

# Effect of Health Promotion Model and Self-Determination Theory Based Intervention on Preeclampsia Prevention among Pregnant Women at Beni-Suef Governorate

Hanaa Kamal Helmy<sup>(1)</sup>, Rasha El -Sayed Ibrahim<sup>(2)</sup>

(1) Assistant Professor at Maternal and Neonatal Health Nursing Department, Faculty of Nursing, Beni- Suef University, Egypt

(2) Lecturer at Maternal and Neonatal Health Nursing Department, Faculty of Nursing, Beni- Suef University, Egypt

## Abstract

Pre-eclampsia is the greatest common hypertensive disorder of pregnancy, It is a major cause of maternal mortality and morbidity, preterm birth, intrauterine growth restriction, and perinatal death worldwide. It has been predictable that preeclampsia complicates 2-8% of pregnancies globally, and is considered to be the third cause of maternal death. **Aim of this study** was to determine the effect of the health promotion model and self-determination theory-based intervention on preeclampsia prevention among pregnant women. **Subjects and method:** A quasi-experimental design was conducted at the antenatal clinic at Beni-Suef University Hospital, Egypt. **A purposive sample** of 60 pregnant women was included in the study, they were divided into study and control groups from June 2019, until December 2019. **Tools:** Data were collected through three main tools: A Structured interviewing questionnaire, The questions about pre-eclampsia prevention knowledge, and the health promotion model. **Results:** The results of this study revealed there was a significant difference ( $p < 0.05$ ) in all variables after the implementation of an intervention and the average score of the various variables in the intervention group was greater than that of the control group ( $p < 0.05$ ). **Conclusion:** The application of the health promotion model and self-determination theory-based intervention on preeclampsia prevention in pregnant women had an effective improvement of pregnant women's knowledge change behavior, and dietary practices were also improved in the study group compared to the control group. **Recommendations:** The intervention of management of PE with the pregnancy based on HPM and self-determination theory should be integrated into the ANC program at the study setting and similar ones.

**Keywords:** Pre-eclampsia prevention, Health Promotion Model, Self-determination theory, Knowledge, Pregnant women.

## Introduction:

Early detection and prevention of preeclampsia (PE) are very important to avoid morbidity and mortality associated with them. Potential interventions for reducing the risk of preeclampsia include taking rest, dietary salt restriction, and calcium supplementation in pregnancy and prevent its complications and vitamin D supplementation. Preeclampsia is characterized by many signs as hypertension and proteinuria and nephropathy in pregnant women who are usually in 20 weeks of gestational age. It affects around 2–5% of pregnancies (Irion et al., 2017).

The prevalence may range as high as 10 to 18% in some developing countries. The reports of the World Health Organization indicate that every day, approximately 830

women die from preventable causes related to pregnancy. PE included early-onset of the disease and late-onset of the disease. The early-onset PE is accompanied by fetal growth restriction (FGR), umbilical artery forms, and abnormal uterine and negative effects on maternal and neonatal outcomes. In contrast, the late-onset of PE is accompanied by low maternal disease and a low in fetal involvement, and perinatal outcomes (Alkema et al., 2016).

It was very important to screen for PE to know high-risk pregnancy and help in modifying care during the antenatal period and maintain preventive management to minimize complications and deaths (Rastegari et al., 2019). PE pathophysiology included abnormal placentation and expanded to its vascular supply and endothelial dysfunctions that

increase the maternal vascular supply and high blood pressure. Prediction of preeclampsia in early pregnancy focused on assessing maternal history, measuring blood pressure, and serum biomarkers for (Park, et al., 2015).

Planning appropriate monitoring and clinical management of PE can be followed through early detection followed the early identification of disease complications. Many factors complicate the prevention of PE cases. Most of them were related to unknown causes and the several signs and symptoms of the disease that means a large number of pregnant women need to be treated to prevent complications. Because nearly 50,000 pregnant women worldwide are died from this disease (Cunningham et al., 2018).

Prevention of preeclampsia may be primary, secondary, or tertiary (Alkema et al., 2016). Primary prevention includes avoiding pregnancy in women at high risk for PE, improving women's nutrients intake, modifying their lifestyles to minimize the occurrence of the disease and reduce the stressors associated with these pregnancies and improve mental health in mothers with high-risk pregnancy (Hadian et al., 2018).

Secondary prevention is based on the interruption of known pathophysiological mechanisms of the disease before its establishment. Recent efforts have focused on the selection of high-risk women and have proposed an effective intervention, as early as it is possible, to avoid the disease or its severe complications because it helps indicate that prenatal outcomes improve with expected management (Poon&Sahota, 2019).

Tertiary prevention relies on using treatment to avoid PE complications. Magnesium sulfate can reduce the rate of PE, but 71% of pregnant women needed to be treated to prevent eclampsia. Therefore, tertiary prevention can be difficult to achieve if women exposing to unnecessary risks, so that the provision of care can lead to decrease premature birth and hospitalization costs in a low-birth-weight neonate due to high-risk pregnancy (Ichikawa K, et al., 2015).

Pre-eclampsia prevention in pregnant mothers needed to be done through health promotion by looking at various internal and

external factors of pregnant women. The Health Promotion Model (HPM) as a nursing theory may be used as a theoretical basis to help patients conduct healthy behaviors. Physical and psychological changes experienced by pregnant mothers in pregnancy will have an impact on their ability to make efforts to prevent pre-eclampsia, so a behavioral model for the prevention of pre-eclampsia with self-determination is needed to form a high commitment because health promotion measures that applied are expected to help in the prevention of pre-eclampsia in pregnant mothers (Gan, 2018).

#### Significance of the study:

The results classified more than 60% of pregnant women as high risk and predicted less than 30% of those destined to develop PE, with a false-positive rate of 10% (Ray et al., 2016). Despite the high prevalence and serious consequences of PE in Egypt and other developing countries, Women at risk for PE identification are very important through antenatal care, and these women can be scheduled for more intensive antenatal interventions. For now, no effective treatment is formally advised for PE currently. PE is considered such as a global health problem, associated with high rates of maternal and neonatal morbidity and mortality. (Polit and Beck, 2018). Hence, the study was aimed to determine the effect of the health promotion model and self-determination theory-based intervention on preeclampsia prevention among pregnant women.

#### Operational definition:

**Health promotion model:** In the present study, it was referred five dimensions: taking rest, treatment of pre-eclampsia, dietary salt restriction, calcium supplementation, and vitamin D supplementation throughout seven months of implementation intervention sessions. It focused on helping pregnant women to improve knowledge and encouraged health professionals to increase the self-determination of pregnant women to strengthen and improve commitments in eclampsia prevention (Pender, 2011).

#### Aim of the study

The study was aimed to evaluate the effect of health promotion model and self-determination theory-based intervention on preeclampsia

prevention among pregnant women. **This aim achieved through:**

- 1- Assess knowledge of pregnant women regarding the prevention of preeclampsia using health promotion model and self-determination to identify their needs.
- 2- Design and implementation of an intervention-based health promotion model and self-determination according to the needs of pregnant women
- 3- Determine the effect of health promotion model and self-determination theory-based intervention on preeclampsia prevention among pregnant women.

### Research hypothesis:

**H1** Pregnant women who will receive health promotion model and self-determination theory-based intervention; their knowledge will be improved after implementation of intervention.

**H2** Pregnant women will be adopted better nutritional practices, and better health regarding PE after implementation of health promotion model and self-determination theory-based intervention.

### Subjects and Methods:

#### Research design:

A quasi-experimental research design (pre/post-test) control, and study group. It used for establishing the cause-and-effect relationship between an independent and dependent variable.

#### Setting:

The study was conducted at the antenatal clinic at Beni-Suef University hospital, which is located at the ground floor of outpatient building that includes two rooms. It starts from 8 AM to 1 PM. Women attended for antenatal care, counseling, and any gynecological procedure.

#### Subjects:

**Sample type:** A Purposive sample was used.

**Sample Size:** 60 pre-eclamptic pregnant women, was taken from the pregnant women who attended the antenatal clinic at Beni-Suef University Hospital from June 2019, until December 2019. All the studied pregnant women meet these inclusion criteria as women after 20 weeks of pregnancy, pregnant women suffering

from pre-eclampsia, both primipara and multipara, free from physical, chronic disease as (heart disease, GDM), and agree to participate in this study. Pregnant women were classified to 30 pregnant women for each group.

#### Tool of data collection:

Data were collected through three main tools.

**A structured interview questionnaire** was developed by the researchers after reviewing the related literature and research studies with items based on the theory of prevention of PE and the health-promotion model (HPM) (Steeegers et al., 2017). It was composed of three parts:

#### Part (1): It included

- 1- Socio-demographic data related to age, educational level, occupation, residence.
- 2- Medical and obstetric history of pregnant women includes; gravidity, Parity, follow up, and Family history of preeclampsia.

**Part (2):** This part was used (pre/ post-test), It included twenty questions which include; definition, causes, signs and symptoms, and the nature of preeclampsia, the epidemiology, the symptomatology, the healthcare, and consequences. Taking rest for prevention, treatment of pre-eclampsia, dietary salt restriction for prevention of pre-eclampsia, calcium supplementation during pregnancy, and vitamin D supplementation.

**Scoring:** For knowledge items, a correct response was scored 1 and the incorrect zero. For each area of knowledge, the scores of the items were summed-up and the total divided by the number of the items, giving a mean score for the part. These scores were converted into a percent score, and means and standard deviations were computerized. Knowledge was considered satisfactory if the percent score was 60% or more and unsatisfactory if less than 60%.

**Part (3):** Health-promotion model (HPM) constructs that have been used in designing and evaluating behavioral interventions. It designed by (Pender, 2011). This questionnaire measures health-promoting behaviors within five dimensions: taking rest, treatment of pre-eclampsia, dietary salt restriction, calcium supplementation, and vitamin D supplementation.

The questionnaire items are scored based on a 4-point Likert scale.

**Scoring:** The responses “Never”, “sometimes”, “often” and “always” were respectively scored 4,3, 2, and 1. The scores of the items were summed-up and the total divided by the number of the items, and converted into a percent scores. Higher scores indicate more favorable behaviors.

### **Methods of Data Collection:**

#### **Validity:**

The content validity of study tools was checked by three expert professors in maternal and neonatal nursing they reviewed the instruments for clarity, relevance, comprehensiveness, understanding, applicability, and easiness for administrative minor modifications that required correction was carried out accordingly.

#### **Reliability:**

The reliability was done by Cronbach's Alpha coefficient test which revealed that each of the three tools consisted of relatively homogenous items as indicated by the moderate to the high reliability of each tool was (0.89).

#### **Administrative design and Ethical considerations:**

Official permission was granted by submission of an official letter from the Dean of the faculty of nursing of Beni-Suef University to the director of Beni-Suef university hospital as approval for data collection to conduct this study and the aim of the study was explained to the pregnant women. The researcher informed the participants that, the study was voluntary, they were allowed to refuse to participate and they had the right to withdraw from the study at any time, without giving any reason. Moreover, they were assured that their information was confidential and used for research purposes only.

#### **A pilot study**

A pilot study was conducted on 10% of the mothers (6 pregnant women). It was excluded from the total sample. The clarity and testing of the feasibility of the research process needed for modifications were carried out based on the results of the pilot study to develop the final form of the tools. Pregnant women involved in the pilot

were excluded from the study to avoid contamination of the study sample.

#### **Fieldwork:**

To fulfill the aim of this research, the following phases were adopted, assessment, implementation, and evaluation. These phases were carried out from the beginning of June 2019 and completed at the end of December 2019 covering seven months. The researcher visited the previously mentioned setting three days/week, from 9.00 Am to 1.00 Pm.

#### **A. Preparatory phase (Assessment):**

The preparatory phase was the first phase of the research, the researchers carried out through review of local and international related literature about the various aspects of the research problem. This helped the researchers to be acquainted with the magnitude and seriousness of the problem and guided the researchers to prepare the required data collection tools. Interviewing was carried out using a structured interviewing questionnaire (pretest). The researchers identified themselves to the women and explained the study aim, benefits and the procedures to be performed. Women who were willing to participate in the study and met the inclusion criteria were approached by the researchers. Baseline assessment of patients included sociodemographic, medical & obstetrical data and knowledge about preeclampsia. The researcher discusses the definition, of pre-eclampsia causes and the influence of pre-eclampsia on pregnancy, and ways to prevent pre-eclampsia, which includes procedures for taking rest for prevention, treatment of pre-eclampsia, dietary salt restriction, calcium supplementation to prevent pre-eclampsia and its complications, and vitamin D supplementation.

Self-determination material included three psychological needs of the pregnant women that need to be fulfilled and self-motivation to prevent Pre-eclampsia. Family support material that helps in pre-eclampsia prevention includes the benefits of this support for pregnant women, types of support given to the pregnant women, and family support for pregnant women to have a strong determination in preventing Pre-eclampsia.

### B. Interviewing and planning phase:

The intervention model: was held three times; consisting of meeting with health professionals, the meeting with pregnant mothers, and meeting with pregnant women and their families who attended with pregnant women to the hospital. The meeting was held for 45-60 minutes targeting health professionals with Pre-eclampsia health promotion to pregnant mothers. The first meeting aimed to improve the understanding of health professionals about educational intervention. The researchers discussed the model of health education that needed to be provided based on HPM and self-determination, and aimed to increase the satisfaction of pregnant women in terms of psychological needs, including autonomy, competence, and relatedness. At the end of the meeting, the researchers gave the module to the health professionals. The second meeting was held for 45-60 minutes targeting the pregnant women in groups. This meeting aimed to improve the perceived benefit and reduce perceived barriers according to the HPM theory, to improve the orientation and goals of maternal pregnancy in implementing Pre-eclampsia prevention behaviors according to the theory of self-determination, and to support the groups of pregnant women. The researcher was interviewed with pregnant women in a private room. The meeting involved 4 sessions were conducted with a small group (3-4) of the women with PE. The duration of each session 30-45min. At the beginning of the first meeting an orientation to the intervention and its aims took place as follows, **first session** explored participants a basic knowledge of women about PE, (Pre-test) In the **Second session** include discussion about oral medications, exercising, and dietary recommendations daily. **Third session** the researchers conveyed material about the concept of pre-eclampsia of pregnancy, ways to prevent Pre-eclampsia through taking rest for prevention, treatment of pre-eclampsia, dietary salt restriction, calcium supplementation, and vitamin D supplementation., the role of support for pregnant women groups, and the concept of self-determination. The researchers applied the concept of communication by paying attention to fulfill the psychological needs of the pregnant women according to the Self-determination Theory, which included the needs of autonomy,

competence, and relatedness. The **Fourth session** completed the intervention with a focus on fostering a sense of control over behavior change. At the end of the meeting, pregnant women were asked to plan the actions to be carried out. They were also given a form to record the adherence to dietary salt restriction, calcium supplementation, and vitamin D supplementation.

The researchers provided Arabic-language brochures and leaflets about pre-eclampsia in pregnancy, there was a meeting between multigravida with primigravida mothers. Researchers provided an opportunity for multigravida mothers to convey previous pregnancy experiences in carrying out pre-eclampsia prevention behaviors and as role models for other pregnant women. The meeting was held for 45-60 minutes targeting the family members of pregnant women who attend with pregnant women to the hospital. The purpose of this meeting was to increase family support to pregnant women to prevent pre-eclampsia. The researchers delivered material about the concept of pre-eclampsia, ways to prevent pre-eclampsia, and the role of family support to pregnant women.

- Control group pregnant women were to receive the routine care only.

### C- Evaluation phase:

The researchers also looked at the form of the results of record adherence to dietary salt restriction, calcium supplementation, and vitamin D supplementation that had been made by pregnant women and discussed the obstacles that existed in carrying out prevention for pre-eclampsia. Post-test data collection was carried out after one month of intervention using the same pre-test tool in both study and control groups. Comparison between the collected data (pre / posttest) was done to determine the effectiveness of intervention.

### Statistical analysis:

Data entry and statistical analysis were performed using SPSS for Windows, version 20. Data were presented using descriptive statistics in the form of frequencies and percentages for qualitative variables and mean and SDs for quantitative variables. Paired T-test was used to examine the differences between the pre-test and

post-test scores for both the intervention group and control group. Pearson's correlation coefficient (r) test was used to assess the degree of association between two sets of variables. Statistical significance was considered at P-value <0.05.

#### Limitation of the Research:

Sometimes the sessions were extended due to noise and other individuals' interruption.

#### Results:

**Table (1):** Showed that (73.3%) of respondents were aged  $\leq 30$  years in the intervention group and (86 %) in the control group. less than half of the intervention group (46.7%) and about two-thirds of the control group (65.9%) had elementary education levels. 70% of them were housewives in the intervention group and the control group were (80 %). More than two-thirds of the intervention group (66%) and more than three-quarters of control groups (76.0%) were from rural areas

**Table (2):** Regarding gravidity (37%) of respondents had three gravida in the intervention group and the same in the control group (64%). The same table showed that (73%) of respondents were go to regular antenatal follow up in the intervention group, while was (37%) of respondents in the control group. Concerning family history of preeclampsia (77%) of respondents did not have family history of preeclampsia in the intervention group compare to 60% in the control group.

**Figure 1:** Revealed that (37%) of respondents had three parity in the intervention group while and the same parity in the control group.

Table (3): Clarified that there is an increased mean score after an intervention in the intervention group on the nature of preeclampsia ( $15.76 \pm 3.48$ ), the epidemiology ( $21.36 \pm 1.18$ ), Knowledge, the symptomatology ( $15.73 \pm 4.47$ ), Healthcare ( $29.83 \pm 0.28$ ), and Consequences ( $16.57 \pm 3.48$ ). In the intervention group, the mean difference like preeclampsia was 4.17, the difference in the epidemiology score was 1.20, the difference in Knowledge, the symptomatology score was 4.16, the difference in

Healthcare score was 0.41, and the difference in Consequence's score was 4.15. The results of the t-test showed that p-value < 0.05, indicating that there were significant differences before and after the intervention.

**Figure (2):** Revealed that the health-promotion model achieved success in improving the knowledge of pregnant women regarding the nature of preeclampsia; from only (24%) to (76%) optimal knowledge, the epidemiology from (23.3%) to (76.7%) optimal knowledge, the symptomatology from (26%) to (74%) optimal knowledge, the healthcare from (13.3%) to (86.7%) optimal knowledge, and consequences from (24%) to (76%) optimal knowledge (p<0.05).

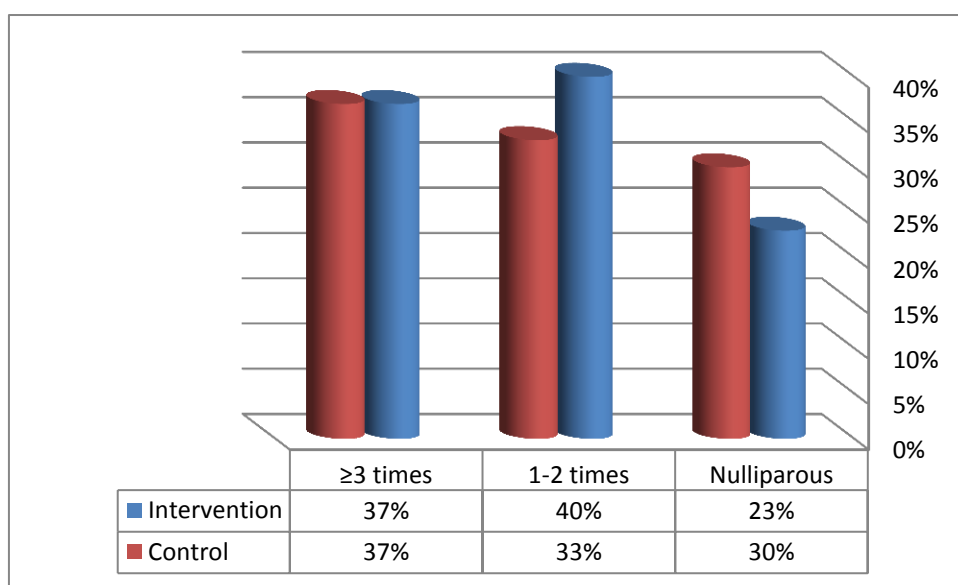
**Table (4):** Illustrated that after the implementation of an intervention, between the control and intervention groups, there was a significant difference in all variables, and the average score of the various variables in the intervention group was greater than that of the control group. The double T-test indicates a meaningful difference between the average score of the mentioned variables in the intervention group, pre-, and post-the intervention; moreover, the average score of the intended variables in the intervention group after the intervention is greater than that of the period pre to the intervention, while the double T-test in the control group reveals no difference by a slight change in the average score.

**Table (1):** Percentage distribution of the studied pregnant women in both groups regarding their demographic characteristics (N=30)

Item	Intervention (30)		Control group (30)		P-value
	No.	%	No	%	
<b>women ' age in years</b>					
≤30 years	22	73.3	26	86	0,275
>30 years	8	26.7	4	14	
<b>Women ' education</b>					
Illiterate	4	13.3	3	10	0,156
Elementary	14	46.7	19	65	
Higher	12	40.0	8	25	
<b>Occupation</b>					
- Employee	9	30.0	6	20	0,455
- Housewife	21	70.0	24	80	
<b>Residence</b>					
-Rural	20	66.0	23	76	0,146
-Urban	10	34.0	7	24	

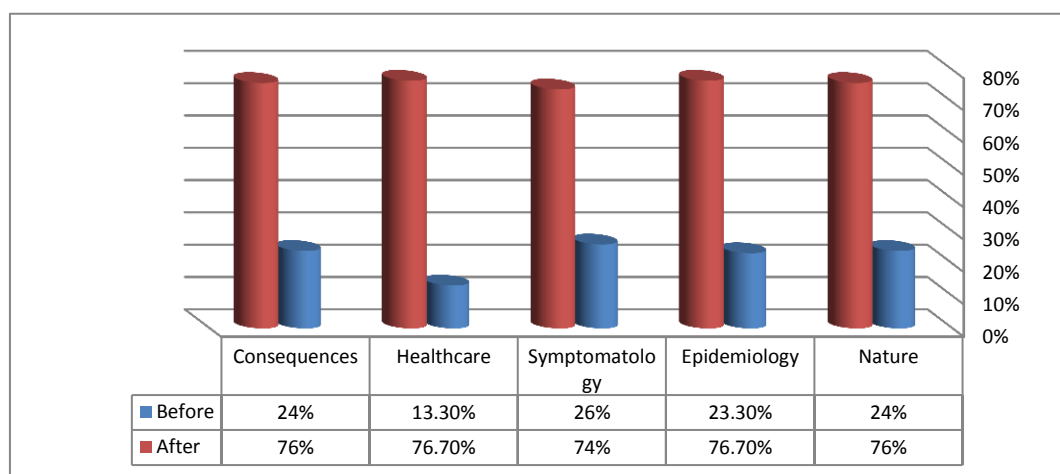
**Table (2):** Distribution of the study sample according to their medical and obstetric history

Item	Intervention (30)		Control group (30)		P-value
	N	%	N	%	
<b>Gravidity</b>					
Primigravida	7	23	9	30	0,092
1-2 times	12	40	10	33	
≥3 times	11	37	11	37	
<b>Antenatal follow up</b>					
Regular	22	73	11	37	<0.001*
Irregular	8	27	19	63	
<b>Family history of PIH</b>					
Yes	7	23	12	40	<0.001*
No	23	77	18	60	

**Figure (1):** Distribution of the study sample according to their parity

**Table (3):** The health-promotion model (HPM) constructs mean scores between the intervention and control group regarding knowledge about pre-eclampsia prevention in the pre-post intervention

Pre-eclampsia prevention	Group	pretest (mean±SD)	posttest (mean±SD)	Mean differences	P-value
The nature of preeclampsia	Intervention	11.56 ± 5.43	15.76 ± 3.48	4.17	0.019
	Control	14.83±4.19	15.84±3.32	1.9	0.389
The epidemiology	Intervention	20.22 ± 0.97	21.36 ± 1.18	1.20	0.003
	Control	19.20±2.53	18.77±1.42	-0.33	0.642
Knowledge the symptomatology	Intervention	11.63 ± 5.34	15.73 ± 4.47	4.16	0.019
	Control	14.83±4.17	15.63±3.71	1.18	0.389
Healthcare	Intervention	29.43±0.53	29.83±0.28	0.41	0.009
	Control	29.63 ± 0.53	28.73 ± 0.27	0.41	0.009
Consequences	Intervention	12.54 ± 5.33	16.57 ± 3.48	4.15	0.019
	Control	13.73±3.18	14.93±3.31	1.10	0.379

**Figure (2):** Effect of the interventional program on the knowledge of the pregnant women about preeclampsia**Table (4):** Comparing the average score of behaviors (taking rest, treatment of pre-eclampsia, dietary salt restriction, calcium supplementation, and vitamin D supplementation) in the intervention and control group regarding knowledge about pre-eclampsia prevention in the pre-post intervention

Pre-eclampsia prevention	Group	pretest (mean±SD)	posttest (mean±SD)
Taking rest	Intervention	1.56 ± 7.43	0.76 ± 7.48
	Control	1.83±7.46	1.83±7.49
	P (independent t)	P=0.84	P=0.00
Treatment of pre-eclampsia	Intervention	2.22 ± 10.87	1.76 ± 15.08
	Control	2.20±10.63	2.20±10.67
	P (independent t)	P=0.54	P=0.00
Dietary salt restriction	Intervention	2.63 ± 8.34	1.33 ± 10.47
	Control	2.13±9.33	2.13±9.37
	P (independent t)	P=0.12	P=0.00
Calcium supplementation	Intervention	2.23±12.13	1.63±14.28
	Control	2.21 ± 11.53	2.20 ± 11.57
	P (independent t)	P=0.43	P=0.00
Vitamin D supplementation	Intervention	2.54 ± 14.33	1.57 ± 17.48
	Control	2.73±15.18	2.74±15.21
	P (independent t)	P=0.54	P=0.00



## Discussion:

Pre-eclampsia is the greatest common hypertensive disorder of pregnancy, which progresses with proteinuria after 20 weeks gestation. In severe cases, preeclampsia can progress into eclampsia. It is a multi-system disease process, which is classified as mild or severe, relying on the severity of the organ dysfunction, so recognizing pre-eclampsia is very vital in diminishing the danger of eclampsia. It proceeds to be a major problem, particularly in developing countries that, adding significantly to high maternal mortality and morbidity rate (Serra, et al., 2020).

Health promotion model and self-determination theory based educational intervention will be more effective in changing the pregnant women knowledge and, behavior, and dietary practices. So, the present study was conducted to determine the Health Promotion Model and Self-Determination Theory Based Intervention on Preeclampsia Prevention among Pregnant Women.

This study was performed to determine the effect of health promotion model and self-determination theory-based (SDT) intervention on preeclampsia prevention among pregnant women. Based on the predictive constructs of the model and their effect on health-promoting behaviors, the constructs were most correlated with health-promoting behaviors. Interventions based on HPM and SDT influenced preeclampsia prevention. Preeclampsia prevention behavior was measured by five indicators including taking rest, treatment of pre-eclampsia, dietary salt restriction, calcium supplementation, and vitamin D supplementation.

The results of the current study revealed that the t-test showed a p-value < 0.05, indicating that significant differences in all knowledge variables pre- and post-the intervention with an increased mean score and improving pregnant women's knowledge. This may be due to intervention may increase the self-determination of pregnant women so that they have a strong commitment to conducting behaviors to prevent pre-eclampsia. This is confirmed the importance of providing the intervention based on health belief model.

These findings agree with, Wallis et al., (2013), who reported that knowledge allows pregnant women to detect signs and symptoms, leading to early diagnosis and management, which can prevent complications and reduce morbidity and mortality.

Also, in the same line with a study conducted by Mohamed, et al (2020) is also emphasizing that education based on HPM was proved to be effective in the prevention of disease during pregnancy in the intervention group and the intervention improves the compliance to treatment and showed higher recovery among the studied pregnant women compared to the control group. (Neer et al., 2013), emphasized that implementation of these model, is considered efficient solutions for improving pregnancy outcomes and mother-fetus health through increased awareness of the mother and her family, social support, and providence of accessible health care.

Moreover, this result is supported by Thomson et al., (2011) who found that an increase in post-test scores on the adequacy of taking rest, nutrition, dietary restriction in the intervention group for pregnant women.

The results of the current study revealed that the health-promotion model made a success in improving the knowledge of pregnant women regarding the nature of preeclampsia; the epidemiology, the symptomatology, the healthcare, and consequences ( $p < 0.05$ ). The findings of the current study pointed out that the studied pregnant women had sufficient knowledge after the educational intervention. This result was supported by John & Kibusi, 2020, who revealed that continuous education helps in the early prevention and management of pre-eclampsia for improving maternal and neonatal survival.

The results of the current study revealed that, after the implementation of the intervention, between the control group and the intervention group, there was a significant difference in all variables as rest for prevention, treatment of pre-eclampsia, dietary salt restriction, calcium supplementation, and vitamin D supplementation pre and post-intervention, and the average score of the

intended variables in the intervention group after the intervention is greater than that of the period pre to the intervention. This is confirming the positive effects of the intervention based on HPM.

Similarly, **Bahabadi, et al., (2020)**, revealed that based on the constructs of Pender's health promotion model, social support, perceived benefits and perceived barriers were the most important predictors of health-promoting lifestyles in pregnant women, and have a significant impact on their health for pregnant women.

Moreover, this result is supported by **Briceno et al., (2019)** who reported PE prevention is based on the primary interventions, such as bed rest, restriction of the activity or performing regular exercise, reducing salt intake, and antioxidants such as vitamins C and E, marine oil, garlic, and bed rest might help prevent this syndrome.

On the other hand, similarly with **Masoumeh and Hamzeh, (2019)** who found that counseling, screening, health promotion, and self-care training are effective in the prevention and control of preeclampsia in women at high risk for this disease and also, found that rest plus nutritional supplementation are effective in a reduction the risk of preeclampsia and also of gestational hypertension.

Also, support the hypothesis of the study conducted by (Costa et al., 2011) and reported that an increase in calcium intake during pregnancy might reduce the incidence of high blood pressure and PE among pregnant women. Prevention of preeclampsia is more likely to be successful by identifying women at high risk and scheduling them to proper antenatal care. Efforts should be made to find earlier PE predictors to institute interventions before 16 weeks.

Similarly, **Maia et al, (2012)** found that interventions such as rest, exercise, reduced salt intake, garlic, marine oil, antioxidants, progesterone, diuretics, and nitric oxide showed insufficient evidence to be recommended as preventive measurements for PE prevention.

Furthermore, **Kazemi et al., (2011)** found that implementing the educational intervention based on Health Belief Model was effective in preventive behaviors of pregnant women and modifying the pregnant women's beliefs.

Also, these results were supported by **Hofmeyr et al., (2008)** who found that garlic may have a role in the prevention of preeclampsia, and Calcium supplementation administered in the second half of the pregnancy seems to reduce blood pressure directly but does not prevent the endothelial damage associated with preeclampsia.

### **Conclusion:**

Using a health promotion model-based intervention on pre-eclampsia prevention among pregnant women improved their knowledge, change pregnant women's behavior, and dietary practices of pregnant women in the study group. Efforts to prevent pre-eclampsia include adherence to taking rest, dietary salt restriction, calcium supplementation, and vitamin D supplementation, through these things carried out simultaneously will be able to promote the health and prevent eclampsia of pregnant women. The intervention involves pregnant women and their families that increased understanding of pre-eclampsia and will increase support, which strengthens self-determination in pregnant women.

### **Recommendations:**

*In the light of the study's findings, the researchers are recommended that:*

- 1- There is an important to design continuous health education program to pregnant women and their families so that they can help in providing continuous support.
- 2- Encouraging early detection of preeclampsia during pregnancy causes early providing of prophylactic strategies through ANC identification of PE as a preventative treatment.
- 3- Further research should focus on replication of the study on a large representative probability sample is highly recommended in different hospitals at Beni-Suef

governorate to achieve more generalization of the results.

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