific research question, area or concept providing an information on literatures at the time of review rather than broadening upon the literature. (Xiao and Watson 2017.) According to Kangasniemi et.al. (2013), the steps for writing a descriptive literature review follows four steps starting with research question formation, data selection, constructing the description and ending with observation of the results making research question a foundation for descriptive literature reviews.

5.2 Search strategies and selection of method

The data was collected from the CINAHL and is available through TAMK's Andor online library service. The PICO method was applied to form the research question and to determine the keywords. 'P' is the Population (Women with Gestational Diabetes Mellitus). 'I' stands for intervention/interest (patient education). 'Co' is the outcome (management).

The synonyms were created through MeSH/terms. The synonyms as per MeSH are “Gestational Diabetes Mellitus/Gestational Diabetes/Pregnancy-Induced Gestational Diabetes”. For patient education, the synonyms are “Diabetes Education/Counseling/Guidance”, whereas for management, the synonyms are “Self-

Care /Self-Management/ Management/Care". These synonyms were used to find all the relevant information for this research.

The Boolean operators "AND" OR " were used to connect the keywords to get all the possible literature containing the keywords during the search. The Boolean operators allowed the maintenance and structure of the search process and helped adjust the search results. Moreover, 'MH' stands for a major heading or word from a thesaurus, 'TI' stands for a word that must be in the title, and 'AB' stands for a word that must be in the abstract.

The search process is shown in Table 1, which was conducted on Monday, 25.12.2023, at 12:07 AM. The serial numbers represent the iterations done with the query items, including different terms formulated using MeSH terms and Boolean operators. Limiters and expanders visualize the expansions and limitations of the search using different aspects of the search, for example, time and language, whereas the result section shows the number of search results obtained after refining the search with the help of limiters and expanders mentioned.

TABLE 3. Search strategies.

#	Query	Limiter and Expander	Results
S6	S2 AND S4 AND S5	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	404
S5	((MH "Patient Education") OR (MH "Diabetes Education")) OR TI (patient education OR diabetes education OR counseling OR guidance) OR AB (patient education OR diabetes education OR counseling OR guidance)	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	192 890
S4	((MH "Self Care") OR (MH "Self-Management")) OR (management OR care)	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	2 062 288

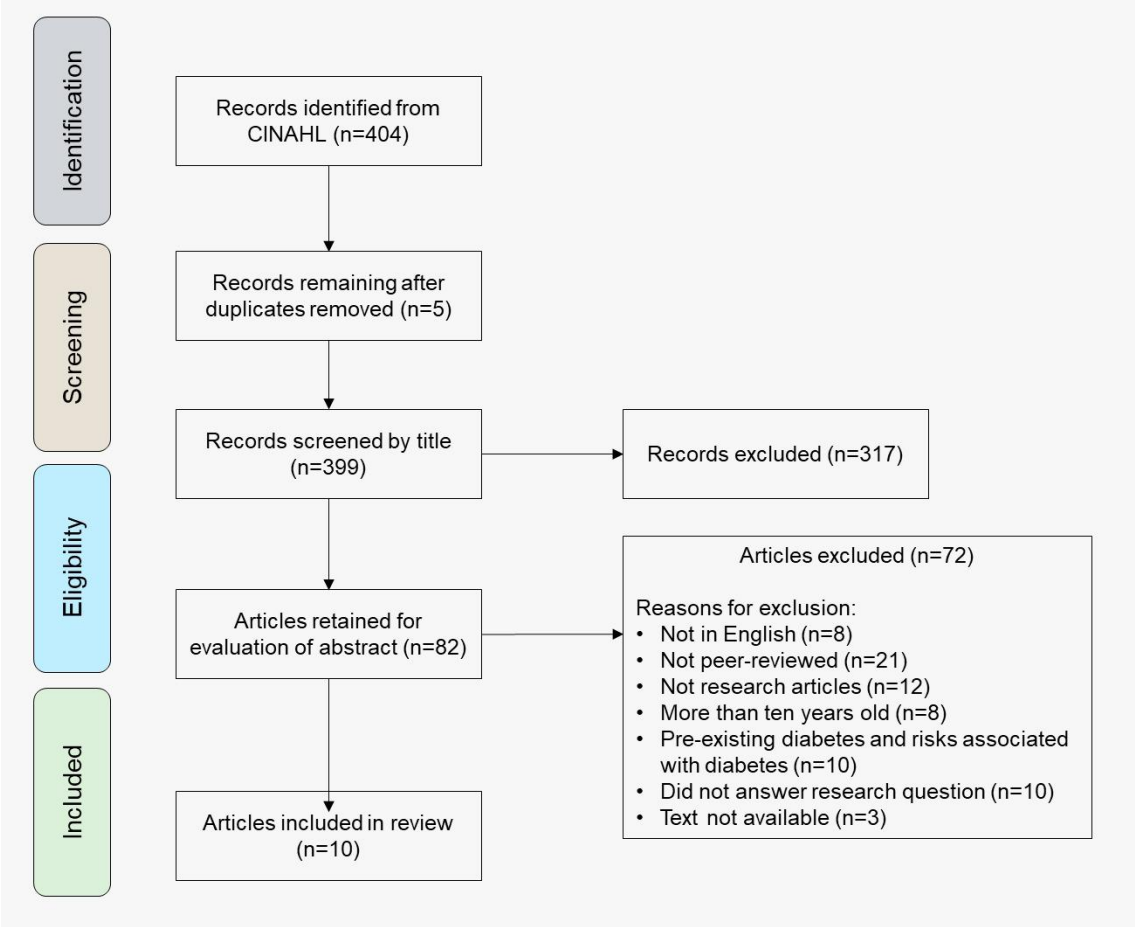
S3	(MH "Self Care") OR (MH "Self-Management")	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	47 990
S2	(MH "Diabetes Mellitus, Gestational") OR TI (Diabetes Mellitus Gestational OR Diabetes Pregnancy-Induced OR Gestational Diabetes) OR AB (Diabetes Mellitus Gestational OR Diabetes Pregnancy-Induced OR Gestational Diabetes)	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	12 596
S1	(MH "Diabetes Mellitus, Gestational")	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	8 803

S1 utilizes the query where ‘Diabetes Mellitus, Gestational’ is the major heading. For this, ‘Apply equivalent subjects’ was used as the only expander, whereas ‘Boolean/Phrase’ was used as the only Search mode. However, no limiters were used, which brought 8803 relevant results.

For S2, all three – ‘MH,’ ‘TI,’ and ‘AB’ were included with the ‘OR’ Boolean operator while keeping ‘Apply equivalent subjects’ as the only expander and ‘Boolean/Phrase’ as the only Search mode. This query brought 12596 relevant results back. A similar process was replicated, however, for various combinations until query S6 was reached, where from among the previous queries, S2, S4, and S5 were used with the ‘AND’ Boolean operator while keeping ‘Apply equivalent subjects’ as the only expander and ‘Boolean/Phrase’ as the only Search mode. This search narrowed the results to 404 relevant results.

The selection method for 10 articles is shown in the Prisma flowchart as shown in Figure 1. Apart from the limiters like English language, time frame of 10 years and peer-review, the selection method of the 10 articles were refined on basis of researched articles, sample group without underlying diabetes and risks associated with diabetes as well as articles answering our research question.

FIGURE 1. Prisma chart showing selection method.



Moreover, 10 articles were from Australia, China, Finland, Turkey, America, England and Iran. The articles have used qualitative and quantitative research methodology. Randomised control trials, questionaries, interviews were some examples of methodology collected by the articles. The sample sizes of the 10 articles were varied from 10 to over 100 participants. The 10 articles are in listed in the Appendix 1.

5.3 Analysis of data

The thematic analysis method is used to analyse the qualitative data collected in this thesis. It is the method used to recognize and provide meanings to the data's themes, words, or patterns. The results of this analysis often provide new insights and understanding (Naeem, Ozuem, Howell & Ranfagni 2023). This prevalent analysis method consists of being alternative of the phenomena in the data collected, forming patterns and themes to make the statements into a conclusion (Naeem & Ozuem 2022).

The first step of thematic analysis is to skim through the material to gain a sense of it and then focus on relevant keywords and citations. Consequently, classify the codes according to their common traits (Naeem et al. 2023). The researcher keeps an open mind and familiarizes with the text by reading those several times (Sundler, Linberg, Nilsen and Palmer 2019).

The first step was followed by skimming and reading the materials many times. The second step of thematic analysis is to search for meaning and organize it into patterns, i.e., focusing on research questions (Sundler et al., 2019). Patterns were weorganized into meanings by focusing on answers to our research question. After patterns are organized, patterns are given meaningful wholeness, the themes (Sundler et al. 2019). The third step is to organize patterns into themes, which have been shown in table 4, giving themes meaningful wholeness.

In table 4, the results of the ten articles are presented within quotation marks (“ ”) and analysed into themes. The quotation marks are the raw data from original researchers’ opinions represented in their own words, showing the clear findings and interpretations of the data collected (Patton 2014). Sandelowski (1994) and Matt (2004) emphasizes that the raw data in quotations marks demonstrates the supportiveness to researchers’ direct claims, emotions, responses, and experiences making quotations as a validate process in representing data.

TABLE 4. Thematic organization of the articles.

Raw Data	Theme
1.“Before intervention no significant differences in pregnancy weight, fasting plasma glucose and 2 h post-prandial blood glucose was noticed. After intervention of routine examination and personalized psychological nursing intervention compliance and satisfaction in the intervention group were higher than in control group. The intervention group has a remarkably higher disease awareness rate, self-psychological adjustment, and management ability than of the control group. Better pregnancy outcomes observed in intervention group than of control group with routine education and routine examination only.”	Intervention
2. “Both web-based educational intervention and standard education class do have correct answers. However, the intervention group with web based knew ‘’types of carbohydrate food for GDM vs the group with just standard GDM education. Both groups had excellent knowledge of fruits and vegetables. The intervention group with web-based have increased knowledge on exercise daily for 30 mins than of the control group. The understanding of fetal effects, care requirements were also known higher in the intervention group.”	Intervention
3. “The intervention group received individualized counseling on diet, physical activity, and weight control from trained study nurses, and had one group meeting with a dietitian. The control group received standard antenatal care. Women in the intervention group increased their leisure time physical activity more and improved their dietary quality compared with women in the control group.”	Counselling

4. “Nursing counselling and feedback provided via smartphone is important as a factor in the individualization of care. It increased the physical activity status of women, facilitated their adherence to diet, increased patient satisfaction, and reduced the rate of insulin therapy. No effect was found on blood glucose values.”	Counselling
5. “Dietary counselling on supplementation with whole berries and leafy vegetables in increased antioxidant intake and total serum antioxidant capacity improved random blood glucose, decreased serum IL-6 and improved HDL cholesterol versus the control group.”	Counselling
6. “The observation group with self-management education including base knowledge of diabetes, diet control, exercise regulation, foot care and regular monitoring of blood glucose as well as husband participating had obvious promoting effect on glycemic control and the improvement of self-management behavior ability in patients with gestational diabetes than that of the control group who has only the convention education.”	Intervention
7. “The patient centered educational DVD on anxiety and glycemic control plus usual care in women newly diagnosed with GDM did not show any differences in anxiety or for postprandial glucose meals those who just had usual care. However, the DVD group had significantly lower postprandial breakfast glucose compared to the control group.”	Intervention

8. “No significant difference in post-partum glucose level in women receiving Intensive Behavior Education Program/IBEP on healthy lifestyle intervention program and those who received routine GDM management.”	Intervention
9. “The groups with control standard prenatal care/GDM dietary counselling, home (standard care + phone education/support + home exercise), or F2F (standard care + on-site education/support + guided exercise with instructor on 2 days/week) group from 20 weeks (about 4 and a half months) gestation to delivery showed that F2F group had significantly higher exercise min, pedometer steps/day, and motivational determinants (attitude, subjective norm, perceived controls. Blood glucose at 36 weeks were lower in F2F group as well as F2F started insulin later in 33 weeks than home in 27 weeks and control group on 31 weeks.”	Intervention
10. “Self-care counseling, both in the form of face-to-face and on social networks, improved the score of self-care and quality of life as well as glucose tolerance test (GTT) in women with gestational diabetes.”	Counselling

6 RESULTS

The two different strategies emerge from our findings which impact management of GDM, which are Intervention strategies (1,2,6,7,8,9) and Counselling strategies (3,4,5,10).

6.1 Intervention

The intervention group of women with GDM receiving nursing intervention of routine examination and personalized psychological intervention in comparison with those who received just the routine education and examination showed that the intervention group demonstrated significantly higher awareness rate, self-psychological adjustment and management abilities, higher satisfaction, and compliance than in the control group who has just received the routine education and examination (1). Both interventions, standard and standard education combined with web-based education, showed excellent results in GDM's knowledge of fruits and vegetables (2). In contrast, the combination of standard education with web-based intervention verified that the women knew the types of carbohydrate food for GDM, increased knowledge on exercise daily for 30 minutes, and understood foetal effects and care requirements more than the group intervened with standard education only (2).

The group with self-management education, including the base knowledge of diabetes, diet control, exercise regulation, foot care, regular blood glucose, as well as the participation of the husband showed a promoting effect on glycaemic control, improving self-management behaviour ability in patients with self-management education (6). The group with usual care and the group with patient-centred educational DVD on anxiety and glycaemic control with newly diagnosed GDM did not show differences in anxiety or for postprandial glucose meals (7). However, lower postprandial breakfast glucose was noticed in the patient-centred educational DVD group than in the usual care group (7).

The intervention called Intensive Behaviour Education Program (IBEP) on healthy lifestyle program and those who got routine GDM management did not show a significant difference in post-partum glucose levels (8). Among three different groups, which are the prenatal care group (GDM dietary counselling), home group (standard care, phone education/support, home exercise), and face-to-face group (standard care, on-site education/support, guided exercise with instructor) showed that face-to-face group had higher exercise minutes as well as higher motivational determinants like attitude, subjective norm, perceived controls (9). Moreover, face-to-face group started insulin in 33 weeks whereas home group started in 27 weeks and control group started in 31 weeks (9).

6.2 Counselling

One group received individualized counselling on a diet by a dietitian, physical activity, and weight control by a trained nurse, which showed the increase in their leisure time with physical activity with improved dietary quality and then that of a control group, which received just the standard antenatal care (3). The individualization of nursing care with counselling and feedback via smartphone showed increased physical activity in women with GDM, facilitated their adherence to diet, and increased patient satisfaction by reducing the rate of insulin (4). However, there was no effect found on the blood glucose values (4).

The dietary counselling on supplementation with whole berries and leafy vegetables increased antioxidant intake and total serum antioxidant capacity in random blood glucose, decreased IL-6, and improved HDL cholesterol (5). Both forms of self-care counselling, which were face to-face and on social networks, improved the score of self-care and quality of life with an improved glucose tolerance test (GTT) (10).

7 DISCUSSION

7.1 Ethics and reliability

The research community follows the principles of integrity, accuracy, and paying attention to every detail while researching, recording, presenting, and evaluating the results. The researcher is responsible to provide due respect to the other researcher's work by citing their publication and giving them credit while conducting his research and publishing the results (Finnish National Board on Research Integrity 2023).

The first aim of the research is to generate knowledge and truth and to minimize misinterpretations of the research data. Cooperation and coordination with different disciplines and institutions by promoting trust, mutual respect, and fairness are to be remembered. The rules of peer-review, copyright, citation, and data sharing policies. Thirdly, being accountable to the public in the sense of human subject protection, animal care and use, and conflict of interest. (Resnik 2023.)

According to the Finnish National Board on Research Integrity (2023), the team within the research project deals with the rights of the researcher, obligations, questions concerning accessing the data as well as authorship. These aspects are to be considered even before starting the research. However, these aspects are to be revised during each step as the research progresses in time.

English is not the thesis researchers' mother tongue; thus, the team faced some challenges like analysing text, paraphrasing, and understanding texts during this thesis process. The variety of articles explained same subject but differently as per the article researchers' native languages which was experienced while finalizing the theory part of this report. Moreover, due to the lack of sufficient articles, we could not focus on one country or one region. The support from our supervisor and the teamwork helped us in the process of writing.

To make our thesis more reliable, we chose data/articles which were peer reviewed. Since our topic deals with pregnancy, we carefully analysed the samples

collected for articles we reviewed by focusing on participants over 18 years old to preserve the research ethics. We also signed a contract before starting the research process for our thesis with our co-ordinator. This descriptive literature review is done for Tampere University of Applied Sciences.

7.2 Findings

Our findings showed the importance of patient education strategies in managing GDM among women. It also covered the two patient education strategies- intervention and counselling. It also emphasized support materials used for patient education and the impact of patient education strategies on GDM management.

The importance of nursing psychological interventions with routine examinations among women with GDM was discussed in the article, which has promoted a higher awareness rate, management abilities, higher satisfaction, and higher self-psychological adjustment (1). Korean Journal of Women's Health Nursing (2021) supports the same by emphasizing the need for intervention on the factors affecting physical health, i.e., diet, exercise, and glucose since these are the most important factors affecting health. However, the psycho-emotional nursing intervention closely connected to depression, anxiety, stress, self-efficacy, and self-management are also crucial and highly useful in the intervention approach (Korean Journal of Women Health Nursing 2021).

Interventions like standard education integrated with web-based education can enhance knowledge about exercise, fetal effects, and care needs of women with GDM (2). Leblalta, Kebaili, Sim and Li (2022) also claim that interventions like digital health can assist women to improve GDM care through self-care on recommendations on dietary, exercises increasing the level of self-monitoring adherence.

Ensuring the husband's participation in self-management education groups positively affected glycaemic control while improving the self-management behaviour ability of GDM women (6). On the contrary, lack of support from partners can negatively affect women's experience by leading them to experience pregnancy

as unwanted (Al-Mutwah, Campbell, and Kubis, 2023). This implies that the participation of the GDM women partner can positively impact the intervention.

Hosseinzadeh, Sharifzadeh, Hosseinzadeh & Torshizi (2022) argue that face-to-face intervention, even one hour, was proven effective for increasing self-care scores. Likewise, the face-to-face intervention group performed more exercises, started insulin later, and was found to have better attitudes, subjective norms, and perceived norms than other groups (9). Similarly, face-to-face self-care counselling contributed to improved self-care, quality of life, and glucose tolerance tests (10).

Bhattad & Pacifico (2022) believe that patient education using different materials can assist patients with health literacy. However, the patient-centred educational DVD on anxiety and glycaemic control was not adequate compared to the usual care group (7). Moreover, no difference in post-partum glucose levels was observed between intervention initiatives like the Intensive Behaviour Education Program (IBEP) and any routine GDM management (8).

Individualized counselling by trained nurses and feedback via smartphone on weight control showed higher motivation in women with GDM, increased physical activity, adherence to diet as well as the lowered level of insulin used, and a higher level of care satisfaction in women with GDM (3,4). The dietary management of GDM is one of the traditional ways of managing GDM by supporting the placental, maternal, and foetal metabolic needs, which can help to have a lifetime commitment to healthy eating in women (Hernandez & Brand-Miller 2018). Also, article 5 focuses on dietary counselling on supplementation with whole berries and leafy vegetables, having benefits on blood glucose and other health benefits for women with GDM.

8 CONCLUSION

We reviewed the prevalence, risks, diagnosis, and management of GDM among women with GDM in our thesis. Further, the relationship between patient education and nursing was examined too. The two patient education strategies and tools used to execute these strategies for managing GDM were discussed. Moreover, this thesis highlights the importance of patients and may provide tips for healthcare professionals to support the motherhood journey among women with GDM.

According to the findings, differentiating between counseling and intervention strategies in patient education required extensive discipline since they were used interchangeably in the data collected. Regardless of the lack of differentiation, these patient education strategies were popular and used repeatedly. However, we found that not all patient education strategies were successful for various reasons. Nevertheless, patient education aimed to empower patient's self-care abilities for optimal care outcomes.

In the future, the research can be focused on a specific country, community, culture, beliefs, and religion with the goal of expanding the knowledge of patient education strategies in that specific area. By doing such specific research studies, we might have different results as observed in this thesis report. Moreover, the most effective patient education strategies could be studied and applied in medical and nursing science for future patient education. It would also be interesting to compare the differences between patient education strategies and tools used, which could help dwell into the vast area of patient education strategies.

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APPENDICES

Appendix 1. List of Articles

S.N.	Authors, Year, Country, Name of Article	Purpose	Sample and Methods	Key Results
1	He, R., Lei, Q., Hu, H., Li, H., Tian, D., & Lai, Z. 2022. The effect of health education combined with personalized psychological nursing intervention on pregnancy outcome of pregnant women with gestational diabetes mellitus. *BioMed Research International*, *2022*. China	To study the effect of health education combined with personalized psychological nursing intervention on pregnancy outcome of pregnant women with gestational diabetes mellitus (GDM).	170 patients with GDM admitted to Guangdong Women and Children Hospital from January 2018 to December 2018 were selected as study subjects and randomly divided into two groups. During the period from diagnosis of GDM to termination of pregnancy, both groups were given routine education and routine examination, and the intervention	There were no big differences observed in pregnancy weight, fasting plasma glucose and two hour postprandial blood glucose before the intervention for the groups that had routine education and routine examination only. After intervention which included routine examination and personalized psychological nursing, the intervention group complied and were more satisfied compared

			group adopted health education combined with personalized psychological nursing interventions during pregnancy. The pregnancy weight, blood glucose index, compliance, disease awareness, self-adjustment management ability, satisfaction, and pregnancy outcome were measured before and after the intervention.	to the control group. The intervention group demonstrated significantly better awareness rate towards disease, adjusted well psychologically on their own, and better capability to manage than the control group which resulted in improved pregnancy outcomes in the intervention group.
2	Sayakhot, P., Carolan-Olah, M., & Steele, C. (2016). Use of a web-based educational intervention to improve knowledge of healthy diet and lifestyle in women with gestational diabetes mellitus	The aim was to improve knowledge on healthy diet and lifestyle in GDM. Evaluation of the intervention explored women's	A total of 116 women, aged 18–45 years old, newly diagnosed with GDM, participated (Intervention (n) = 56 and control (n) = 60). Women were randomly allocated	Both web-based educational intervention group and the control group that took standard education class were able to answer correctly as well as were knew very well about fruits and vegetables. However,

	compared to standard clinic-based education. BMC pregnancy and childbirth, 16(1), 1-12. Australia	knowledge and understanding of GDM, healthy diet, healthy food, and healthy lifestyle, after using the web-based program compared to women receiving standard clinic-based GDM education	to the intervention or control groups and both groups attended a standard GDM education class. Group 1(Intervention) additionally used an online touch screen/computer program. All women completed a questionnaire following the computer program and/or the education class. All questions evaluating levels of knowledge had more than one correct answer and scores were graded from 0 to 1, with each correct component receiving a score, eg. 0.25 per each correct answer in a 4 answer question. Chi-	the web-based intervention group were able to recognize types of carbohydrates, possessed increased knowledge of benefits of exercising daily for thirty minutes, and had better understanding of fetal effects along with care requirements than the control group.

			square test was performed to compare the two groups regarding knowledge of GDM.	
3	Koivusalo, S. B., Rönö, K., Klemetti, M. M., Roine, R. P., Lindström, J., Erkkola, M., ... & Stach-Lempinen, B. (2016). Gestational diabetes mellitus can be prevented by lifestyle intervention: the Finnish Gestational Diabetes Prevention Study (RADIEL) a randomized controlled trial. Diabetes care, 39(1), 24-30. Finland	To assess whether gestational diabetes mellitus (GDM) can be prevented by a moderate lifestyle intervention in pregnant women who are at high risk for the disease	Two hundred ninety-three women with a history of GDM and/or a prepregnancy BMI of ≥30 kg/m(2) were enrolled in the study at <20 weeks of gestation and were randomly allocated to the intervention group (n = 155) or the control group (n = 138). Each subject in the intervention group received individualized counseling on diet, physical activity, and weight control from trained study nurses, and had one	In contrast to the control group that received standard antenatal care, the intervention group were provided with individualized training by expert study nurses on topics like diet, physical exercise and weight control measures. The intervention group produced results reflecting increase in physical activity during leisure time and improved quality of diet than that of the control group women.

			group meeting with a dietitian. The control group received standard antenatal care. The diagnosis of GDM was based on a 75-g, 2-h oral glucose tolerance test at 24-28 weeks of gestation.	
4	Simsek-Cetinkaya, S., & Koc, G. (2023). Effects of a smartphone-based nursing counseling and feedback system for women with gestational diabetes on compliance, glycemic control, and satisfaction: a randomized controlled study. *International Journal of Diabetes in Developing Countries*, *43*(4), 529-537. Turkey	To investigate the effect of a smartphone-based nursing counseling and feedback system on physical activity, glycemic control, and patient satisfaction among women with GDM	This was a single-center, randomized controlled study. Women with GDM were also in the intervention and control groups. The groups received (1) routine biweekly prenatal care (control group) or (2) counseling and feedback from the nurse via a platform installed on their smartphone (smartphone	Providing nursing counselling and feedback through smartphones proved to be an important factor in delivering individualized care to women. Reach through smartphones not only increased the physical activity but also assisted them in aspects including adhering to the recommended diet, enhanced satisfaction as patients

			group) in addition to routine clinical care.	and reduction in the rate of insulin therapy. However, blood glucose values were not impacted by the counselling provided via smartphones.
5	Jaworsky, K., DeVillez, P., Alexander, J. M., & Basu, A. (2023). Effects of an Eating Pattern Including Colourful Fruits and Vegetables on Management of Gestational Diabetes: A Randomized Controlled Trial. Nutrients, 15(16), 3624. USA	The aim of the study was to know how counselling on lifestyle changes can affect cardiometabolic risks in women with GDM.	12-week randomized controlled trial based on behavioral counseling in which women with GDM (N = 38) were randomized into either a nutrition education (control) (N = 18) group or nutrition intervention (N = 20) group.	The intervention group that received dietary counselling to supplement their diet with whole berries and leafy vegetables realized enhanced random blood glucose, reduced amount of serum IL-6 and better HDL cholesterol than the control group. The results were contributed by enhanced antioxidant intake and improved serum antioxidant capability due to the supplemental diet.

6	Xuehong, L., & Shuyuan, P. (2015). Influence of husband participating in self-management education on blood glucose and self-care ability of gestational diabetes mellitus patients. *Chinese Nursing Research*, *29*. China	To probe into the application effect of husband participating in self-management education in the management of gestational diabetes	A total of 100 cases of gestational diabetes patients were divided into observation group (48 cases) and control group (52 cases) based on their husbands' willingness to participate. The self-management education was implemented for the patients in control group including base knowledge of diabetes, diet control, exercise regulation, foot care and regular monitoring of blood glucose. The observation group in the base of conventional self management education, asked her husband to participate in	Unlike the control group that received only the conventional education, the observation group with self-management education, comprised of basic diabetes knowledge, diet control, regulating exercises, foot care and regular blood glucose monitoring as well as husband’s participation, produced results like promoting effect on glycemic control as well as improved ability to self-manage behavior.

			self care self management education and family nursing management. To observe the change of fasting blood glucose, postprandial 2 h blood glucose, glycated hemoglobin and self management behavior of two groups of patients before intervention and after intervention for 3 months	
7	DRAFFIN, C. R. *et al.* Impact of an educational DVD on anxiety and glycaemic control in women diagnosed with gestational diabetes mellitus (GDM): A randomised controlled trial. Diabetes Research & Clinical Practice, *[s. l.]*, v. 126, p. 164–171, 2017. UK	The diagnosis of gestational diabetes mellitus (GDM) during pregnancy can lead to anxiety. This study evaluated the impact of an innovative pa-	150 multi-ethnic women, aged 19-44years, from three UK hospitals were randomised to either usual care plus DVD (DVD group, n=77) or usual care alone (control group, n=73) at GDM diagnosis.	Patient centered DVD containing educational material on anxiety and glycemic control along with the normal usual care in recently diagnosed GDM women failed to produce notable differences in anxiety or postprandial glucose meals

		tient-centred educational DVD on anxiety and glycaemic control in women newly diagnosed with GDM	Primary outcomes were anxiety (State-Trait Anxiety Inventory) and mean 1-h postprandial capillary self-monitored blood glucose for all meals, on day prior to follow-up.	compared those women who just received usual care. Instead, the DVD group exhibited significantly reduced postprandial breakfast glucose when measured against the control group.
8	Durnwald, C. P., Kallan, M. J., Allison, K. C., Sammel, M. D., Wisch, S., Elovitz, M., & Parry, S. (2016). A randomized clinical trial of an intensive behavior education program in gestational diabetes mellitus women designed to improve glucose levels on the 2-hour oral glucose tolerance test. American Journal of Perinatology, 1145-1151. Iran	To evaluate whether women with gestational diabetes mellitus (GDM) enrolled in an intensive behavior education program (IBEP) demonstrate lower mean fasting glucose levels on the 2-hour 75 g oral glucose tolerance test (2-	Study Design A prospective randomized controlled trial of women diagnosed with GDM was conducted. Exclusion criteria were GDM diagnosis ≥ 33 weeks or < 20 weeks. Women were randomly assigned to one of two treatment arms: (1) routine GDM management or (2)	There were no stark difference observed in post-partum glucose level in women belonging toeither of the groups- the control group undertaking routine GDM management and the intervention group undergoing Intensive Behavior Education Program

		hour OGTT) at 6 to 12 weeks postpartum compared with women who undergo routine GDM management	an IBEP. Women underwent a 2-hour OGTT at 6 to 12 weeks postpartum. Fisher exact test, t-test, and Wilcoxon rank sum test were used as appropriate.	
9	Downs, D. S., DiNallo, J. M., Birch, L. L., Paul, I. M., & Ulbrecht, J. S. (2017). Randomized face-to-face vs. home exercise interventions in pregnant women with gestational diabetes. Psychology of Sport and Exercise, 30, 73-81. USA	Evaluate effects of a theoretically based, semi-intensive (Face-to-Face; F2F) exercise intervention and minimum-contact (Home) exercise intervention to the standard care (Control) on exercise, its motivational determinants, blood glucose levels, and insulin use of	Participants (N = 65) were randomized to a Control (standard prenatal care/GDM dietary counseling), Home (standard care + phone education/support + home exercise), or F2F (standard care + on-site education/support + guided exercise with instructor on 2 days/week) group from ~20 weeks gestation to	Among the three groups, face-to-face group (receiving standard care, on-site educational support and guided exercise with instructor two days per week) exhibited improved exercise minutes, pedometer steps per day and enhanced attitude, subjective norm and perceived control (collectively called motivational determinants) than the other two groups which in-

		pregnant women with gestational diabetes mellitus (GDM).	delivery. Assessments of exercise and motivational determinants were obtained at baseline (20-weeks gestation) and follow-up (32-weeks gestation). Blood glucose levels (fasting/postprandial mg/dL) and insulin use were extrapolated from medical records.	cluded control standard prenatal care or GDM dietary counselling in one and standard home care, phone educational support and home exercise in the other. The face-to-face group also demonstrated lower blood glucose at thirty six weeks and required insulin later (during week thirty three) than the other two groups.
10	Ghasemi, F., Vakilian, K., & Khalajinia, Z. (2021). Comparing the effect of individual counseling with counseling on social application on self-care and quality of life of women with gestational diabetes. Primary Care Diabetes, 15(5), 842-847. Iran	The present study aimed to compare the effect of two different forms of face-to-face and counseling on a social application, i.e., WhatsApp, on self-care and quality of life	The present research was an educational trial with control group, which was conducted on diabetic women between 24 and 26 weeks of pregnancy. A total of 126 subjects were included in the study using the convenient sampling	Both groups of women with gestational diabetes who received self-care counselling face-to-face and those receiving the same over social networks managed to improve their respective scores of self-care, quality of life, and glucose tolerance test (GTT).

		of women with gestational diabetes.	method. They were assigned into three groups. All of the participants answered the questionnaires gestational diabetes self-care, and quality of life at the beginning and end of the study. The GATHER approach to counseling (G = Greeting, A = Ask, T = Tell, H = Help, R = Return) was performed in four 45-min sessions for face-to-face and WhatsApp groups in the pregnancy weeks of 27, 28, 29, and 30. The subjects in the control group received only the routine	

			cares for gestational dia-betes. T test, Chi squared test, and ANOVA repeated measurement test were used to analyze the data.	