Effect of Self-Management Program Based on 5 A's Model for Gestational Diabetic Women on Maternal and Neonatal Outcomes

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Abstract:

Background: Gestational Diabetes Mellitus is a pregnancy-related complication that is on the rise internationally and linked to bad health outcomes for both mothers and the unborn child. 5 A's model is a realistic, evidence-based approach created to modify behavior, achieve self-management, and enhance pregnancy outcomes. **Aim:** was to investigate the effect of self-management program based on 5A's model for gestational diabetic women on maternal and neonatal outcomes. **Methods:** A quasi-experimental research design was used at antenatal clinic of Obstetrics and Gynecological department in Benha University Hospital. A purposive sample of 85 pregnant women diagnosed with GDM. **Tools:** four tools were used : A structured Interview Schedule, Gestational Diabetic Attitude Scale, Gestational Diabetes Self-Management Questionnaire and Maternal & Neonatal Outcome Sheet. **Results:** there was a highly statistical significant differences in total knowledge score, total attitude score and total self-management ability score post intervention compared to pre intervention among studied group($p<0.001$). Also, there was a statistical significant reduction in the occurrence of maternal complications in study group. Similarly, the neonates of the study group had better outcome & lower incidence for developing neonatal complications. **Conclusions**: Self-management program based on the 5A's model regarding gestational diabetes has a positive effect on women's knowledge, attitudes and self-management ability with favorable maternal & neonatal outcomes. **Recommendations:** a simple Arabic handout outlining the benefits of GDM self- management based on the 5A's model should be disseminated to all pregnant women with GDM at hospitals and maternal and child health centers to facilitate modifications in lifestyle and adherence to self-management routines, ultimately leading to enhanced outcomes in pregnancy.

Keywords: Gestational diabetes, Maternal outcome, Neonatal outcome, Self-management program and 5A's model.

Introduction

Gestational diabetes (GD) is a common metabolic disorder that potentially impact both pregnant women as well as their offspring. The elevated prevalence of GD is contingent upon numerous factors, including advanced maternal age, overweight, a family history of diabetes mellitus, a history of gestational diabetes in the previous pregnancy and current pregnancy complications like eclampsia, macrosomia, stillbirth, miscarriage or premature delivery ***(Kiani, et al., 2017).*** A worldwide health issue known as gestational diabetes is characterized by a glucose intolerance that manifests for the first time in the second or third trimester of pregnancy. This syndrome results in variable degrees of hyperglycemia as the pancreatic beta cells are unable to react appropriately to the increased demand for insulin during pregnancy ***(Liu, et al., 2023).***

Globally, the prevalence of GD has increased, which has a negative impact on the health of expectant mothers and newborns ***(American Diabetes Association, 2020).*** According to recent study, hyperglycemia occurs in 16.6% of pregnancies worldwide, and the majority of pregnant women are classified as GD (***Simmons, et al., 2018***). In the past few years, there has been a noticeable rise in the occurrence of GD on a global scale, as evidenced by incidence rates spanning from 1.4% to 18.5% in different countries. In the United States, GDM affects about 6% of pregnancies and is becoming more common (***Ibrahim, 2019).***Two recent studies revealed that there was a high incidence of GD in Egypt, with one finding a frequency of 2-14% in the Menoufia Governorate in 2017 and the other

finding a prevalence of 8.86% in El-Minya City in 2018 ***(Khalil, et al., 2017 and El Sagheera & Hamdi, 2018).***

Gestational diabetes, caused by increased insulin resistance and impaired insulin secretion during pregnancy, poses significant risks to both mother and infant. Maternal complications include hypertension, preeclampsia, preterm labor and polyhydramnios. Persistent insulin resistance post-childbirth increases the women risk of type II diabetes and cardiovascular disease ***(Venkatesh, et al., 2022).*** Fetal and neonatal long-term complications increase metabolic disease risk, while short-term issues include macrosomia, asphyxia, respiratory distress syndrome, birth injury, infections and perinatal mortality due to unexplained anomalies ***(García-Moreno, et al., 2022 & Malaza, et al., 2022).***

Women with gestational diabetes mellitus are encouraged to attain ideal glycemic control throughout pregnancy by efficient self-management in order to avoid associated problems. Self-management is a powerful tool that is crucial in the treatment of pregnant women with GDM in order to avoid these issues and maintain a healthy blood glucose level throughout the pregnancy. The self-management scale typically involves blood glucose self-monitoring, dietary changes and increased physical activity. ***(Mensah, et al., 2020).***

Prenatal care for women with GD is crucial for achieving favorable maternal and neonatal outcomes. Prenatal care can empower pregnant women by sharing the knowledge and skills they require and maximizing their mental and physical well-being ***(Lamadah, et al., 2022).*** Blood glucose monitoring, lifestyle changes, and medicinal nutrition therapy are the main components of standard gestational diabetes care. When these conservative methods fail to establish glycemic control, insulin therapy is started ***(Saha, 2022).*** The demands of pregnant women with GD go beyond simple glycemic control and also include preventing complications and raising women's awareness of the importance of taking an active role in self-management **(*Rasmussen, et al., 2020*)**.

The 5 A's model is an evidence-based, non-medical approach to behavior modification, specifically designed to empower women to adopt behavioral changes. It consists of five fundamental steps: assess, advise, agree, assist, and arrange. Healthcare providers evaluate women's knowledge, provide comprehensible disease information, set collaborative goals, help identify barriers and arrange follow-ups. This model is effective in health education initiatives ***(Vallis, et al., 2013).*** Maternity nurses can employ the 5 A's model to enhance the GD women outcomes, which may be used to control the condition after a diagnosis or to halt or postpone the development of problems related to gestational diabetes ***(Sadeghigolafshanl, et al., 2020).***

In order to prevent and reduce GDM issues that could negatively affect both the health of the mother as well as the health of the newborn and improving pregnancy outcomes, the involvement of the maternity nurse in caring for women with GDM is thought to be essential. This can be achieved by providing pregnant women with pertinent information that aims to broaden, correct and empower their knowledge as well as help them develop a positive attitude toward GDM, which includes adhering to recommended diet plans, exercise routines, self-monitoring blood glucose levels and GDM medical treatment throughout the gestational period ***(Nollino, et al., 2019).***

Significance of the study

Gestational diabetes is the most prevalent and harmful pregnancy complication ***(Wang et al., 2022).*** The prevalence of GD rises with age that affected from 8% to 26% of women aged 45, GD affected roughly 204 million women world widely, and by 2045, that number is projected to rise to 308 million ***(International Diabetes Federation, 2015).*** The incidence rates ranging from 1.4% to 18.5% in various nations. In the United States, GDM affects about 6% of pregnancies and is becoming more common ***(Ibrahim, 2019).*** Additionally, the majority of GD cases occurs in developing nations where access to maternal care is restricted ***(Ogurtsova, et al., 2017).*** Egypt now has a substantially higher rate of diabetes than other countries, the International Diabetes Federation (IDF) ranked Egypt among the top 10 nations ***(Elberry, et al.,***

2023). Egypt has a 7.2% diabetes prevalence rate ***(Abdel-Moaty, et al., 2023).***

According to the survey, a limited number of studies have been conducted to assess the effects of self-management program based on 5A model. To the best of our knowledge, the effect of self-management program based on 5A model has not yet been evaluated in pregnant women with GDM. As improving the maternal and neonatal outcome active cooperation, self-management program are of great importance in the management of GDM. Therefore, the current study was conducted to investigate the effect of self-management program based on 5A's model for gestational diabetic women on maternal and neonatal outcomes.

Aim of the research:

This research aimed to investigate the effect of self-management program based on 5A's model for gestational diabetic women on maternal and neonatal outcomes.

Research Hypothesis:

H1- Gestational diabetic women who will receive self-management program based on the 5A's model regarding gestational diabetes will exhibit improved knowledge after implementation of program than those who don't.

H2- Gestational diabetic women who will receive self-management program based on the 5A's model regarding gestational diabetes will experience positive attitude after implementation of program than those who don't.

H3: Gestational diabetic women who will receive self-management program based on the 5A's model regarding gestational diabetes will experiences good self-management ability after implementation of program than those who don't.

H4: Gestational diabetic women who will receive self-management program based on the 5A's model regarding gestational diabetes will have better maternal and neonatal outcomes and fewer complications after implementation of program than those who don't.

Operational definitions:

Self-management program based on 5 A's model: an evidence-based practical model designed to help gestational diabetic women change their health behavior and achieve self-management, as well as improve maternal and neonatal outcomes. This model outlines five steps: assess advice, agree, assist, and arrange.

Materials & Method

Research design:

A quasi-experimental design (two groups, "control & study" and "pre-posttest) was used. The purpose of this design is to establish a causal relationship between an independent variable and a dependent variable, similar to that of a true experiment but, subjects are assigned to different groups based on predetermined parameters, unlike a true experiment ***(Thomas, 2022).***

Setting:

The research was carried out at obstetrics and gynecological outpatient clinic in Benha University hospital in Qaliobya governorate, Egypt. The setting comprises a single floor that is divided into four distinct sections: the reception area, the antenatal examination section, the gynecological examination section, and a room designated for nursing staff. The official operating hours of the antenatal clinic commence at 9 am and conclude at 12 pm on a daily basis. For routine antenatal care, two nurses and four obstetricians (consisting of a consultant, specialist assistant, specialist, and one junior doctor) provide their services. The flow rate of gestational diabetic women was 5-6 women per week.

Sample size, type and criteria: Based on the statistical census conducted by Benha University Hospital, the flow rate of GDM was 850 women in 2022, the sample size calculated as 10% of total flow rate (85 pregnant women) medically diagnosed with gestational diabetes between December, 2022 to July, 2023 (randomly divided as, 38 women assigned to the control group and 37 women assigned to the study group) according to the following **inclusion criteria**: gestational age between 28-32 weeks, with a single living fetus, adhering to a regular schedule of antenatal visits, can read and write. Conversely, the **exclusion criteria**: pregnant women who suffered from other medical conditions such as hypertension, chronic diabetes mellitus, and cardiac diseases, as well as psychological complications and pregnant women experiencing obstetric-related problems such as pregnancy-

induced hypertension and preterm labor.

Data collection tools:

Four fundamental tools were utilized:

First tool: A structured interviewing questionnaire: this tool was developed by the researchers subsequent to an extensive review of pertinent literature ***Javid, et al., 2015 and Bhavadharini, et al., (2017).*** It was organized into three parts:

Part 1: General characteristics of studied women as age, educational level, place of residence, occupation, weight, height, body mass index.

Part 2: Obstetrical and medical history: consisted of gestational age in weeks, numbers of gravidity, parity, history of abortion, antenatal visits, personal and family history of gestational diabetes.

Part 3- Women's knowledge assessment sheet regarding GDM: It was adopted from ***Kondamuri et al., (2021)*** and consisted of 18 items questionnaire in five subscales involved knowledge about GDM risk factors (4 items), knowledge about GDM screening (3 items), knowledge about treatment options (3 items), knowledge about immediate complications (5 items) and knowledge about future course(3 items).

Scoring system:

Each correct response was given a score of 1 and incorrect answer was given a sore of 0 each woman was scored out of total 18. Inadequate knowledge < 75% = < 13.5 point and Adequate knowledge ≥ 75% = ≥ 13.5point. This tool collected in two stages (at the onset of study and two months later).

Second tool: Gestational Diabetic Attitude Scale: It was adopted from ***Anderson et al., (1998)*** to evaluate the pregnant women attitudes towards gestational diabetes. The scale consisted of 33 items which were divided into five subscales. Each item was assessed using a Likert scale. The subscales covered attitudes related to: 1) the necessity for specialized training in GDM care, 2) the severity of GDM, 3) the importance of strict glucose control, 4) the psychosocial impact of GDM, and 5) the attitude towards patient autonomy.

Scoring system:

Positive statements were scored from 5 = strongly agree to 1 = strongly disagree, On the other hand, negative statements were scored from 1= strongly agree to 5 = strongly disagree. The total score of each woman was arbitrary categorized as having a "positive attitude" when the score greater than or equal ≥ 50% of the total score, and a "negative attitude" when the score less than < 50% of the total score.

Third tool: Gestational Diabetes Self-Management Questionnaire (GDSMQ) was adopted from ***Bukhsh, et al., (2017)*** which evaluate women's self-care activities. It comprises four subcategories: glucose management (5 items), dietary control (4 items), physical activity (3 items), and healthcare use (3 items). Additionally, item 16 provides an overall rating for self-care. There are seven positively coded items (items 1, 2, 3, 4, 6, 8, and 9) and nine negatively coded items (items 1, 2, 3, 4, 6, 8, and 9) (nos. 5, 7, 10, 11, 12, 13, 14, 15, and 16).

Scoring system:

The scoring of GDSMQ involves summing the scores of all items on a scale ranging from 0 to 48. A score of more than 50% indicates good self-management ability, while a score less than 50% indicates poor self-management ability.

Fourth tool: Maternal and neonatal outcomes assessment sheet: it was adopted from ***(Koivusalo, et al, 2016)*** and was written in an Arabic language in the form of multiple choice questions and close ended questions and divided into two parts:

Part 1: Maternal outcome sheet: included mode of delivery, blood glucose level at labor (mg/dl), maternal complications as: preterm labor, obstructed labor, postpartum hemorrhage and infection, blood glucose level following delivery (mg/dl).

Part2: Neonatal outcome sheet: as macrocosmic baby, admission to NICU, jaundice, shoulder dystocia, hypoglycemia, hyperglycemias, trauma / injury, prematurity, respiratory distress syndrome (RDS), still birth, intrauterine fetal death.

Tools validity:

A panel comprising five specialists in the field of obstetrics and gynecological nursing from faculty of nursing at Benha University conducted

an assessment of the content validity. Adjustments were made based on the panel's evaluations of the clarity of sentences and the suitability of the content.

Tools reliability:

The assessment of reliability was conducted using Cronbach's Alpha coefficient test, which demonstrated that all four tools were comprised of relatively homogeneous items. the internal consistency of women knowledge questionnaire was (0.88), the internal consistency of gestational diabetic attitude scale was (0.80), the internal consistency of gestational diabetes self-management questionnaire was (0.89) and maternal and neonatal outcomes assessment was (0.74).

Ethical considerations:

The Approval of the Ethical Research Committee (ERC) was obtained from Faculty of Nursing at Benha University. Each woman was provided with comprehensive explanations regarding purpose of the research and was informed that their participation was voluntary. They were also given the assurance that they could leave the research at any time before it was finished. Those who consented to participate in the research were required to provide verbal consent before the commencement of data collection. Participants were assured that all information gathered would be used exclusively for research and participant confidentiality was strictly upheld all across the entire study process.

A pilot study:

The pilot study was carried out on 10% of the total study sample consisting of (9 women with GDM) in order to test the objectivity and applicability of the research tools, the viability of the research procedure, and to determine the time required to complete them, all tool modifications were performed. The pilot sample was excluded from the study sample.

Field work:

In order to achieve the research aim, the researchers implemented the subsequent stages, preparatory phase, interviewing & assessment phase, the planning phase, the implementation phase and the evaluation phase. These phases were executed starting from the commencement of December, 2022 and concluding at the conclusion of June, 2023, spanning duration of seven months. The researchers visited the previously mentioned setting three days per week, (Sunday, Tuesday, Thursday) from 9.00 Am to 12.00 Pm until the predetermined sample size of women was attained.

Preparatory phase:

In this phase the researchers conducted a comprehensive review of related literatures sources such as books, articles, periodically published academic journals and magazines in order to formulate tools of data collection. Contents of the self-management program based on 5A' model about gestational diabetes were outlined, instructional approaches were selected and educational materials (including videos, visually engaging images and pamphlet) were created.

Interviewing & assessment phase: -

During this phase, the process involved conducting interviews with women belonging to both the control and study groups. The interviews commenced with the control group to prevent any potential bias, followed by the study group. Initially, the researchers extended greetings to the women, introduced themselves to woman, clarify the research aim and provided the woman with comprehensive information about the research purpose, duration & research phases. Furthermore, oral consent was obtained. The researchers gathered data by employing various tools, self-administered questionnaire (first tool) to collect the general characteristics, obstetric and medical history and women's knowledge regarding GDM. Additionally, gestational diabetic attitude scale (second tool) and gestational diabetes self-management questionnaire (third tool) were administered. On average, each interview with a woman lasted approximately 30-40 minutes. Furthermore, an average of 1-2 GD women was interviewed per day.

Planning phase:

The results from the interviewing and assessment phase led to the development of the GDM self-management program, which is based on the 5A' model. Various teaching strategies, instructional media and the numbers and content of sessions were chosen based on the needs of the

study group.

Implementation Phase:

The study group was provided with self-management program based on the 5A's model. The duration of the intervention spanned a period of two months. After analyzing the results of the pilot study, it was decided that three sessions would be carried out to implement the intervention. The educational sessions were structured to endure for duration of 1.5 hours and were based on a set of five sequential stages.

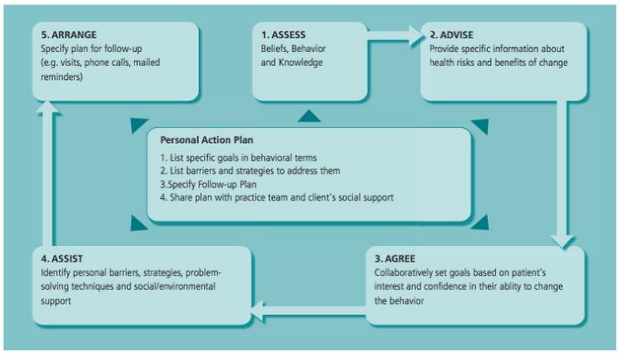
The initial stage (Assess): This particular stage involved the compilation of data from the medical records of recruited women, as well as conducting interviews with women (completing the study questions form and documenting blood glucose levels). This stage was executed in order to assess the participants in terms of risk factors, medical history, medication history, self-monitoring of blood sugar, their adherence to insulin injection and sleep patterns, as well as their dietary habits, physical activity, and stress levels. Moreover, the examination results were regarded as a reflection of the women's status and served as motivational factors for their behavioral modifications. Additionally, their beliefs and motivation concerning lifestyle changes were investigated through face-to-face interviews.

The second stage of the process (Advise): Based on the information gathered in the preceding phase, the women were informed about their condition at this point. Furthermore, women diagnosed with gestational diabetes were informed about all health risks, including bad eating habits, irregular eating schedules, insufficient physical activity and a lack of stress management techniques during pregnancy. The advantages of behavioral changes and their impact on women's health were emphasized. Furthermore, the potential complications of gestational diabetes, both early and late, as well as the associated risk factors and preventive measures, were explained. The significance of modifying behavior to stop or postpone the emergence of problems was emphasized.

The third stage (Agreement): This particular stage encompassed an agreement between GD women and researchers regarding the selection of suitable behavioral objectives, taking into account the condition, interest and priority of each participant, as well as the findings derived from the assessment. Subsequently, a practical plan was devised to achieve these objectives. The participants were asked to rate their behavior on a scale of 0 to 10 every day for the first month and record the results in their behavior goal logbook. For a total of 1.5 hours, the first session included individual sessions with each participant for stages 2 and 3.

The fourth stage (Assist): Depending on how many participants were involved and what kind of intervention was needed, this stage was given either as an individual or group session. The educational resources disseminated during this stage focused on key aspects such as insulin administration, self-monitoring of blood glucose, sound dietary habits and sufficient physical exercise. Additionally, a tape encompassing stress management techniques and muscle relaxation strategies was provided. In order to alleviate financial obstacles related to self-monitoring of blood glucose levels, glucose measurement strips were furnished to the gestational diabetes women. The educational materials were also furnished to the attendees in the form of educational booklets. This specific phase was held out in the course of the second intervention meeting.

The fifth stage (Arrange): In this step, GD women's practices were observed for a period of two months. Telephone conversations were conducted daily for the first two weeks, twice a week for the next two weeks, and once a week until the end of the follow-up period to make sure the GD women took the necessary action. Participants were reminded to follow the guidelines for their intended behavior during these phone calls. Furthermore, every four weeks, participant progress was evaluated via phone calls or in-person interviews (third session). The agreed-upon operational plan and behavior goals were reviewed, and the degree of progress made toward these goals was assessed, during these interview sessions.



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The control group was provided with only routine care at the hospital. Upon completion of the intervention period, all women in both the intervention and control groups were required to complete the same questionnaires used in pretest, which assessed their knowledge on gestational diabetes mellitus (GDM), their attitudes towards gestational diabetes, their self-management practices related to gestational diabetes, as well as maternal and neonatal outcomes assessment sheet used in posttest only. In adherence to ethical considerations, all documents and modules were subsequently provided to the control group at the conclusion of the study.

Statistical design

The verification of data was conducted prior to their entry into the computer system. The SPSS software (version 25) was utilized for the analysis of the data. To determine the normal distribution of quantitative variables, the Kolmogorov-Smirnov test was employed. When comparing nominal variables between the two groups, the chi-square tests were utilized. In cases where the frequency count is less than 5 for more than 20% of cells, Fisher's exact test was applied as an alternative to the chi-square test, especially for smaller sample sizes. The independent t-tests were employed for comparing the mean scores between the two groups, while the Mann Whitney test was used for non-parametric quantitative data. The spearman method was utilized to test the correlation between numerical variables. A p-value less than 0.05 were considered statistically significant, and a p-value less than 0.001 were considered highly significant.

Limitations of the study:

Two limitations were existed within the study. The first constraint concerns the lack of a fixed location for holding training sessions in addition to difficulties in organizing and arranging phone conversations. The second constraint refers to the paucity of domestic and global sources that have examined the selected variables.

Results

Table (1): displays that the mean age of the study and control groups was (29.00 ± 6.05) and (27.34 ±6.29) years, respectively. Concerning educational level, (45.9%) and (39.5%) of women respectively had a secondary education. (54.1%) and (65.8%) of women respectively living in rural areas. Regarding occupation, (64.9%) and (65.8%) of studied women respectively were housewives. There was no statistically significant difference between both groups regarding general characteristics ($p > 0.05$).

Table (2): indicates that the study and control groups had mean body mass index of (35.55±3.03) and (35.87±4.02) kg/m2, respectively, with no statistically significant difference between the two groups ($p > 0.05$).

Table (3): explains that the study group's mean gestational age was (25.95 ± 1.43) weeks, while the control group's was (26.32 ± 1.34) weeks. The mean number of gravidity and parity among study group were (2.32 ± 0.97) & (1.22 ± 0.95) weeks, and among control group were (2.32 ± 0.84) & (1.07 ± 0.75) weeks, respectively. Furthermore, no prior history of abortion was reported by (87.5%) and (93.1%) of the study and control group, respectively. (48.7%) and (63.1%) of women respectively visited the antenatal clinic twice a month for the duration of their current pregnancy, respectively. There was no family history of gestational diabetes in (70.3%) and (76.3%) of studied women, respectively. Furthermore, (73.0%) & (71.1%) of women, respectively have no previously history of gestational diabetes, with no statistically significant difference between two groups regarding obstetric & medical history ($p > 0.05$).

Table (4): clarifies that, prior to the implementation of GDM self-management

program based on the 5A'model, there was no statistically significant difference regarding the knowledge items among the groups under study. After intervention, there was a statistically significant difference observed in the studied group (P<0.000).

Figure (1): shows that, prior to the implementation of the self- management program, (94.6%) of the study group and (97.4%) of the control group respectively had inadequate knowledge regarding gestational diabetes. However, after application of the self-management program, (91.9%) and (5.3%) of women respectively had adequate knowledge , reflects highly statistically significant rise in total knowledge score post intervention compared to pre intervention among studied group (p<0.001).

Table (5): clarifies that, prior to the implementation of the GDM self-management program, there was no statistically significant difference (p>0.05) in the attitudes of the study and control groups toward all items related to gestational diabetes. However, following the intervention, a highly statistically significant difference was observed in the study group compared with the control group (p ≤ 0.001).

Figure (2) illustrates that, before implementation of the self- management program, (73.0%) of the study group and (68.0%) of the control group had negative attitude toward gestational diabetes with no statistically significant difference between both groups (p>0.05). However, after implementation of the self- management program, (89.2%) of the study group had positive attitude toward gestational diabetes compared with (39.5%) of the control group. There was highly statistically significant difference between both groups (p<0.001).

Table (6) shows that, there was no statistically significant difference between the studied groups concerning all item of self-management ability regarding gestational diabetes before implementation of self- management program based on 5A'model (p>0.05). However, highly statistically significant improvement was observed in the study group compared with the control group after implementation of the program (P<0.000).

Figure (4) illustrates that, (94.6%) & (89.5%) of the study group and control group respectively had poor self-management ability before implementation of the self- management program, with no statistically significant difference between both groups (p>0.05), However, (91.9%) &(13.2%) of women respectively had good self-management ability after implementation of the program with highly statistically significant difference between both groups (p<0.001).

Table (7) clarifies that, before implementation of the self-management program the mean random blood glucose level was (166.2 ±35.7) mg/dl & (175.1 ±37.9) mg/dl of study and control group respectively, with no statistical significant difference between both groups (p>0.05). However, highly statistically significant improvement was observed in the study group with the mean random blood glucose level (112.92 ± 17.66)mg/dl compared with (153.00 ± 20.79) mg/dl of the control group (p<.001**). The rate of vaginal delivery was higher in the study group; meanwhile, the CS rate was higher in the control group with statistically significant differences. In addition, there were higher proportions of complications in the control group than in the study group (p<.001**).

Table (8) demonstrates that, the mean gestational age at labor (38.48+1.36) weeks of the study and (36.36+1.66) weeks of the control group. Abnormal Apgar score were observed in (18.9%) of the study group, whereas the control group exhibited a much higher frequency of (44.7%) and needed for resuscitation, only (5.4%) of the study group women had a macrocosmic baby compared to less than one third of the control group (23.7%). Additionally, the control group exhibited a significantly elevated incidence of neonatal complications, such as admission to the neonatal intensive care unit, jaundice, macrosomic infants, and hypoglycemia, in comparison to the study group. There was statistical significant difference between both groups (p≤0.05).

Table (9) shows that, there were a highly significant and positive correlation between total knowledge and total self-management ability (p <0.001**) and a significant negative correlation

between maternal and neonatal outcomes with self- management ability and attitude in study group, While in control group as positive and no significant correlation between attitude with knowledge and self- management ability, as well as a significant and negative correlation between attitude with self- management ability, knowledge and outcomes.

Table (1) Distribution of studied women according to their general characteristics, study group (n.= 37), and control group (n=38).

General characteristics	Study group (n=37)		Control group (n=38		X^2	p-value
	(No.)	%	(No.)	%		
Age (in years)						
20-< 25	9	24.3	16	42.1	5.650	0.130 n.s
25- < 30	12	32.4	11	28.9		
30-<35	8	21.6	2	5.3		
35- 40	8	21.6	9	23.7		
Mean ± SD	29.00 ± 6.05		27.34 ± 6.29		t-test= (1.163) p value = (0.249 n.s)	
Level of education						
Primary	6	16.3	10	26.3	2.663	FE 0.446 n.s
Secondary	17	45.9	15	39.5		
University	13	35.1	13	34.2		
Postgraduate	1	2.7	0	0.0		
Residence						
Rural	20	54.1	25	65.8	1.076	0.351 n.s
Urban	17	45.9	13	34.2		
Occupation						
House wife	24	64.9	25	65.8	0.007	FE 1.000 n
Working	13	35.1	13	34.2		

FE fisher's exact test Not Significant (P>0.05) t: independent t test

Table (2) Distribution of studied women according to anthropometric measurements, study group (n.= 37), and control group (n.=38)**.**

Anthropometric measurements	Study group (n.=37)	Control group (n.=38)	Test	p-value
	Mean ± SD	Mean ± SD		
Height	161.43 ± 5.23	160.11 ± 5.99	t-test (1.021)	(0.310 n.s)
Weight	92.51 ± 7.56	91.66 ± 8.68	t-test (0.455)	(0.651 n.s)
BMI (kg/cm2)	**No. (%)**	**No. (%)**		
Overweight (25–29.9)	1 (2.7)	3(7.9)	X^2= 2.255	(0.521 n.s)
Obese class I (30 -34.9)	12 (32.4)	14(36.8)		
Obese class II (35 -39.9)	20 (54.1)	15(39.5)		
Obese class III (≥ 40)	4(10.8)	6(15.8)		
Mean ± SD	35.55 ± 3.03	35.87 ± 4.02	t-test (- 0.392)	(0.697 n.s)

BMI: Body mass index (n.s) Not Significant (P>0.05) t: independent t test

Table (3) Distribution of studied women according to their obstetric, and medical history, study group (n.= 37), and control group (n.=38)

Obstetric, and medical history	Study group (n.=37)		Control group (n.=38)		χ^2	p-value
	(No.)	%	(No.)	%		
Gestational age in weeks Mean ± SD	25.95 ± 1.43		26.32 ± 1.34		t-test (- 1.156)	(0.251 n.s)
Number of gravidity Mean ± SD	2.32 ± 0.97		2.32 ± 0.84		t-test (0.041)	(0.968 n.s)
Number of parity Mean ± SD	(n=29) 1.22 ± 0.95		(n=32) 1.07 ± 0.75		t-test (1.230)	(0.223 n.s)
History of abortion						
- Yes	2	6.9	4	12.5	2.510	FE 0.191 n.s
- No	27	93.1	28	87.5		
If yes mention numbers	(n=2)		(n=4)			
One time	1	50.0	3	75.0		
Two times	1	50.0	1	25.0	4.380	0.112 n.s
Antenatal visits						
Once/ month	9	24.3	6	15.8	2.378	0.498 n.s
Twice / month	18	48.7	24	63.1		
Three times / month	9	24.3	6	15.8		
Four times/ month	1	2.7	2	5.3		
Family history of gestational diabetes						
Yes	26	70.3	29	76.3	0.350	FE 0.609 n.s
No	11	29.7	9	23.7		
Previous history of gestational diabetes						
Yes	10	27.0	11	28.9	0.034	FE 1.000 n.s
No	27	73.0	27	71.1		

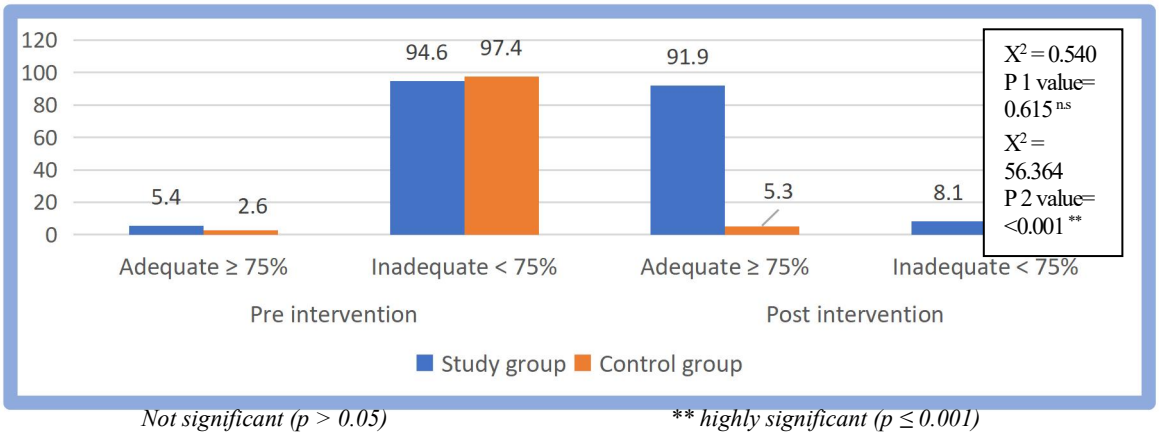
FE fisher's exact test (n.s) Not Significant (P>0.05)

Table (4) Comparison of studied women's knowledge regarding gestational diabetes (pre and post intervention), study group (n.= 37), and control group (n.=38).

Study periods / knowledge items	Responses	Pre intervention		χ^2 test P value	Post intervention		χ^2 test P value
		Study group (n.=37)	Control group (n.=38)		Study group (n.=37)	Control group (n.=38)	
		No. (%)	No. (%)		No. (%)	No. (%)	
Gestational diabetes mellitus risk factors	Adequate ≥ 75%	12 (32.4)	5(13.2)	3.973 FE 0.057 n.s	33(89.2)	8(21.1)	35.119 FE<0.001 **
	In adequate <75%	25 (67.6)	33 (86.8)		4(10.8)	30(78.9)	
Screening of gestational diabetes	Adequate ≥ 75%	9(24.3)	6(15.8)	0.853 FE 0.399 n.s	34(91.9)	10(26.3)	15.211 FE<0.001 **
	In adequate <75%	28 (75.7)	32(84.2)		3(8.1)	28(73.7)	
Treatment options	Adequate ≥ 75%	8(21.6)	29(78.4)	0.000 FEp	35(94.6)	9(23.7)	38.873 FE<0.001 **
	In adequate	8(21.6)	29(78.4)	1.000 n.s	2(5.4)	29(76.3)	

	<75%						
Immediate complications	Adequate ≥ 75%	9(24.3)	11(29.7)	0.274 FE0.794 n.s	36(97.3)	14(36.8)	30.832 FE<0.001**
	In adequate <75%	28(75.7)	26(70.3)		1(2.7)	24(63.2)	
The future course	Adequate ≥ 75%	13(35.1)	8(21.6)	1.662 FE0.302 n.s	35(94.6)	12(31.6)	31.819 FE<0.001 **
	In adequate <75%	24(64.9)	29(78.4)		2(5.4)	26(68.4)	

n.s not Significant at >0.05 ** highly statistically significant at ≤0.001 FEp: p value for Fisher exact for chi square



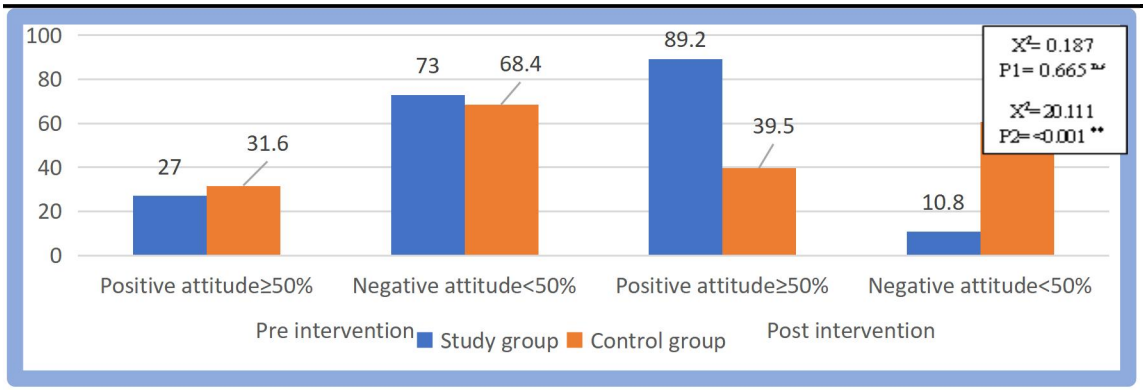
Not significant (p > 0.05) *** highly significant (p ≤ 0.001)*

Figure (1) Comparison between study and control groups related to total knowledge score about gestational diabetes mellitus pre and post intervention, study group (n= 37), and control group (n=38)

Table (5): Comparison of attitude score towards gestational diabetes among the studied women (pre and post intervention), study group (n= 37), and control group (n=38).

Study periods / Attitude items	Pre intervention		U – test P value	Post intervention		U- test P value
	Study group (n=37)	Control group (n=38)		Study group (n=37)	Control group (n=38)	
	X̄ ±SD	X̄ ±SD		X̄ ±SD	X̄ ±SD	
the necessity for specialized training in GDM care	2.00±0.34	1.96 ±0.39	624.500 (0.396 n.s)	4.51±0.31	2.00± 0.43	0.000 (<0.001 **)
the severity of gestational diabetes	2.85±0.33	2.88±2.18	653.000 (0.591 n.s)	3.05±0.21	3.03 ± 1.20	467.500 (0.011 *)
the importance of strict glucose control	3.34± 0.30	3.39±0.23	643.000 (0.518 n.s)	2.83±0.24	3.39 ±0.27	74.500 (<0.001 **)
Psychosocial impact of gestational diabetes	3.34±0.15	3.39±0.27	583.500 (0.192 n.s)	3.49 ±0.35	3.71±0.29	454.500 0.008*
Attitude toward patient autonomy.	2.84±0.24	2.87±0.27	670.000 (0.723 n.s)	3.74±0.21	2.74±0.31	2.500 (<0.001 **)
Total	14.38±0.84	14.50±0.62	645.500 (0.542 n.s)	17.62±0.65	14.88±1.46	37.000 (<0.001 **)

n.s Not Significant at >0.05, (*) Statistically significant at ≤0.05 ** highly statistically significant at ≤0.001, U test: Mann Whitney test



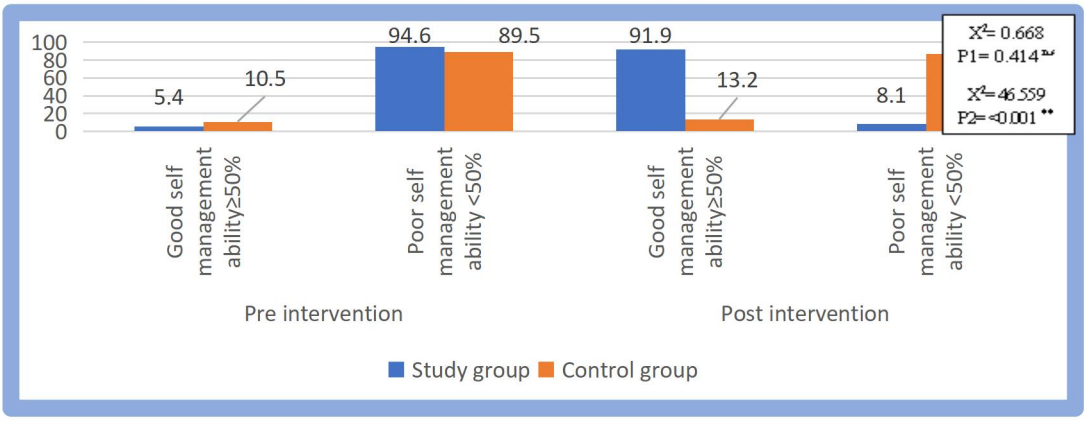
Not significant (p > 0.05) *** highly significant (p ≤ 0.001)*

Figure (2) Comparison between study and control groups related to total attitude score about gestational diabetes mellitus pre, and post intervention, study group (n= 37), and control group (n=38)

Table (6) Comparison of studied women according to diabetic self-management ability (pre and post intervention), study group (n.= 37), and control group (n.=38)

Study periods / Self - management items	Pre intervention		U- test P value	Post intervention		U- test P value
	Study group (n.=37)	Control group (n.=38)		Study group (n.=37)	Control group (n.=38)	
	X̄ ±SD	X̄ ±SD		X̄ ±SD	X̄ ±SD	
Glucose management	1.66 ±1.04	1.29±0.90	584.500 0.196 n.s	9.39±0.71	1.63±0.98	0.000 <0.001 **
Dietary control	0.99±0.85	1.47± 1.32	582.500 0.187 n.s	9.44± 0.86	1.88±1.57	0.000 <0.001 **
Physical activity	0.90±0.82	1.08± 1.08	641.500 0.470 n.s	9.34±0.99	1.64± 1.41	0.000 0.001 **
Health care use	0.96 ±0.99	1.22 ±0. 77	575.500 0.146 n.s	9.61 ±0. 59	1.26±0.78	0.000 <0.001 **
Total	4.51±1.93	5.08± 1.94	594.000 0.248 n.s	37.77 ±1.36	6.41±2.33	0.000 <0.001 **

n.s: Not significant at >0.05 ** highly statistically significant at ≤0.001 U test: Mann Whitney test



(Not significant (p > 0.05) *** highly significant (p ≤ 0.001)*

Figure (3) Comparison between study and control groups related to total self- management ability about gestational diabetes mellitus pre and post intervention, study group (n= 37) , and control group (n=38)

Table (7) Distribution of studied women according to maternal outcomes, study group (n.= 37), and control group (n.=38)

Maternal outcomes	Study group (n.=37)		Control group (n.=38)		X^2 & t-test	p-value
	(No.)	%	(No.)	%		
Maternal random blood glucose levels pre-program (mg/dl)	**Mean ± SD**		**Mean ± SD**			
	166.2 ±35.7		175.1 ±37.9		t-test= 1.221 p value = 0.169	
Maternal random blood glucose levels post program (mg/dl)	112.92 ± 17.66		153.00 ± 20.79		t-test= (- 2.260) p value = (0.001**)	
Mode of delivery						
Vaginal	12	32.4	4	10.5	5.361	FE 0.026*
Cesarean	25	67.6	34	89.5		
Incidence of maternal complications						
Yes	8	21.6	23	60.5	11.701	0.001**
No	29	78.4	15	39.5		

If yes, the complications are	(n.=8)		(n.=23)			
-Preterm labor	7	87.5	10	43.5		FE
-Obstructed labor	1	12.5	5	21.7	4.574	0.023*
-Post partum hemorrhage	0	0.0	5	21.7		
-Infection	0	0.0	3	13.1		

FE fisher's exact test (*) Statistically significant at ≤0.05 ** highly statistically significant at ≤0.001 t: independent t test

Table (8) Distribution of studied women according to neonatal outcome assessment after implementation of self- management program regarding GDM, study group (n.= 37), and control group (n.=38).

Fetal and neonatal outcome	Study group (n=37)		Control group (n=38)		X^2 FE	p-value
	(No.)	%	(No.)	%		
Gestational age at delivery/ weeks	38.48+1.36		36.36+1.66		t=4.951	0.001*
Apgar score Normal Abnormal	 30 7	 81.1 18.9	 21 17	 55.3 44.7	5.743	0.025*
Need for resuscitation	7	18.9	17	44.7	6.095	0.014*
Admission to neonatal intensive care unite	2	5.4	14	36.8	11.039	FE 0.001**
Jaundice	1	2.7	8	21.1	5.978	FE 0.028*
Macrosomic baby< 4 kg	2	5.4	9	23.7	5.005	FE 0.047*
Shoulder dystocia	1	2.7	6	15.8	3.794	FE 0.050*
Hypoglycemia	1	2.7	7	18.4	4.861	FE 0.027*
Birth trauma	1	2.7	6	15.8	3.794	FE 0.050*
Prematurity	2	5.4	8	21.1	3.972	FE 0.046*
Respiratory distress	1	2.7	6	15.8	3.794	FE 0.050*
Still birth	0	0.0	4	10.5	4.114	FE 0.043*

FE: Fisher's exact test (*) statistically significant at ≤0.05 ** highly statistically significant at ≤0.001 NA. Not applicable t: independent t test

Table (9): Correlation coefficient between total knowledge, total self -management ability and total attitude score among studied women with maternal and neonatal outcomes pre and post intervention, study group (n=37) and control group (n=38).

Variables	Studied groups	Knowledge		Self -management ability		Attitude	
		r- test	p-value	r- test	p-value	r- test	p-value
Knowledge	Study group	-	-	0.955	0.010*	0.322	0.050*
	Control group	-	-	0.005	0.975 n.s	0.142	0.395 n.s
Self -management Ability	Study group	0.952	<0.001**	-	-	-0.338	0.033*
	Control group	0.253	0.060 n.s	-	-	-0.103	0.544 n.s
Maternal outcomes	Study group	-0.927	0.016 *	-0.348	0.035*	-0.937	<0.001**
	Control group	-0.006	0.972 n.s	-0.039	0.814 n.s	-0.059	0.724 n.s
Neonatal outcomes	Study group	-0.354	0.025*	-0.615	<0.001**	-0.348	0.034*
	Control group	-0.279	0.102 n.s	-0.008	0.960 n.s	-0.283	0.085 n.s

(n.s) not statistically significant at > 0.05 (*) statistically significant at ≤0.05 (**) highly statistically significant at ≤0.001

Discussion

Pregnant women and their offspring are affected by GDM, results in significant medical costs for prenatal, intrapartum, and postpartum

treatment. It can be better controlled with effective GD self-management, which is best accomplished through educational interventions that are supported by scientific data. The 5A's approach, which stands for assess, advice, agree, assist, and arrange, is essentially a series of behavioral interventions that support self-management among pregnant women with GD, that improve pregnant women's knowledge and attitude, as well as maternal and neonatal outcomes ***(Osuagwu, et al., 2020).***

The current study aimed to investigate the effect of self-management program based on 5 A's model for gestational diabetic women on maternal and neonatal outcomes. The present study discussed under the following sections: general characteristic of studied women, gestational diabetic knowledge, women attitude regarding gestational diabetes, women self-management. Additionally, the research hypothesis was supported by the research results as there was a highly statistically significant difference between the study and the control group regarding all study variables.

Concerning general characteristics of the studied women, current results reveled that, the mean age of the study and control groups was (29.00 ± 6.05) and (27.34 ± 6.29) years, respectively. Less than half of the studied women had a secondary education, more than half of both groups living in rural areas. Concerning occupation, more than two thirds women in both groups were housewife. There was no statistically significant difference between both groups regarding general characteristics (p >0 .05).

These results are in concurrent with ***Ibrahim & Saber, (2019)*** who found that age range of the participants in two groups spanned from (18-38) years with a mean age (27.7 ± 5 years), Additionally, they was observed that almost half of the women included in the study possessed a moderate level of education, while more than half of the women were unemployed.

The findings of the current study clarified that the mean body mass index of the study and control groups was (35.55±3.03) and (35.87±4.02) kg /m2, respectively. There was no statistically significant difference were observed among both groups (p > 0.05).

These results agreed with ***Elbeltagy et al., (2020)*** who reported that there was no statistical significant difference were observed among the studied groups in relation to body mass index at baseline assessment. Also this result is consistent with ***Said & Aly, (2019)*** who found no significant difference in weight, height, or body mass index between the intervention and control group.

Regarding obstetrics history, the current results illustrated that the mean gestational age of study and control groups was (25.95 ± 1.43) and (26.32 ± 1.34) weeks, respectively, the mean number of gravidity and parity among the study group (2.32 ± 0.97) & (1.22 ± 0.95) and the control group (2.32 ± 0.84) & (1.07 ± 0.75) respectively. As well as the majority of both groups had no previous history of abortion. Less than half of the study group and more than two third of the control group visited the antenatal clinic twice /month. Nearly three quarter of both group had no family history of gestational diabetes. Additionally, less than three quarter of both group had no previous history of gestational diabetes. No statistically significant difference between two groups regarding the regarding obstetric & medical history (p > 0.05).

These findings are consistent with the findings of ***El Toony, et al., (2018),*** who reported a mean gestational age of 25±4 weeks. This discovery can be interpreted as being due to the impact of gestational diabetes mellitus on pregnant women during the second and third trimesters. During this time, there is insulin resistance caused by hormone production by the placenta.

Our findings demonstrate that there was no statistically significant distinction in all knowledge aspects prior to the implementation of the gestational diabetes management

program, which was based on the 5A model, among the groups under study. Additionally, there was a highly statistically significant discrepancy recorded following the implementation (P<0.000) among the groups under study. From the perspective of the researcher, this enhancement in the knowledge of the study group could be linked to the active involvement of studied women and their effective communication with the researchers, who aided them in acquiring knowledge. Furthermore, the self-management program plays a crucial role in helping pregnant women obtain knowledge pertaining to gestational diabetes.

The result of this study is consistent with the findings of ***Saboula, et al., (2018),*** who discovered a noteworthy improvement in the overall knowledge score of gestational diabetic women following the intervention. Similarly, ***Mohamed &Ahmed, (2019),*** who found a statistically significant difference between pre and post educational program knowledge scores. Additionally, this finding aligns with ***El-Ansary & Fouad, (2020)*** who revealed a highly statistically significant difference in pregnant women's overall knowledge about gestational diabetes before and after the intervention (p= 0.001), indicating a marked increase in knowledge following the intervention.

Our study findings reveled that, there was no statistically significant difference between the study and control groups in relation to all items of attitude about gestational diabetes before implementation of GDM self-management program based on 5A'model (p>0.05). However, a highly statistically significant difference was observed in the study group compared with the control group after implementation of GDM self-management program based on 5A'model (p ≤ 0.001). The researchers suggest that this positive effect of the GDM self-management program based on the 5A's model on women's knowledge, self-management, and attitudes is due to the improvement of self-care through education of diabetic women, which is an essential role of healthcare providers for further training of women. These findings are corroborated by ***Islam, et al., (2017),*** who found that the majority of participant had a positive attitude towards GDM control, investigation and expressed positive responses for GDM education program.

Regarding self-management ability towards gestational diabetes the current findings showed that, there was no statistically significant difference between the studied groups concerning all item of self-management ability including glucose management, dietary control, physical activities, and healthcare utilization regarding gestational diabetes before implementation of self- management program based on 5A'model (p>0.05). However, the study group showed highly significant improvement in self-management after implementing a 5A'model self-management program, possibly due to proper education and awareness of healthy behaviors, influenced by personal attitude, knowledge, resources, and cultural background. (P<0.000).

On contrary, the study conducted by ***Nouhjah, (2021),*** who demonstrated the majority of participants exhibited unfavorable attitudes towards blood glucose monitoring and physical activity, while their drug regimen compliance was favorable. The study found that women with gestational diabetes need better knowledge and skills in monitoring blood glucose levels. Implementing a self-management program improved positive diabetic behaviors, such as maintaining a balanced diet and engaging in physical activity. However, the control group lacked proper training and was unwilling to engage in physical activity due to false beliefs.

The current results found that before implementing a self-management program for gestational diabetes management, the mean random blood glucose level was (166.2 ±35.7) mg/dl in the study group and (175.1 ±37.9) mg/dl in the control group. However, a significant improvement was observed in the study group with the mean random blood

glucose level (112.92 ±17.66) mg/dl compared with (153.00 ± 20.79 mg/dl of the control group (p<.001**). The researchers suggest that this positive effect of the GDM self-management program based on the 5A's model on blood glucose level of pregnant women with GDM. These results in the same line with ***Rokni, et al., (2022)*** who discovered that, following the intervention, participants in the intervention group had mean blood glucose levels that were significantly lower than those of the control.

Regarding maternal outcomes after implementation of a self –management program; the current study has found that there was a higher rate of vaginal delivery when comparing the study group to the control group, while the rate of cesarean section was higher in the control group with significant statistical differences. In addition, there were greater proportions of complications in the control group than in the study group as preterm labor and obstructed labor (p<.001**). This result may have been caused by certain obstetricians' preference for cesarean sections even though there was no clear evidence of risk to the mother or fetus.

These findings are consistent with ***Prakash, et al, (2018)*** who reported that less than half of the studied women required a cesarean section and more than one third of women developed complications either during pregnancy or labor. However, these findings are contradicted by a study conducted by ***Vaghela & Sarvaiya, (2020)*** who demonstrated that there was no significant difference in the mode of delivery among the studied groups.

Concerning neonatal outcome after implementation of the program the mean gestational age at delivery was 38.48±1.36 weeks for the study group, while it was 36.36±1.66 weeks for the control group. Moreover, only less than one third of the study group exhibited abnormal Apgar scores, compared to less than half of the control group who required resuscitation. Additionally, the rates of neonatal complications such as admission to the neonatal intensive care unit, jaundice, macrosomic baby, and hypoglycemia were significantly higher in the control group than in the study group (p≤0.05). This can be attributed to the positive impact of the self-management program on the study group, resulting in a reduction of neonatal complications among women with gestational diabetes.

The results of this research align with the research carried out by ***Mohamady, et al. (2022),*** who noted that less than half of the participants' newborns were exposed to complications, and a similar percentage had babies with macrosomia. Furthermore, a statistically significant relationship was observed between self-care practices and neonatal complications.

In contrast, a contrary viewpoint to that of ***Rafael, et al., (2023)*** contends that there are no notable disparities between the two cohorts, with the exception of a higher incidence of respiratory distress syndrome in the GDM group (9.4%, p = 0.06). The prevalence of macrosomy among women in the study population was found to be lower (6.1%) in comparison to the control group (6.6%).

Regarding the correlation coefficient among the studied variables within the studied groups post intervention, it was observed that there were a highly significant and positive correlation between total knowledge and total self-management ability at (p<0.001**). Additionally, a significant negative correlation was observed between maternal and neonatal outcomes with self-management ability and attitude in the study group. However, in the control group, a positive and not significant correlation was found between attitude, knowledge, and self-management ability, while a significant and negative correlation was observed between attitude and self-management ability, knowledge, and outcomes. The researchers emphasizes the importance of diabetes education in diabetic women's care, as it enhances awareness, promotes self-care behaviors, and reduces GDM complications, thus recommending the introduction of self-

care training initiatives.

These findings are consistent with the research conducted by ***Zandinava, et al., (2017),*** which demonstrated a positive impact of education on awareness and self-care in the intervention group. Furthermore, these findings are akin to the study conducted by ***Barasheh, et al., (2017),*** which revealed an improvement in knowledge levels, self-care behaviors, and attitude in the intervention group following program implementation.

Conclusion:

Based on the findings of the current study, it can be concluded that the Self-management program based on the 5A's model regarding gestational diabetes has a positive effect on women's knowledge, attitudes and self-management ability. As a result, this had a positive effect on both the maternal and neonatal outcomes when compared to the control group who solely received routine hospital care. Aforementioned conclusions greatly corroborate the study hypotheses and effectively fulfilled the research aim.

Recommendations:

Based on the light of study's findings the following recommendations are suggested:

1. Encouraging antenatal screening for gestational diabetes mellitus for early detection and effective management, thereby leading to improved maternal, fetal and neonatal outcomes.
2. Maternity nurses should incorporate a GDM self-management program based on the 5 A's in routine antenatal health education classes to increase awareness among pregnant women about effective GDM management and ultimately improve pregnancy outcomes.
3. A simple Arabic handout outlining the benefits of GDM self- management based on the 5 A's model should be disseminated to all pregnant women with GDM at hospitals and maternal and child health centers. This is done to facilitate improved modifications in lifestyle and the adherence to self-management routines, ultimately leading to enhanced outcomes in pregnancy.
4. Maternity nurses and other healthcare workers should be equipped with the GDM self-management program based on the 5 A's to update their knowledge on GDM management strategies.
5. More studies need to be conducted including large sample size and in different geographic location to generalize the results of the study.

Acknowledgment

The authors wish to extend their sincere appreciation and gratitude to all the women who willingly participated in the study. Furthermore, the researchers express their kind appreciation to all those who aided in the implementation of the research.

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