Effectiveness of Nursing Intervention on Health Locus of Control and Self-Efficacy in Women with Gestational Diabetes

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ABSTRACT

Contents: Gestational diabetes is associated with an increased risk of complications during delivery and problems for both the mother and the offspring in prenatal and postnatal periods and later life. Lack of self-care is the most important reason for mortality in diabetic patients. Self-efficacy has a significant role in enhancing successful adherence to healthy behaviors, lifestyle modifications, and diabetes control among gestational diabetes pregnant women.

Aim: The current study aimed to evaluate the nursing intervention (NI) effectiveness on health locus of control (HELOC) and self-efficacy in women with gestational diabetes (GD).

Methods: A quasi-experimental design (study and control group) was used. The researchers conducted this study at the Antenatal Outpatient Clinics of Shebin El-Kom Teaching Hospital, Menoufia Governorate, Egypt. A purposive sample of 120 women with GD was carefully chosen from the nominated setting and dispersed accidentally into two identical groups (study and control group). Three tools were used for collecting the study data: A structured self-administered questionnaire, the Multidimensional Health Locus of Control Scale-C Form, and the General Self-efficacy Scale.

***Results*:** There is a statistically significant difference between the intervention and control groups in their internal health locus of control (HELOC) scores after the intervention, with a mean difference of 4.70 at CI 95% for the intervention group $p<0.001$. A non-statistically significant difference was found between the intervention group and the control group in the external health locus of control (HELOC) mean scores before and after the intervention, although there was a significant difference between the change in both groups $p=0.032$. Also, there is a highly statistically significant difference between the intervention group and the control group in the self-efficacy scores after the intervention in the intervention group, where $p<0.001$ compared to a non-significant difference between them before the intervention group intervention ($p=0.555$).

***Conclusion*:** The study concluded that the women with GD who attended NI sessions obtained higher HELOC scores (internal and external) and higher self-efficacy scores than those who do not. Educational nursing intervention should become a fundamental part of the total management of gestational diabetes in antenatal outpatient clinics.

Keywords: Health locus of control, self-efficacy, gestational diabetes, nursing intervention

1. Introduction

Gestational diabetes mellitus (GDM) is currently the most common medical complication of pregnancy, and the prevalence of undiagnosed hyperglycemia is increasing. Maternal overweight and obesity, late childbearing age, prior GDM history, type 2 DM family history, and ethnicity are major risk factors for GDM *(Szmuilowicz et al., 2019)*.

GDM is characterized as intolerance to the glucose of varying severity, diagnosed during pregnancy that usually resolves postpartum. The world health organization (WHO) defines GDM as hyperglycemia first detected during pregnancy. It typically occurs during the second trimester of pregnancy because of the increase in the insulin-antagonist hormone level at this time (WHO, 2015).

GDM affects an estimated 15 percent of pregnant women worldwide, with 87.6 percent of hyperglycemia occurring in low- and middle-income countries. It is one of the health issues facing countries in Sub-Saharan Africa (Ogurtsova et al., 2017). It occurs in about 2-10% of all pregnancies and may improve or disappear after delivery, and its incidence is constantly rising. Hyperglycemia during pregnancy can lead to increased risks for adverse outcomes for both the pregnant woman and the fetus. These include preeclampsia, complications of worsening diabetes, infection, miscarriage, premature childbirth, congenital malformations, macrosomia, increasing need for cesarean delivery, stillbirth, and neonatal death (American Diabetes Association (ADA), 2015).

Diagnosis is usually performed using an oral glucose tolerance test (OGTT). The main therapies for GDM are

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dietary modification and increased physical activity, but pharmacotherapy, usually insulin, is used when norm glycemia is not achieved. Oral hypoglycemic agents are also used in some countries. Treatment improves immediate pregnancy outcomes, reducing excess fetal growth, adiposity, and pregnancy-related hypertensive disorders. GDM increases the risk of long-term complications, including obesity, impaired glucose metabolism, and cardiovascular disease, in both the mother and infant. Optimal management of mother and infant during long-term follow-up remains challenging with the very limited implementation of preventive strategies in most parts of the world. GDM is rising globally, but it is a neglected health threat to mothers and their children in low-resource countries *(Szmuilowicz et al., 2019).*

The health locus of control is a psychological factor that has been investigated as one of the predictors or determinants of health outcomes in chronic diseases *(Wielengaboiten et al., 2015).* Individuals with a high locus of control have a high quality of life. How individuals assess their sense of control impacts their quality of life and mental health *(Sharif, 2017).* Individual beliefs related to health, control, and management are also called health locus of control. High internal loci of control individuals claim that their control over their life events is largely due to their actions and behaviors. However, those with a high external locus of control assume that their decisions and lives are governed by powerful others or chance *(Dallolio et al., 2018).*

One of the most probable determinants of glucose self-management and self-monitoring by diabetic patients is self-efficacy *(Moghadam et al., 2020).* Self-efficacy is one of the principles of the social cognitive theory of Bandura, which describes the interaction between personal, behavioral, and environmental factors in both health and illness *(Williams & Rhodes, 2016; Lin et al., 2019).* Besides, self-efficacy is an effective mechanism for the awareness, prediction, and dedication of patients to self-care while treating diabetes. It takes high self-confidence and self-efficacy to make lifestyle improvements, such as eating patterns, smoking cessation, and exercise *(Massouh et al.,2020).* The main factor in effective self-management of chronic diseases is highly self-efficacious *(Brands et al., 2017).*

A high degree of self-efficacy is crucial for carrying out these self-care activities *(Cardwell, 2013).* Self-efficacy has a significant role in enhancing successful adherence to healthy behaviors such as weight loss, dietary modifications, and exercises, in addition to enhancing lifestyle modifications and diabetes control among gestational diabetes women. Relevant knowledge and coping strategies are not adequate for GDM women to enhance adherence to a healthy lifestyle: rather, they need a perceived outcome expectation, positive reinforcement, a high level of confidence, and determination to attain the desired goal. Evidence showed that role modeling and positive reinforcement by healthcare providers effectively increase patients' self-efficacy *(Al-Hashmi et al., 2018).* Locus of control significantly affects the intention of the DM patients in performing the control. The patients' intention, which is dominated by internal locus, is derived from the magnitude of skills to behave, while patients' intention, which has the external locus dominant, is formed because of the other people expected to control their behavior *(Haskasa et al., 2016).*

Self-care is a crucial aspect of GDM management to avoid the development of maternal and neonatal complications *(Al-Azemi et al., 2014).* Self-care activities include lifestyle modifications (e.g., diet and physical activity) and blood glucose (BG) levels' self-monitoring *(Colberg et al., 2013).* World Health Organization reported that women must take an active role and develop their capacity to make healthy choices during pregnancy to improve maternal and neonatal health *(Sleath et al., 2016).*

GD management to maintain norm-glycemia requires well-planned healthcare providers regularly checking-up patients and teaching them to be active participants in the management *(Fappa et al., 2016).* Self-care makes high demands on the patients concerning regular lifestyle habits and constant self-monitoring of blood glucose. GDM compounds the psychosocial disturbances of a normal pregnancy. Being both potentially life-threatening and associated with lifestyle changes, its diagnosis and treatment significantly impact women's lives. The nursing management of gestational diabetes mellitus should include lifestyle changes (exercise, diet, and nutrition), in addition to the adherence to diabetes medication, if required, to prevent maternal and neonatal-perinatal complications. *(Mensah et al., 2019).*

Nurses play an important role in encouraging adherence to healthy lifestyle choices and behaviors. They can incorporate health education, goal-setting and planning, role modeling, mastery experience, and motivational messages, reducing maternal and neonatal complications among women with GDM. The nursing intervention positively impacts the management of these women, including self-monitoring of blood glucose (SMBG) levels, medical nutrition therapy (MNT), regular exercise, and medication if needed. Besides, Women with GDM require regular follow-up and a constant balance between diet, exercise, and weight loss once the baby is born to avoid progression to type 2 diabetes *(Young-Hyman et al., 2016).*

2. Significance of the Study

The prevalence of GDM is estimated to be about 15 percent globally and is expected to increase in women in their reproductive age due to increasing numbers of overweight and obesity *(Mensah et al., 2019).* A study was done by *Salem et al. (2019);* entitled "Prevalence and predictors of gestational diabetes mellitus among pregnant women attending Fanara Family Center in Egypt." They conclude that the prevalence of GDM was found to be six percent among pregnant females attending Fanara family practice center. Early detection of GDM and controlling its risk factors are necessary for better maternal and fetal outcomes *(Salem et al., 2019).* People with diabetes have shown difficulty regulating their health behavior *(Haskasa*

et al., 2019). Self-care is a crucial point in the management plan of gestational diabetes to decrease maternal and neonatal complications. Enhancing the knowledge of the locus of control and sense of self-efficacy of Egyptian women with gestational diabetes would boost their understanding and cooperation in reducing the number of diseases that affect children and mothers' health. However, this study aimed to evaluate the effectiveness of designed nursing intervention (NI) on health locus of control (HLOC) and self-efficacy in women with gestational diabetes (GD) in one Egyptian teaching hospital.

3. Aim of the study

This study aimed to evaluate the nursing intervention (NI) effectiveness on health locus of control (HELOC) and self-efficacy in women with gestational diabetes (GD).

It achieved through the following objectives:

- To implement NI about GD for women with GD.
- To evaluate HLOC (internal and external) and self-efficacy in women with GD before and after NI about GD.

3.1. Research hypotheses

- Two research hypotheses were tested to fulfill the aim of the present study.
- H1: Women with GD, who will attend NI sessions, will obtain higher scores of HLOC (internal and external) than the control group.
- H2: Women with GD, who will attend NI sessions, will obtain higher self-efficacy scores than the control group.

3.2. Operational definitions

Gestational Diabetes Mellitus (GDM)

Gestational Diabetes Mellitus (GDM) is defined as Impaired Glucose Tolerance (IGT) with onset or first recognition during pregnancy. National guideline for diagnosis and management of Gestational Diabetes endorses the single-step test recommended by WHO to diagnose GDM using a 75gm glucose, through Oral Glucose Tolerance Test (OGTT) irrespective of the last meal with a threshold value of 2-hour BS >140 mg/dL.

Locus of control

It is the extent to which persons perceive contingency relationships between their actions and their outcomes.

Internal locus of control

It is the person's believes that at least some control over life events resides within themselves.

External locus of control

It is the person's believes that their outcomes are determined by agents or factors extrinsic to themselves, i.e., fate, luck, chance, powerful others.

Self-efficacy

Self-efficacy is a predictive variable of health behavior in smoking cessation, weight loss, prevention of chronic diseases, and physical activity participation by women.

Nursing intervention (NI)

It is defined in this study as providing the pregnant woman with information regarding the disease condition, teaching insulin administration, achieving and maintaining normoglycemia, and evaluating the present pregnant woman and fetal well-being.

4.Subjects & Methods

4.1. Research design

The present study was designed as a quasi-experimental design (pre-post, study/control group design). (a quasi-experimental design aims to establish a cause-and-effect relationship between an independent and dependent variable. Though, unlike a true experiment, a quasi-experiment does not depend on random assignment. Instead, subjects are assigned to groups based on non-random criteria *(Dinardo, 2008)).* The intervention group followed the nursing intervention (NI), while the control group was subjected to conventional prenatal care. Dependent variable: HLOC (internal and external) and self-efficacy. Independent variable: Nursing intervention.

4.2. Research setting

The present study was conducted at the Antenatal Outpatient Clinics of Shebin El-Kom Teaching Hospital, Menoufia Governorate, Egypt. The pregnant women's admission rate was two to five per day, but the flow rate of pregnant women with gestational diabetes was two to three per week. Services provided to the subjects are completely free. The areas served by the hospital are Shebin EL-Kom city and its neighboring villages. The establishment at two days per week (Monday and Wednesday). Those days were the high-risk clinic follow-up. The study's setting includes a pre-equipped room; with an adequate number of seats, data show, and supportive materials (e.g., insulin syringe, Mannequin, blood glucose monitor, Flip-charts).

4.3. Subjects

A non-probability purposive sample of 120 women with GD was recruited and carefully chosen from selected setting to share in the current study; they were distributed randomly into two equal groups (n=60), intervention and control groups, during the period from January 1, 2019, to the end of June 2019.

Inclusion criteria

All pregnant women were eligible to participate if they were in:

- Childbearing age (18–35 years).
- Can read and write (tools of data collection were self-administered).
- Pregnant at 24-28 weeks of gestation till before delivery.
- Medically diagnosed with gestational diabetes.
- Free from any other medical or obstetric problems (e.g., diabetes mellitus, pregnancy-induced hypertension) (self-reported).
- Accepting to participate in the study.

Exclusion criteria

Women with any medical health problems during the recruitment period were excluded.

Women who met the inclusion criteria were invited to participate and received brief study information.

Participants were volunteers, and before taking part in the study. Women were randomized into two groups so that groups of women in different categories of age and education level were randomly assigned separately to the intervention or control group. This method enhances the likelihood of detecting differences between the groups.

Sample size calculation

Based on data from literature *Bastani et al. (2010),* considering a level of significance of 5% and power of study of 80%, the sample size can be calculated using the following formula:

n = [(Zα/2 + Zβ)2 × {2(SD)2}]/ (mean difference between the two groups)2

Where

SD = standard deviation

Zα/2: This depends on the level of significance; for 5%, this is 1.96

Zβ: This depends on power; for 80%, this is 0.84.

Therefore,

n= [(1.96 + 0.84)2 × {2(3.3)2}]/ (1.69)2=59.8

Based on the above formula, the sample size required per group is 60.

Recruitment and groups' assignment

Participants' records were reviewed for those who attended the clinic for their first time and 24 to 28 weeks of gestation to recruit the study subjects. One hundred twenty eligible women with GD were identified and assigned to the intervention or control groups. Participants of the intervention group (n = 60) were allocated into ten subgroups. Each formed of 6 participants.

4.4. Tools of the study

4.4.1. Structured Self-Administered Questionnaire

The participant's general characteristics were collected using a structured self-administered questionnaire. The researchers developed it from eight items (i.e., participant's age, residence, level of education, employment status, economic status, telephone number, gravidity, and gestation weeks at enrollment). The participants completed it.

4.4.2. The Multidimensional Health Locus of Control Scale- C

It is adopted from *Wallston et al. (1994)*, who adapted it from the original MHLOC A and B forms to assess condition-specific locus of control. The MHLOC Scale - A and B forms were developed concurrently to assess perceived beliefs regarding where control over an individual's health lies. These scales were designed to measure three dimensions of health-related locus of control, including internality, powerful others, and chance.

The two forms were created to be equivalent for use in repeated measures designs. This questionnaire has four factor-analyzed subscales, including internality and the external locus of control scales of chance, doctors, and other powerful people. The subscales in each of these forms were found to have adequate internal consistency. Cronbach alpha coefficients were calculated and found to be 0.86 for the HLOC scale *(Bastani et al., 2010).* HLOC was assessed using the Multidimensional Health Locus of Control scale *(Wallston et al., 1976).* This scale consists of 11 statements, each of which, with proper internal consistency, is scored on a six-point Likert scale that starts from strongly agree to strongly disagree. Five items contribute to the internal locus of control scale (e.g., People's ill health results from their carelessness). Six statements belong to the external locus of control scale. It contains such statements as "People who never get sick are just plain lucky".

Scoring system

The rating of each statement in the scale (for example, one mark for strongly disagree and 6 for strongly agree). Ratings are summarized so that internal item scores range from 6 to 30, with higher scores suggesting greater confidence in internal HLOC, and external item scores range from 6 to 36, with higher scores indicating a greater confidence in external HLOC.

4.4.3 General self-efficacy scale

In assessing the self-efficacy of women with GD, the General Self-Efficacy Scale (GSES) was used. This scale was adopted from *Schwarzer and Renner (2009).* There are ten items on the GSES (e.g., I can always manage to solve difficult problems if I try hard enough; if someone opposes me, I can find the means and ways to get what I want; it is easy for me to stick to my aims and accomplish my goals; I am confident that I could deal efficiently with unexpected events; thanks to my resourcefulness, I know how to handle unforeseen situations; and I can solve most problems if I invest the necessary effort.

Scoring system

The scale options were scored from 1 (totally wrong) to 4 (entirely correct). Scores range from 4 to 40, with higher scores indicating higher competence in dealing with daily issues.

4.5. Procedures

The internal consistency of the questionnaire was calculated using Cronbach's alpha coefficients. The reliability of the tools was done using test-retest reliability and proved to be reliable was 0.76 for General Self-Efficacy Scale (GSE) and 0.7222 for the Health locus of control scale. The given values of Cronbach's alpha coefficients indicated accepted reliability for the tools.

The used tools in the present study were validated in previous studies. For this study, the Arabic translation was done according to the original questionnaires. A panel of five experts confirmed the Arabic version's content validity in maternity and newborn health nursing, before introducing it to the subjects. Validation was done to ensure that the questions were consistently conveyed and carry the intended meaning; to ensure the tools' clarity and understandability.

Ethical considerations: Official approval was obtained from the board of Obstetrics and Gynecology Department of Shebin El-Kom Teaching Hospital. The study was accepted by the Ethics Committee of the Nursing Faculty.

Also, pregnant women with GD gave their informed written consent before enrollment and after explaining the study's aim. Women were also informed about their right to withdraw from the study at any time without giving a reason. They were reassured that all research data would be confidential and used only for the study. Subjects' privacy was always maintained. Additionally, after collecting the required data, women with GD allocated to the control group were invited to attend GD training sessions to gain the same benefits.

Fieldwork: The intervention group received care according to the GD NI sessions. The intervention was carried out through three phases: preparation for the intervention, implementation of the intervention, and outcomes evaluation.

The intervention was several GD NI sessions for the women in the intervention group. These sessions took the form of 4-hour sessions divided into two sessions; each session 2 hours (one hour was theory and one was practice) in which six women participated. Group education was chosen for the intervention because it is an efficient approach for the subjects covered by this intervention, and it costs less than one-on-one teaching *(Freda, 2002)*. The sessions were scheduled conveniently for the participants and in a quiet room in the study setting. The researcher presented the sessions with the assistance of the trained staff qualified in maternity and newborn.

The education was aimed at empowering women to obtain knowledge and practice related to GD. The following topics were covered: Diet, exercise, personal hygiene, foot care, and insulin therapy (injection). Each woman in the intervention group also attended an individualized face-to-face meeting thirty minutes before the sessions on the same day to address the participant's initial concerns and to guide the participant in identifying key issues at the sessions. Women in the control group received the routine clinic intervention sessions.

Phase 1: Preparation for the intervention

This phase included three steps: staff training, pilot study, and formation of the intervention subgroups.

Staff training is designed to ensure the success of the NI sessions at the Obstetrics and Gynecology Department of Shebin El-Kom Teaching Hospital. The research team members and assistant medical and nursing academic staff (n = 6; one junior obstetrician, one researcher, and four nurses) were subjected to 4-hour sessions divided into two sessions; each session 2 hours (one hour was theory and one was practice). The training sessions were implemented over one day. It focused on learning the research team about NI sessions' approach regarding GD and revising the required clinical skills. By the end of sessions training, the team conciliator assigned roles to each member. The medical staff was responsible for GD diagnosis and risk assessment to confirm that the participant was free from any other medical or obstetrical complications through physical examination. The nursing staff was responsible for the participants' education and skills-building.

Pilot study: After staff training and before implementing the NI sessions, a pilot study was conducted on 10% of the pre-assigned sample size (12 women; 6 assigned to the NI group and six assigned to the control group). It aimed to assess the clarity of the measures and acceptability of group NI sessions in the real clinical field. According to pilot findings, the study measures were clear, and no modifications were done. The tools were acceptable from the pilot subjects. The pilot sample was included in the analyzed study sample.

Formation of the NI sessions subgroups: At the initial prenatal care visit, the research team clarified the study aim and nature to each eligible woman with GD and a female friend (Each participant was allowed to join one friend). There was a need for the friend to have a previous experience with GD. That is to ensure active participation in group discussions (not obligatory). Informed written consents were taken from both groups; then, each potential participant was assigned to a NI sessions subgroup. Each subgroup consisted of 6 women with GD because learning in a small group (6) was more effective than a large group (60). Ten subgroups belonged to the main intervention group. All members of the same group were asked to attend as a group in upcoming visits. Participants' attendance was based on a predesigned prenatal care schedule of 2 structured sessions. The one session led over 120 minutes. Attendance of the friends was optional.

Phase 2: Implementation of the intervention

The implementation consisted of providing NI sessions through structured group sessions. Every session ran in an organized sequence. Each session started with GD diagnosis and risk assessment and was followed by education and skills building. The contents of NI sessions included the following main topics:

- General information about GD such as definition, etiology, risk factors, and treatment of GD.
- Maternal and neonatal complications related to gestational diabetes mellitus (GDM).
- Concept of self-efficacy and aspects of health locus of control.
- The role of a positive self-concept and health locus of control on preventing GDM complications.
- Different self-efficacy enhancing strategies (e.g., motivational messages, role modeling, goal setting plans, and mastery experiences) lift their conviction that they have power over their illness.

-Teach the women how to monitor blood glucose and insulin injection (this is the practical part).

Diagnosis of GD Risk assessment: During the first 30-40 minutes of each session, the physical assessment was done to all the same group members at one clinic. A trained junior obstetrician carried out the physical assessment. After that, group members were asked to transfer to a nearby room to complete the session's content (i.e., education and skills-building). It was not applicable for the researchers to include physical examination, education, and skills development in the same room because Egyptian women were ashamed of being assessed in a group setting, even in a blocked-off area. In upcoming sessions, women

with GD participated actively in care by making such skills under the session leader's supervision.

Education was provided by conducting GD NI sessions and skills building. It consumed 60 minutes per session.

Skills building to develop participants' skills, a researcher spent around 30-60 minutes (5-10 minutes for each participant) from each session to demonstrate and allow the participants to re demonstrate certain skills. Skills building aimed to teach the participants how to monitor blood glucose and how to self-administer insulin injections.

Group discussions and social support allowed between each subgroup member and knowledgeable guest speakers who had GD's experience (i.e., female friends) in the group setting. The researcher or academic staff guided them. Discussions targeted sharing experiences from others. Thirty minutes were assigned to carry out such discussions around GD concerns of group members. When the participant attended the high-risk outpatient clinic for the next follow-up visit, she could meet and interact with the other subgroup sessions and discussions. This idea allowed information to advance spontaneously. Ten sessions were obtained on Monday and Wednesday within five weeks.

Phase 3: Follow up and outcomes evaluation

Phone numbers of the participants were taken for follow-up during the study period. The initial visit began at 24-28 weeks of gestation till before delivery, and the after coming visits were biweekly or weekly according to gestational age. The participant who did not accomplish adequate NI sessions attendance (i.e., four hours; theory and practice) was declined from the study.

The intervention outcomes were assessed for GD's women's self-efficacy and women's HLOC. First outcomes were evaluated at baseline (before NI) and one month after the intervention. The women were asked to return to the study setting to complete questionnaires for post-intervention evaluation. The participants were contacted by telephone who failed to return.

The control group received the conventional individual prenatal care. Such care involves individual meetings with a healthcare provider on duty. Each participant was subjected to examination within 5-10 minutes at maximum and was assessed for their self-efficacy and HLOC. First outcomes were evaluated at baseline (starting time of the study) and one month after conventional individual prenatal care. The women were asked to return to the study setting to complete questionnaires after one month. The participants who failed to return were contacted by telephone. There were no scheduled plans for the education or skill development issues.

4.6. Limitations of the study

The study sample was nominated from a single setting, so a generalization of the findings could not be accessible.

4.7. Data analysis

All statistical analyses were carried out using Statistical Package for Social Science for windows version 20.0 (SPSS, Chicago, IL). Continuous data were normally distributed and expressed in mean ± standard deviation (SD). Categorical data expressed in number and percentage. The comparisons were determined using Student's t-test for variables with continuous data, and Chi-square test was used for the comparison of variables with categorical data. Statistical significance was set at $p \leq 0.05$.

5. Results

Table 1 reveals no statistically significant difference between the intervention and control group regarding their socio-demographic characteristics, including age, residence, educational level, employment status, economic status, and gravidity.

Table 2 illustrates a non-statistically significant difference between the intervention and control groups in their internal health locus of control (HLOC) scores before intervention. It was 15.1±4.5 for the intervention group and 15.6 ±4.2 for the control group, where p =0.530. In contrast, a highly significant difference was revealed between the intervention and control groups in their internal health locus of control (HLOC) scores after the intervention. It was 22.6±4.6 for the intervention group compared with 17.9±4.7 for the control group, p<0.001. The table also shows positive changes in internal health locus of control between pre-intervention and post-intervention in both groups, with a statistically significant difference between the change value in both groups at p<0.001

Table 3 illustrates a non- non-statistically significant difference between the intervention and control groups in the external health locus of control (HLOC) mean scores before and after intervention where p= 0.837, p= 0.764, respectively. The table also shows positive changes in external health locus of control between pre-intervention and post-intervention in both groups, but it did not reach the statistically significant level between the change value in both groups at p=0.032.

Table 4 illustrates a non-significant difference between the intervention and control groups in the self-efficacy scores before intervention (p=0.555). In contrast, the table shows a highly statistically significant difference between the intervention and control group in the self-efficacy scores after the intervention (18.9±2.6) for the intervention group compared with (10.4±3.6) for the control group as p<0.001. The table also shows positive changes in self-efficacy between pre-intervention and post-intervention in both groups, with a statistically significant difference between the change value in both groups at p<0.001

Figure 1 illustrates an improvement in the mean score of the internal locus of control for the intervention group (22.6 ±4.6) after intervention as compared with (15.1 ±4.5) pre-intervention; as regarding the control group, there was minimal improvement in mean scores of internal locus of control (17.9 ±4.7) after intervention as compared with (15.6 ±4.2) before the intervention.

Figure 2 illustrates the minimal improvement in the mean score of external locus of control of intervention group (25.7±5.2) after intervention as compared with

(22.8±5.4) pre-intervention; as regarding the control group, there was a minimal improvement in mean scores of external locus of control (25.4 ±5.7) after intervention as compared with (23.0±5.2) before the intervention.

Figure 3 illustrates an improvement in the mean score of self-efficacy of the intervention group (18.9±2.6) after intervention as compared with (4.0±1.9) pre-intervention; as regarding the control group, there was a minimal positive change in mean scores of self-efficacy (10.4±3.6) after intervention as compared with (4.2 ±1.8) before the intervention.

Table (1): Comparison of the socio-demographic characteristics between the intervention and control groups of women at the baseline.

Characteristic	Intervention group (n=60)		Control group (n= 60)		Total (n=120)		χ^2	p
	N	%	N	%	n	%		
Age (years)								
18 – 26	39	65.0	32	53.3	71	59.2		
27 – 35	21	35.0	28	46.7	49	40.8	1.690	0.194
Residence								
Rural	29	48.3	33	55.0	62	51.7		
Urban	31	51.7	27	45.0	58	48.3	0.534	0.465
Education level								
Secondary school	22	36.7	23	38.3	45	37.5		
University	38	63.3	37	61.7	75	62.5	0.036	0.850
Employment status								
Not employed	37	61.7	36	60.0	73	60.8		
Employed	23	38.3	24	40.0	47	39.2	0.035	0.852
Economic status								
Not enough	43	71.7	38	63.3	81	67.5		
Enough	17	28.3	22	36.7	39	32.5	0.950	0.330
Gravidity								
Primipara	25	41.7	21	35.0	46	38.3		
Multipara	35	58.3	39	65.0	74	61.7	0.564	0.453

Table (2). Comparison of internal health locus of control (HLOC) scores between the intervention and control groups pre-and post-intervention.

Intervention phases	Intervention group (n = 60)	Control group (n = 60)	Mean difference	T	p
	Mean ±SD	Mean ±SD	[95% CI]		
Pre-intervention	15.1±4.5	15.6±4.2	-0.50 [-2.07; 1.07]	0.629	0.530
Post-intervention	22.6±4.6	17.9±4.7	4.70 [3.02; 6.38]	5.536	<0.001
Change	7.5±3.1	2.3±1.1	5.20 [4.36; 6.04]	12.245	<0.001

Table (3): Comparison of external health locus of control (HLOC) scores between the intervention and control groups pre-and post-intervention.

Intervention phases	Intervention group (n = 60)	Control group (n = 60)	Mean difference	T	p
	Mean ±SD	Mean ±SD	[95% CI]		
Pre-intervention	22.8±5.4	23.0±5.2	-0.20 [-2.12; 1.72]	0.207	0.837
Post-intervention	25.7±5.2	25.4±5.7	0.80 [-1.17; 2.77]	0.301	0.764
Change	2.9±0.6	2.4±1.1	0.5 [0.05; 0.96]	2.175	0.032

Table (4): Comparison of self-efficacy scores between the intervention and control groups pre-and post-intervention.

Intervention phases	Intervention group (n = 60)	Control group (n = 60)	Mean difference	T	p
	Mean ±SD	Mean ±SD	[95% CI]		
Pre-intervention	4.0±1.9	4.2±1.8	-0.20 [-0.87; 0.47]	0.592	0.555
Post-intervention	18.9±2.6	10.4±3.6	8.5 [7.37; 9.64]	14.827	<0.001
Change	14.9±1.4	6.2±3.0	8.7 [7.85; 9.55]	20.356	<0.001

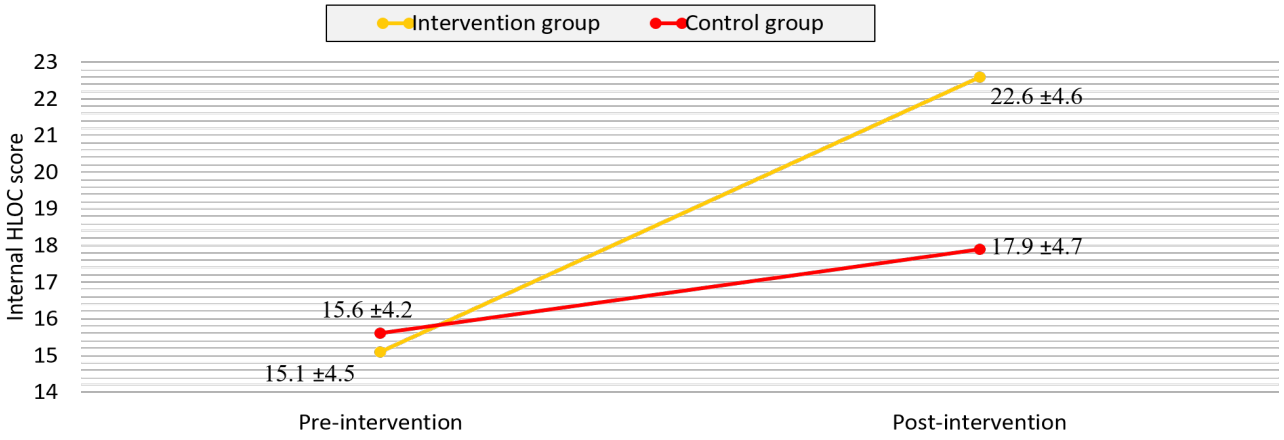

Figure (1): Mean scores of internal health locus of control (HELOC) in the intervention and control groups of women pre-and post-intervention.

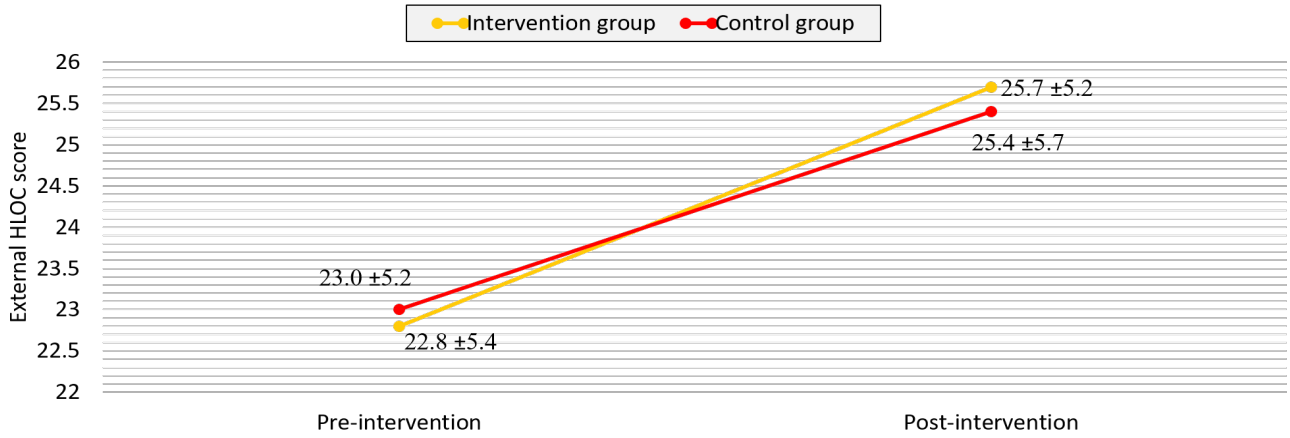

Figure (2): Mean scores of external health locus of control (HELOC) in the intervention and control groups of women pre-and post-intervention.

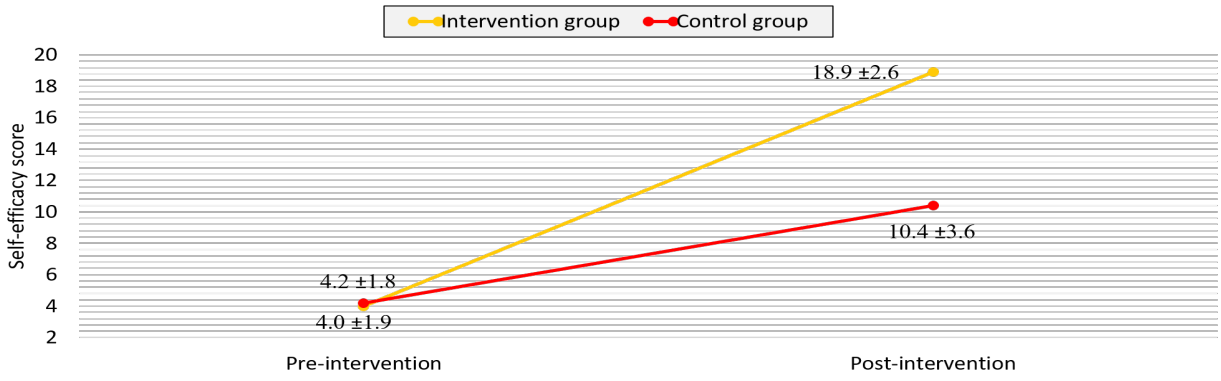

Figure (3): Mean scores of self-efficacy in women's intervention and control groups pre-and post-intervention.

6. Discussion

Pregnant women with GD are among the more difficult patients in adherence to their medical regimen that health care teams must deal with regularly. It is considered one of the critical complications of pregnancy that can negatively affect mothers and infants, leading to unwanted consequences during pregnancy and childbirth *(Carolan, 2013).* GD conditions increase continuously due to individual behaviors related to diabetes control *(Haskasa et al., 2016).* Locus of control deals with the individuals' perception about controlling the situation affecting him or her. *Haskasa et al.'s (2016)* study results indicate that the locus of control significantly affects the diabetic patients' intention to perform the control. Diabetes management behaviors were influenced most by self-efficacy. Therefore, the current study aimed to This study aimed to evaluate the nursing intervention (NI) effectiveness on health locus of control (HELOC) and self-efficacy in women with gestational diabetes (GD).

A two matched groups were recruited to achieve the aim of this study. The existing finding reveals no statistically significant difference between the intervention and control groups regarding their socio-demographic characteristics, including age, residence, educational level, employment status, economic status, and gravidity.

The existing study hypothesizes the women with GD, who participate in NI sessions, will obtain higher scores in the internal health locus of control than the control group. Accordingly, that there is a highly significant difference between the intervention group and control group in the internal health locus of control scores after intervention where ($p < 0.001$); intervention group who receive nursing intervention displayed significant improvement in the mean score of internal locus of control after intervention as compared with the control group who do not participate in nursing intervention sessions; while there is no statistically significant difference between intervention group and control group in the internal health locus of control scores before intervention. This finding indicated that the intervention sessions positively affected the internal health locus of control scores of the intervention group by empowering them to control things that happen in their lives and take greater responsibility for managing their illness and developing effective strategies to control their disease.

This finding was consistent with *Fardaza et al. (2017),* who studied the effect locus of control-based intervention on self-care behavior of patients with type II diabetes; their result revealed a significant difference between the mean scores of internal locus of control before and two months after the intervention ($p<0.001$). However, no statistically significant difference was detected between the intervention and control groups in control mean score's internal locus of control before the educational intervention. Internal locus of control mean score increased significantly in the intervention group after two months of intervention.

Moreover, the present findings were reinforced by *Mehrtak et al. (2017)* in a study entitled "Effectiveness of teaching cognitive-behavioral techniques on the locus of control in hemodialysis. The result revealed a significant difference between the pretest and posttest scores of internal locus of control in the intervention group ($p=0.004$). This result indicates that the nursing intervention motivates gestational diabetes women to create a sense of responsibility in controlling the disease in this group, so they perceive that they have greater control over their blood glucose levels and pay more attention to the treatment regimens, and are less involved in the complications of the disease. Thus, the internal health locus of control increases the person's ability for self-care behaviors and induces better control over diabetes.

Regarding external health locus of control, the existing study hypothesized women with GD, who participate in NI sessions, will obtain higher scores of external health locus of control than the control group. The present finding reveals a non-statistically significant difference between the intervention and control groups regarding the external health locus of control mean scores before and after the intervention. This finding may be because gestational diabetic women in this study view the attainment of a specific outcome outside of their control, so they are less likely to make an effort to engage in health-promoting behaviors. They perceive chance expectations such as fate or luck are controlled by powerful others such as family members or physicians. Furthermore, they believe that they could not control their lives; they also tend to have low initiative and make less effort to see their abilities.

This result was consistent with *Fardaza et al. (2017);* their result revealed a non-statistically significant difference between the test and control groups in the mean score of external locus of control before educational intervention.

After nursing intervention sessions, the existing study revealed that there were positive changes in external health locus of control between pre-intervention and post-intervention in both groups, but it did not reach the statistically significant level between the change value in both groups at $p=0.032$; which contradicted with *Fardaza et al., (2017);* their result revealed that the difference between before and after the intervention was statistically significant ($p<0.001$) in the test group. This contradiction may be due to differences in a data collection questionnaire. So, the first hypothesis is partially supported.

The present study hypothesized that women with GD, who participate in nursing intervention sessions, will obtain higher self-efficacy scores than the control group. The existing finding reveals a highly significant difference between the intervention group and the control group in the self-efficacy scores after intervention $p<0.001$. There is a statistically significant positive change in self-efficacy between pre-intervention and post-intervention in both groups, with a statistically significant difference between the change values in both groups. This finding indicates that nursing intervention has been more effective for women with gestational diabetes through reducing stress and anxiety; promoting self-care behaviors; enabling them to believe that they have control over their lives; encouraging them to use diabetes self-care behaviors in

their daily lives, as a result, have a positive impact on increasing women's self-efficacy and improving their ability to adhere to dietary regimen and physical activities.

The existing finding was reinforced by *Shi et al. (2010); Ha et al. (2014).* They reported that educational strategies, such as behavioral patterns modification and verbal persuasion, among the constructs of Bandura's Self-Efficacy Theory (SET), improved the sense of self-efficacy in diabetic patients. It was generally concluded that, because of an improved sense of self-efficacy, patients who were verbally convinced had particular abilities and could make further attempts to solve problems *(Bandura, 1998).*

The present finding was also consistent with a study conducted by *Eshghi Motlagh et al. (2019).* Their research aimed to investigate the effect of Bandura's Self-Efficacy Theory (SET) educational intervention on self-care, self-efficacy, and blood sugar levels in pre-diabetes mothers during pregnancy. Their result revealed a highly statistically significant difference between the study and control group regarding the sense of self-efficacy.

Also, the present finding shows that there is no significant difference between the intervention group and control group in the self-efficacy scores before intervention (p=0.555); this finding was incongruent with *Eshghi Motlagh et al. (2019);* they conduct a randomized two-group clinical trial on 100 pregnant women with pre-diabetes in Shirvan, Iran, during 2018. The study group received educational training according to the constructs of Bandura's Self-Efficacy Theory (SET). The data were collected using the standardized and adjusted Diabetes Self-Efficacy Questionnaires; their result revealed a significant difference between the intervention group and the control group in the self-efficacy scores before intervention (P*<0.001). This contradiction may be due to differences in data collection questionnaires. Finally, according to the finding of the current study, the research hypotheses were accepted.

7. Conclusion

The current study concluded that women with gestational diabetes who participate in nursing intervention sessions obtain higher internal health locus of control after the intervention than the control group. Simultaneously, there is no significant difference between the intervention and control groups in the external health locus of control mean scores after intervention. Women with gestational diabetes, who participate in nursing intervention sessions, obtain higher self-efficacy scores after intervention than the control group who did not participate in nursing intervention sessions. Therefore, it was concluded that nursing intervention positively affects internal health locus of control and self-efficacy in women with gestational diabetes.

8. Recommendation

This study recommended that

- Raising public awareness about the consequences of gestational diabetes and the role of locus of control and sense of self-efficacy in reducing maternal and neonatal complications among women with GDM.
- A psychological, educational program should be given for all gestational diabetic women about the importance of adherence to healthy lifestyle choices and behaviors in managing their illness.
- Provide health education programs to all gestational diabetic women to improve their health locus of control and sense of self-efficacy.

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