Effect of Guided Instructions Using Bundle of Care on Knowledge and Compliance with Treatment among Pregnant Women High Risk for Preeclampsia.

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Abstract

Background: Early detection and prevention of preeclampsia (PE) are very important to avoid morbidity and mortality associated with them. Recent efforts have focused on the selection of high-risk women and increasing their awareness and compliance with effective interventions as early as it is possible. **Aim:** This study aimed to assess the effect of guided instructions using bundle of care on knowledge and compliance with treatment among pregnant women high risk for preeclampsia. **Design:** A quasi-experimental design was utilized in this study. **Setting:** This study was carried out at the antenatal outpatient clinics of Mansoura University Hospitals, Egypt. **Study subjects:** Anon-probability purposive sample of 108 pregnant women was allocated either to the control group who received the routine antenatal care and the intervention group who received preeclampsia bundle of care intervention. **Tools:** A structured interview questionnaire to cover data related to general characteristics and obstetric history; pregnant women knowledge regarding preeclampsia questionnaire and compliance with preeclampsia treatment questionnaire. **Results:** The present study results showed that there was a highly statistical significant increase (p<0.001) in total knowledge score post intervention compared to pre intervention among pregnant women in both groups and a statistical significant increase in total score of pregnant women compliance with preeclampsia treatment in the intervention group compared to the control group post-intervention (p<0.05), only (27.8%) of women in the intervention group compared to half (50%) in the control group developed preeclampsia with statistical significant difference among both groups (p< 0.05). **Conclusion:** The current study hypothesis were accepted where applying guided instructions using bundle of care was an effective intervention for improving knowledge and compliance with treatment among pregnant women high risk for preeclampsia in the intervention group compared to the control group. **Recommendation:** The current study recommended integrating guided instructions using bundle of care as a nursing intervention into the routine antenatal care in the study setting.

Keywords: Bundle of Care, High risk pregnant women, Knowledge and compliance, Nursing intervention, Preeclampsia prevention.

Introduction

Preeclampsia (PE) is a multi-system pregnancy disorder that is associated with the development of hypertension and usually develops after 20 weeks of pregnancy and frequently near term. It's a condition characterized by elevated blood pressure and protein in the urine (**American College of Obstetricians and Gynecologists., 2019; Belay and Wudad., 2019**). Preeclampsia is still one of the most common causes of maternal morbidity and mortality, affecting 2–8% of all pregnancies globally and up to 10% in developing countries. (**Ramavhoya, Maputle, Rachel, Dorah & Netshikweta ., 2019**).

Preeclampsia can be classified as mild or severe, depending on the severity of the organ dysfunction. It is also categorized into two types:: early-onset preeclampsia which occurs before 34 weeks of pregnancy and late-onset preeclampsia which occurs after 34 weeks of pregnancy. Despite symptoms of early and late-onset preeclampsia are similar, early-onset preeclampsia is associated with a higher risk of complications (**Fondjo, Boamah, Fierti, Gyesi, Owiredu ., 2019**; **Wilkinson & Cole ., 2018**). Women with PE can be affected in a variety of ways, with signs and symptoms affecting numerous organ systems. Headaches, visual abnormalities, abnormal renal function, severe hypertension, chest pain, pulmonary edema and

low oxygen saturation, nausea and abnormal liver function are all symptoms of PE **(Fondjo et al ., 2019; Portelli & Baron ., 2018).**

There are several risk factors for PE. Multiparity, familial history, multiple gestation, history of diabetes mellitus, chronic hypertension, renal disease, trophoblastic disease, low socioeconomic status, poor nutrition, poor antenatal care, past history of PIH, poor reproductive care seeking behaviour and lack of access to quality maternal services are some of these factors **(Hajikhani1, Ozgoli, Pourebrahim & Mehrabi ., 2020 ; Phipps, Thadhani &Karumanchi., 2019)**. If not prevented and managed, it can lead to several complications as accidental hemorrhage, acute renal failure, disseminated inttravascular coagulation, cerebrovascular and cardiovascular complications, HELLP syndrome and in severe cases, it can develop into eclampsia and lead to maternal death **(Mayrink, Costa &Cecatti ., 2018).**

Adequate knowledge about a disorder aids in its prevention, control and management. According to reports, patients' awareness of a condition has a considerable impact on compliance with treatment and helps to reduce the disease related consequences. Preeclampsia is a condition with signs and symptoms that require immediate medical intervention. Women who are informed about PE are more likely to seek medical help early, receive timely management and have less negative effects. This stresses the need for women to have adequate knowledge of the disease **(John & Kibusi., 2020; Fondjo et al ., 2019)**.

Moreover, compliance with treatment varies based on the state of the disease during pregnancy, ambiguity about the treatment efficacy, expected side effects and fear of teratogenic effects of medications. This is particularly prominent when preventive and maintenance therapy are used to treat maternal comorbidities, especially when the severity of the maternal medical issue is not present **(Bahabadi et al., 2020; Adhikari, Patten, Lee, Metcalfe ., 2018).** The use of aspirin as a prophylactic measure in women at risk for preeclampsia has been proven to reduce the risk of preeclampsia by 60–80%. Recent results, however, suggest that the prophylactic benefit is best demonstrated with 90 % adherence to aspirin. The problem, however, lies in adherence with aspirin therapy

during pregnancy **(Shanmugalingam, Mengesha, Notaras, Liamputtong, Fulcher, Lee et al., 2020)**.

Bundle of care approach was developed by the Institute for Healthcare Improvement in North America to describe a collection of interventions needed to effectively and safely care for patients and is concerned with all these aspects of clinical practice and collaboration. Bundle of care approach is a regular process for efficient, interactive and continuous communication between woman and nurse for identifying women needs and concerns and sensitizing them to accept continuous health behaviors and assisting women in sustaining health promotion and improvement. It introduces the woman as an effective factor of continuing care in the health process. Additionally, applying it affects in a better understanding of the women's problems, empowering and engaging the women and family in problem-solving and promoting healthy behaviors **(EL Sayed, Sarhan & Abdel-Mordy., 2020).**

Healthy behaviors and lifestyle most significantly determine the level of health **(Boguszewski, Adamczyk, Tomaszewski, Sałata, Skowera, Patalon et al., 2018)**. Health-promoting behaviors comprise proper nutrition, physical exercise, emotional control, stress management and the development of individual relationships. In contrast, unhealthy diet, smoking, inability to control stress and a sedentary lifestyle can cause adverse consequences **(Kazemi, Hajian, Ebrahimi-Mameghani & Khob., 2018)**.

Measuring blood pressure during pregnancy is a simple tool to screen preeclampsia especially for high risk women. Early diagnosis of this disorder is essential for proper management of pregnant women. **(Browna, Mageec, Kenny, Karumanchie, McCarthyf, Saitog et al ., 2018)**. The nurse's role in the care for a woman with preeclampsia relies on close monitoring of blood pressure and ongoing evaluation for signs of disease progress. Fetal monitoring is necessary during a pregnancy. The woman should be monitored for blood pressure on a regular basis and any elevated readings should be reported, also tested for the amount of protein contained in urine and checked for weight daily. A woman should take daily fetal movement counts. A well-balanced diet with no sodium restriction is advised. Besides, a woman

is advised to drink six to eight glasses of water per day (**EL Sayed, Sarhan & Abdel-Mordy., 2020).**

The seriousness of preeclampsia and the dramatically increasing incidence of this disease make it one of the most urgent health challenges of this century. It is thus important to raise public awareness of this disease and to ameliorate the harmful effects of it once diagnosed (**Fondjo et al., 2019**). In addition, there is a limited evidence of successful intervention studies for women with PE and seemingly, no consistent approach to treat this disease so raising high risk women's awareness and compliance with treatment using bundle of care is discussed in the study

Significance of the study

Preeclampsia is one of the most common pregnancy complications and still the most common cause of maternal morbidity and mortality (70000 to 80000 per year) worldwide (**Romuald, Ratsiatosika, Martial, Lantonirina, Ando-Miora & Rakotovao., 2019**). Preeclampsia affects between 1.8 % to 16.7% of pregnant women in developing countries. Also, it affects 10 percent of African women, which is considerably higher than the global rate of 2% (**Belay and Wudad., 2019**). In an Egyptian study to estimate the prevalence of hypertensive diseases of pregnancy, found that 4.2 percent had PIH, 3.8 percent had preeclampsia and 0.3 percent had eclampsia (**Gabal, Abousaif, Salah-Eldin & Abdelaziz ., 2017**).

Bundle of care approach provides a plan for accepting and improving women's insight and responsibility for continuing care and controlling illness and potential complications and helps them for strengthening and internalizing healthy behaviours (**Rahmani, Moradi, Aghakarimi & Hossain-Gholipour ., 2017**). Considering that the best educational programs lose the desired impact over time without follow-up. Accordingly, combining follow-up and continuous care with education can improve adherence to healthy behaviors in women high risk for preeclampsia, lowering the risk of maternal and neonatal complications and thus improving quality of life (**EL Sayed et al., 2020**).

Preeclampsia is a global health problem due to its high prevalence and its major effects on maternal and infant's health. Although preeclampsia is not completely preventable, many deaths from the disorder can be prevented throughout nursing preventable and promotion measures (**Olaoye, Oyerinde, Elebuji & Ologun ., 2019**). In Egypt, there is inadequacy of data on the quality of health care services offered to high risk pregnant women, lack of knowledge about preeclampsia effect, management as well as nursing care measures to reduce complications and to educate the pregnant women about self-care measures (**Fondjo et al., 2019**). Also, there is an imperative need for teaching, motivating and empowering women high risk for preeclamsia to self-manage and comply with treatment to prevent the occurrence of preeclampsia so this study was designed.

Aim of the study

This study aimed to assess the effect of guided instructions using bundle of care on knowledge and compliance with treatment among pregnant women high risk for preeclampsia.

Hypothesis of the study

Pregnant women high risk for preeclampsia who receive a bundle of care exhibit higher knowledge level and compliance with treatment than those who do not.

Subjects and Method:

Research design

A quasi-experimental design was utilized in this study. The effect of the independent variable (i.e., guided instructions) on the dependent variable (i.e., knowledge and compliance with treatment) was assessed in this study.

Research setting

This study was conducted at the antenatal outpatient clinics of Mansoura University Hospitals, Egypt which consist of 6 rooms for U/S, antenatal examination, gynecological examination, vesicular mole, lab and nursing staff. Also, a reception area, waiting area for women and lecture's hall with adequate number of seats and data show where the researchers interviewed the recruited women to conduct this study. The antenatal clinics provide diagnostic and therapeutic services for pregnant women from Saturday to Wednesday, from 9 a.m. to 12 p.m.

Sampling

Anon-probability purposive sample of 108 pregnant women (54 per each group) was recruited from the previously mentioned setting to share in this study according to the following **inclusion criteria**: (1) age of 18 – 35 years, (2) pregnant women high risk for preeclampsia

diagnosed clinically by resident obstetrician (3) at gestational age 20-24 weeks (4) having single live fetus (5) candidate for low dose aspirin therapy. (6) can read, hear and communicate well, **while excluded** from this study, (1) women diagnosed with hemolysis, elevated liver enzyme, and low platelet count (HELLP) syndrome before the end of the study (2) inability to complete all study sessions and (3) those who suffered from aspirin side effects.

Sample size calculation

Based on data from previous study by (**El Sayed et al., 2020**) investigated the effect of implementing continuous care model on health-related behaviors and quality of life among women with preeclampsia, considering level of significance of 5%, and power of study of 80%, the sample size can be calculated using the following formula: $n = [(Z_{\alpha/2} + Z_\beta)^2 \times \{2(SD)^2\}]/$ (mean difference between the two groups)^2 where SD = standard deviation $Z_{\alpha/2}$: This depends on

level of significance, for 5% this is 1.96 Z_β: This depends on power, for 80% this is 0.84. Therefore, n= $[(1.96 + 0.84)^2 \times \{2(8.36)^2\}]/$ $(4.51)^2$=53.9. Based on the above formula, the sample size required is 54 for each group.

Recruitment of the sample

To avoid bias, data were collected from the control group then the intervention group till finishing the required number per each group. About 116 eligible pregnant women were invited to participate in the current research; 8 pregnant women who fulfilled the inclusion criteria refused to share in the study because they haven't time to attend the upcoming sessions thus excluded from the sample leaving 108 eligible pregnant women allocated either to the control or to the intervention group (n=54 per each group), a number of 10 pregnant women in the intervention group were missed during the follow up but they were replaced. The statistical analysis was done on 108 subjects.
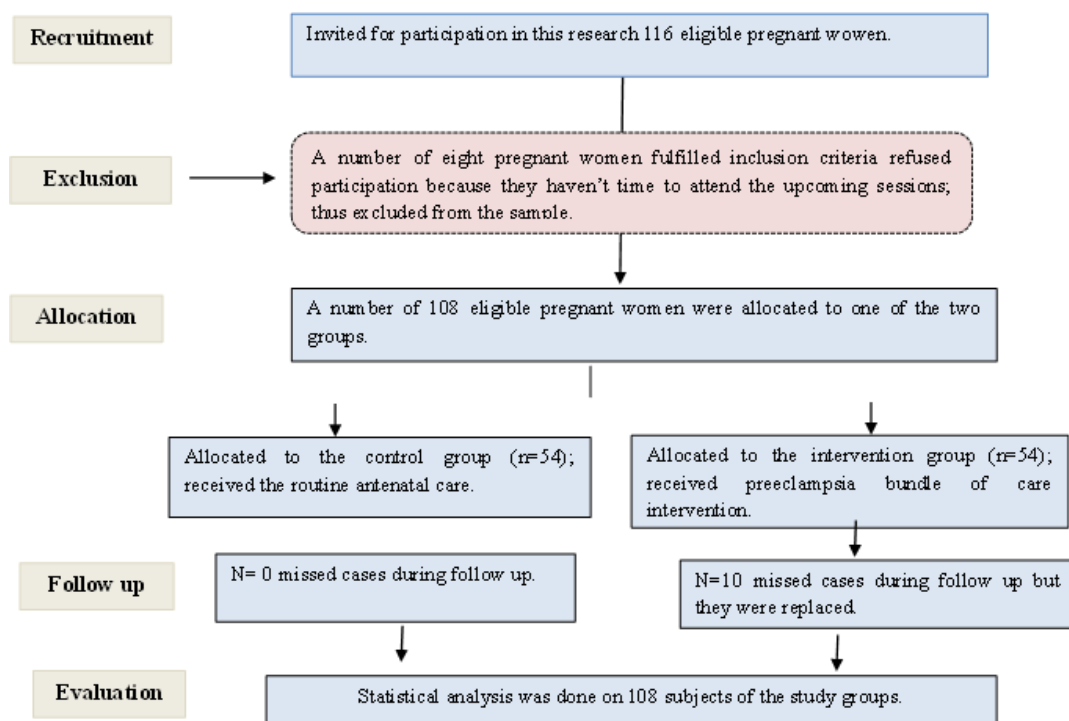

Figure (1): Flowchart of the study sample indicated in.

Tools of data collection

Three tools were used for collecting data; a structured interview questionnaire, pregnant women knowledge regarding preeclampsia questionnaire and compliance with preeclampsia treatment questionnaire.

Tool I. A structured interview questionnaire

It was designed by the researchers and constituted two parts; **Part one** encompassed general characteristics of the studied women as age, educational level, occupation, residence,

monthly income, cigarette smoking, weight, height and BMI while **part two** is about the obstetric history such as gestational age,gravidity, parity, previous history of preeclampsia, family history of preeclampsia, medical history, number of antenatal care visits during the current pregnancy and conception method.

Tool II. Pregnant women knowledge regarding preeclampsia questionnaire

It was designed by the researchers based on a thorough review of the literatures **(Wilkinson &Cole ., 2018**; **Teng &Keng .,2016; You et al., 2012)** to assess Pregnant women knowledge regarding preeclampsia. It consists of 6 questions as definition of preeclampsia, signs/symptoms of PE, etc…. The questionnaire was close-ended with predefined choices.

Scoring system: a correct answer attracts a score of one (1) and incorrect answer attracts a score of zero (0) was used to scale participants' knowledge of PE. The total score ranges from 0 – 6, higher score indicates good knowledge. It was categorized for each woman into "good, fair and poor knowledge" as follows: poor<50 %, fair from 50% to75% and good>75% **(Wilkinson &Cole ., 2018)**.

. Tool III. Compliance with preeclampsia treatment questionnaire

This questionnaire was developed by the researchers after reviewing the literatures **(Koh et al., 2016; Ricci et al., 2017; Afefy and Kamel, 2019)** to assess pregnant women compliance with preeclampsia guided instructions and prophylactic measures/treatment to prevent the occurrence or reducing the incidence of preeclampsia. It comprised 13 items namely, measuring blood pressure daily, checking and recording weight daily, checking urine for proteinuria by dipstick daily, consuming the recommended preeclampsia diet (high protein, low salt, low fat), drinking 8 to 10 glasses of water daily, participating in regular physical activity, compliance with prescribed prophylactic medications, taking rest and adequate sleep, managing and coping with stress, counting fetal kicks daily, compliance with recommended antenatal visits,taking aspirin tablets at regular time daily to prevent pregnant women from preeclampsia as well as compliance with different types of exercise daily.

Scoring system:

The items were rated based on a three-point Likert scale; always (score 3), sometimes (score 2), and never (score 1). The range of obtained scores was between 13 and 39, with higher scores indicating more compliance with treatment.

Validity and Reliability:

In this study, the questionnaires were translated into Arabic language before introducing it to the pregnant women. The content validity of the developed tool was reviewed by a panel of 3 experts in the maternity nursing specialty before using it to ensure that the questions were consistently conveyed and carried the anticipated meaning they were prepared for and the recommended adjustments and modifications were considered according to their remarks as simplify meaning of some statement to be understood. Cronbach alpha coefficients for internal consistency of the pregnant women knowledge regarding preeclampsia questionnaire was 0.917, while 0.902 for the compliance with preeclampsia treatment questionnaire, hence the questionnaires were found to be highly reliable.

Pilot Study

A pilot study was carried out on 10% (11 pregnant women) of the total study sample to test the objectivity and applicability of the study tools and the feasibility of research process as well as to estimate the time needed to answer them. Women in the pilot study were excluded from the study.

Ethical Considerations:

To conduct this study, an ethical approval letter was obtained from Research Ethics Committee-Faculty of Nursing-Mansoura University and official approval was obtained from the director of the antenatal outpatient clinics of Mansoura University Hospitals. A written consent was obtained from every woman involved in this research after clarification of its aim and approach. The women were reassured about the confidentiality of the collected data and their right to withdraw from the study at any time.

Field Work:

This study was conducted in the period from the beginning of February 2021 to the end of August 2021. The researchers attended the previously mentioned setting three days per week, (Saturday, Monday and Wednesday), from 9 a.m. to 12 p.m. until the calculated sample size of women was obtained. This study was accomplished through four phases (preparatory, assessment, implementation and outcome evaluation).

- **Preparatory phase**

The tools for data collection were prepared after massive reviewing of literature then the contents of the educational sessions about preeclampsia were designed, methods of teaching were determined and the educational media (videos, attractive pictures and an Arabic booklet) were prepared. The booklet covered all contents of the sessions.

- **Assessment phase:**

1. The researchers interviewed pregnant women individually, introduced themselves to them, clarified the aim of the research work, created motivation and elucidated the importance of continuing care contact between the researchers and the studied women, explained the ways of communication and identified the required phone calls schedules until the end of the intervention. Once eligibility for participation was confirmed, the researchers took the participant's written consent to share in this study. The researchers collected data regarding women's general characteristics using the first tool of data collection (a structured interview questionnaire).

2. Women's knowledge and compliance with guided instructions and prophylactic measures/treatment regarding preeclampsia were assessed by using pregnant women knowledge regarding preeclampsia questionnaire and compliance with preeclampsia treatment questionnaire respectively. One by one met the inclusion criteria was assigned for the assigned group; taking into consideration collecting the control group data first then that of the intervention group. The questionnaires were distributed among women and collected after filling.

Implementation phase:

- *Control group*

Women in the control group received the routine antenatal care that focused on diagnosis and medical treatment as well as brief health education about blood pressure measurement and taking prescribed medications.

- *Intervention group*

At the beginning, the pregnant women were oriented with the educational sessions' contents. Two educational sessions of theoretical and practical information about preeclampsia were provided to them in 6 groups each included 6-10 women, one session every two weeks for four weeks at the lecture's hall at the antenatal outpatient clinics of Mansoura University Hospitals in the form of lectures and group discussion with duration of 50 - 60 minutes for each session.

In the 1st session, definition of preeclampsia, classification, causes, risk factors, signs & symptoms, complications and prescribed medications of preeclampsia were discussed. **The second session** was concerned with teaching women about prophylactic measurs/care, the necessity for maintaining health status of mother and her fetus, through this session women attention was diverted towards the importance of compliance with preeclampsia bundle of care besides the routine treatment, the importance of measuring and recording blood pressure on a regular basis, weighting daily, and teaching them how to check proteinuria with dipstick, the importance and procedure of counting and recording fetal movements daily, the importance of commitment to recommended antenatal visits, dietary management to preeclampsia as high protein, low salt, low fat, and drinking plenty of water daily. Also, the importance of getting enough rest, maintaining sleep quality, performing regular physical activity and the importance of compliance with prescribed medications. Besides, the importance of stress reduction and techniques to overcome preeclampsia-related stress such as benson relaxation technique.

At the end of each session, conclusion about the important points of each session was stressed by the researchers. The educational sessions were repeated to each group of women. Each woman was provided with an educational booklet at the end of the 1st session as a guide and was informed about the time of the next session. Feedback from the previous session was taken at the beginning of the new one; accordingly, the addressed educational content was rediscussed with full clarification. During data collection, the researchers communicated and followed women by the phone.

Outcome evaluation:

1. Women's knowledge about preeclampsia was assessed two weeks after the 1st session, at this time, the difference between the control and intervention groups related to level of knowledge of preeclampsia was assessed using knowledge regarding preeclampsia questionnaire.

2. Women's compliance with preeclampsia treatment was assessed (at four weeks after the 2nd session) if not attended to clinic they evaluated through calling of subjects via phone, thus, the subject's compliance with preeclampsia treatment for both groups was assessed using compliance with preeclampsia treatment questionnaire.

Data analysis

Statistical Package for Social Sciences (SPSS) version 21 was used for statistical analysis of the obtained data. Data presented using descriptive measures in the form of number, percentage, mean and standard deviation. Chi-square test was used for comparison of variables with categorical data. Pearson correlation test used to the association between variables. The Cronbach's alpha was used to assess the reliability of the second and third tool. Statistical significance was set at p<0.05.

Results

Table (1) shows, less than half of pregnant women high risk for preeclampsia (46.3%, 42.6%) were less than 25 years, among both intervention and control groups

with Mean ±SD (26.2 ±4.9, 27.4 ±4.3 respectively). Nearly two thirds of them (63%) were housewives and from rural areas among intervention group while more than half were housewives and from rural areas (57.4%, 59.3% respectively) among the control group . The higher percentages of both intervention and control groups had basic education and normal BMI (40.7%, 42.6% &40.7%, 29,6% respectively). Regarding the monthly income, data revealed that (70.4%) versus (59.3%) of the subjects in the intervention and control groups respectively had insufficient monthly income. More than three quarters (83.3%, 79.6% respectively) weren't cigarette smokers among intervention and control groups. There was no statistical significant difference among both groups (p > 0.05).

Table (2) represents that, the average gestational age of the current pregnancy in the intervention and control groups was (16.9 ±4.2 & 18.1 ±4.3 respectively) with more than one third (42.6% & 40.7% respectively) of the pregnant women were at gestational age 15 – 20 weeks. Concerning to gravidity more than half of the intervention and control groups (53.7% & 55.6% respectively) were gravida three or more. Also, more than one third of subjects in the intervention and control groups had previous history and family history of preeclampsia (43.6%, 36.6% and38.9%, 33.3% respectively). In addition, pregnant women had medical history of gestational diabetes, chronic hypertension, diabetes mellitus type2, diabetes mellitus type1 in the intervention and control groups (25.9%, 24.1%, 14.8%, 9.3% and 24.1%, 20.4%, 13.0%,14.8% respectively) . There was no statistical significant difference among both groups (p >0.05). The majority of subjects in the intervention and control groups had irregular antenatal visit during the current pregnancy pre intervention (88.9% & 87% respectively) while three quarters (75.9%) in the intervention group had regular antenatal visits compared to less than half (46.3%) in the control group post intervention with statistical significant difference among both groups (p < 0.05).

Figure (2) shows that, more than one quarter (29.6%) of the pregnant women in the intervention group get their information about preeclampsia from their families/ relatives/

friends and from media and internet compared to (31.5% and 27.8% respectively) in the control group, while few percentage in the intervention and control groups get their information from nurses (22.2% and 18.5% respectively), from obstetricans (7.4% and 13% respectively) and from books (11.1% and 9.3% respectively) . There was no statistical significant difference among both groups (p > 0.05).

Figure (3). shows that more than two thirds (68.5%) of the pregnant women in the intervention group had poor knowledge regarding preeclampsia pre intervention whereas (63%)of them had good knowledge post intervention. (9.3%) of the women in the control group had good knowledge regarding preeclampsia pre and post intervention . There was a highly statistically significant increase (p<0.001) in total knowledge score post intervention compared to pre intervention among pregnant women in both groups.

Table (3a). shows that, (46.3%) of women in the intervention group **never** checked and recorded weight daily, consumed the recommended diet, complied with the prescribed medications, the recommended antenatal visits and the different types of exercise daily compared to (50%, 44.4%, 55.6%, 48.1% & 48.1% respectively) in the control group pre intervention. (44.4%) of women in the intervention and control groups **never** measured their blood pressure daily, nearly half (48.1%) of women in the intervention group **never** checked urine for proteinuria by dipstick daily or participated in regular physical activity compared to (55.6% & 42.6% respectively) in the control group pre intervention. Around half of women in the intervention group **sometimes** drinked 8 to 10 glasses of water daily, took rest and adequate sleep, managed and coped with stress, counted fetal kicks daily and took aspirin tablets at regular time daily (33.3%, 40.7%, 38.9%, 38.9%, 42.6% respectively) compared to (27.8%, 42.6%, 35.2%,37%, 44.4% respectively) in the control group pre intervention. There was no statistical significant difference between total score of pregnant women compliance with preeclampsia treatment pre- intervention among both groups (p > 0.05).

Table (3b). shows that, more than half of women in the intervention group **somtimes** checked and recorded weight daily, consumed the recommended diet, complied with prescribed medications, recommended antenatal visits and different types of exercise daily (55.6%, 55.6%, 59.3%, 55.6%& 63% respectively) compared to (37%, 44.4%, 46.3%, 51.9% & 46.3% respectively) in the control group post intervention. (16.4%) of women in the intervention **never** measured their blood pressure daily compared to (44.4%) in the control groups post intervention. More than half of women in the intervention group **sometimes** checked urine for proteinuria by dipstick daily and participated in regular physical activity (57.4% & 66.7% respectively) compared to (44.4% & 48.1% respectively) in the control group post intervention. More than half of women in the intervention group **sometimes** drinked 8 to 10 glasses of water daily, took rest and adequate sleep, managed and coped with stress, counted fetal kicks daily and took aspirin tablets at regular time daily (59.3%, 57.4%, 55.6%, 64.8%, 51.9% respectively) compared to (57.4%, 40.7%, 38.9%,42.6.%, 29.6% respectively) in the control

group post intervention.There was a statistical significant increase in total score of pregnant women compliance with preeclampsia treatment in the intervention group compared to the control group post-intervention (p<0.05).

Figure (4) clarifies that, the presence of hypertension, proteinuria and edema decreased after application of preeclampsia bundle of care on pregnant women high risk for preeclampsia (81.5%, 68.5%& 66.7% respectively) compared to pre intervention (96.3%, 87%& 90.7% respectively) with statistical significant decrease post than pre intervention among intervention group (p< 0.05). As regards control group, there was no statistical significant decrease post than pre intervention (p > 0.05).

Figure (5) shows that, after application of preeclampsia bundle of care intervention on the pregnant women high risk for preeclampsia , only (27.8%) of women in the intervention group compared to half (50%) in the control

group developed preeclampsia with statistical significant difference among both groups (p< 0.05) .

Figure (6 a) illustrates that there was no significant association between preeclampsia total knowledge and compliance scores pre-intervention (p> 0.05).

Figure (6b) shows that there was a significant association between preeclampsia total knowledge and compliance scores post-intervention among intervention group(p<0.05), while there was no significant association between preeclampsia total knowledge and compliance scores among the control group post-intervention (p> 0.05).

Table 1. Sociodemographic characteristics of the pregnant women high risk for preeclampsia in the intervention and control groups

	Intervention group		Control group		Significance test	
	No. (54)	%	No.(54)	%	X²	P
Age (Years)						
<25	25	46.3	23	42.6	0.694	0.707
25 – 30	13	24.1	11	20.4		
>30	16	29.6	20	37.0		
Mean ±SD	26.2 ±4.9		27.4 ±4.3		t=1.353	0.179
Residence						
Rural	34	63.0	31	57.4		
Urban	20	37.0	23	42.6	0.348	0.555
Educational level						
Read and write	13	24.1	15	27.8		
Basic education	22	40.7	23	42.6		
Higher education	19	35.2	16	29.6	0.422	0.810
Occupation						
Housewife	34	63.0	32	59.3		
Working	20	37.0	22	40.7	0.156	0.693
BMI (kg/m²)						
Underweight	5	9.3	3	5.6		
Normal	22	40.7	19	35.2		
Overweight	15	27.8	18	33.3		
Obese	12	22.2	14	25.9	1.146	0.766
Mean ±SD	25.8 ±5.2		26.2 ±4.7		0.419	0.675
Monthly Income						
Not enough	38	70.4	32	59.3		
Enough	16	29.6	22	40.7	1.462	0.227
Cigarette Smoker						
No	45	83.3	43	79.6		
Yes	9	16.7	11	20.4	0.245	0.620

Table 2. Obstetric history of the pregnant women high risk for preeclampsia among the intervention and control groups

	Intervention group		Control group		Significance test	
	No.	%	No.	%	X²	P
Gestational Age (weeks)						
<15	18	33.3	15	27.8	0.828	0.661
15 – 20	23	42.6	22	40.7		
>20	13	24.1	17	31.5		
Mean ±SD	16.9 ±4.2		18.1 ±4.3		1.467	0.145
Gravidity						
One	15	27.8	13	24.1		
Two	10	18.5	11	20.4	0.207	0.902
Three or more	29	53.7	30	55.6		
Parity						
Nullipara	16	29.6	14	25.9	0.964	0.810
One	11	20.4	12	22.2		
Two	5	9.3	8	14.8		
Three or more	22	40.7	20	37.0		
Previous abortion	7	17.9	6	14.6	0.161	0.688
Previous History of Preeclampsia	17	43.6	15	36.6	0.409	0.522

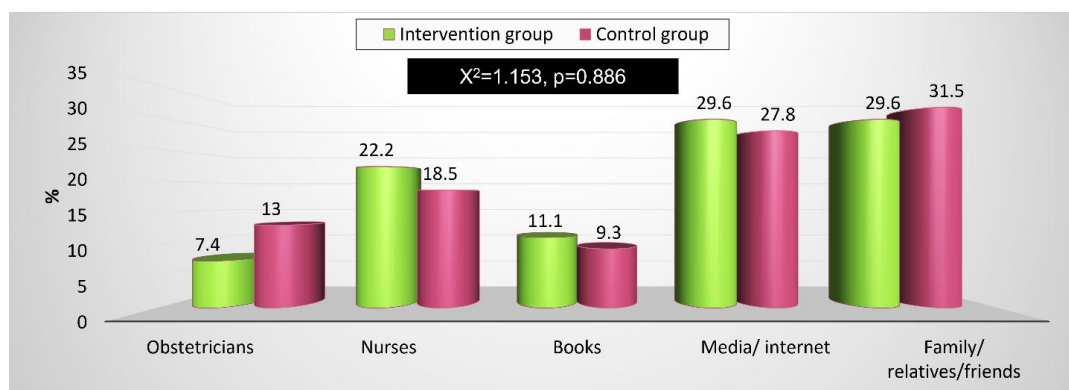|	Intervention group		Control group		Significance test	
	No.	%	No.	%	X^2	P
Family History of Preeclampsia	21	38.9	18	33.3	0.361	0.548
Antenatal Visits						
Pre-intervention						
Regular	6	11.1	7	13.0		
Irregular	48	88.9	47	87.0	0.698	0.874
Post-intervention						
Regular	36	75.9	25	46.3		
Irregular	13	24.1	29	53.7	4.558	0.033*
Conception Method						
Spontaneous	35	64.8	31	57.4		
Ovulation induction	12	22.2	17	31.5		
In vitro fertilization	7	13.0	6	11.1	1.181	0.554
Medical History						
Chronic hypertension	13	24.1	11	20.4	0.214	0.644
Diabetes mellitus Type 1	5	9.3	8	14.8	0.787	0.375
Diabetes mellitus Type 2	8	14.8	7	13.0	0.077	0.781
Gestational diabetes	14	25.9	13	24.1	0.049	0.825
Systemic lupus erythematosus	4	7.4	7	13.0	0.911	0.340

*** Statistical Significant at P<0.05**

Figure 2. Distribution of the source of information about preeclampsia among the pregnant women high risk for preeclampsia in the intervention and control groups.
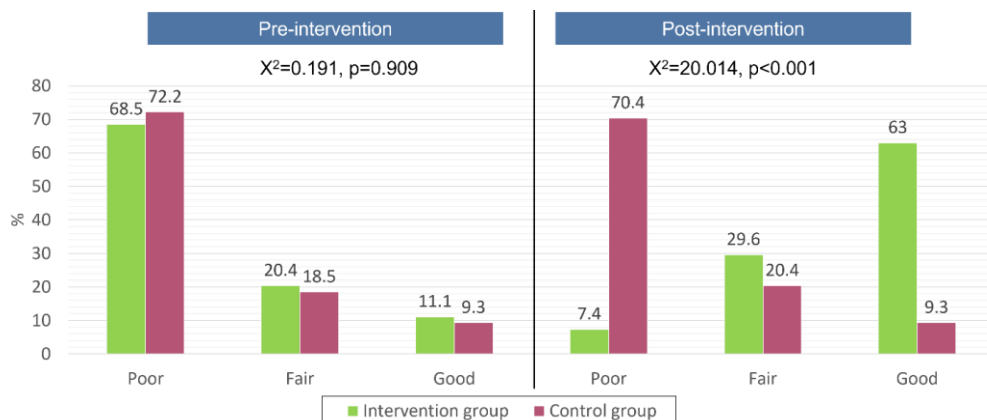

Figure 3. The Pregnant women total knowledge score regarding preeclampsia between intervention and control groups pre- and post-intervention

Table 3 a. Pregnant women compliance with preeclampsia treatment among the intervention and control groups pre-intervention. No= 54

	Intervention group						Control group						Significance test	
	Always		Sometimes		Never		Always		Sometimes		Never		X^2	p
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%		
Measuring blood pressure daily	7	13.0	23	42.6	24	44.4	9	16.7	21	38.9	24	44.4	0.341	0.843
Checking and recording weight daily	9	16.7	20	37.0	25	46.3	5	9.3	22	40.7	27	50.0	1.315	0.518
Checking urine for proteinuria by dipstick daily	7	13.0	21	38.9	26	48.1	9	16.7	15	27.8	30	55.6	0.375	0.829
Consuming the recommended diet	10	18.5	19	35.2	25	46.3	13	24.1	17	31.5	24	44.4	0.523	0.769
Drinking 8 to 10 glasses of water daily	6	11.1	18	33.3	30	55.6	8	14.8	15	27.8	31	57.4	0.575	0.750
Participating in regular physical activity	7	13.0	21	38.9	26	48.1	8	14.8	23	42.6	23	42.6	0.341	0.843
Compliance with prescribed medications	10	18.5	19	35.2	25	46.3	7	13.0	17	31.5	30	55.6	1.095	0.578
Taking rest and adequate sleep	5	9.3	22	40.7	27	50.0	6	11.1	23	42.6	25	46.3	0.190	0.909
Managing and coping with stress (Benson relaxation)	9	16.7	21	38.9	24	44.4	10	18.5	19	35.2	25	46.3	0.173	0.917
Counting fetal kicks daily	10	18.5	21	38.9	23	42.6	9	16.7	20	37.0	25	46.3	0.160	0.923
Compliance with recommended antenatal visits.	6	11.1	23	42.6	25	46.3	4	7.4	24	44.4	26	48.1	0.441	0.802
Taking aspirin tablets at regular time daily to prevent pregnant women from preeclampsia	8	14.8	16	29.6	30	55.6	9	16.7	14	25.9	31	57.4	0.209	0.901
Compliance with different types of exercise daily	10	18.5	19	35.2	25	46.3	7	13.0	21	38.9	26	48.1	0.649	0.723
Total score (mean ±SD)	22.1 ±2.5						22.7 ±2.9						1.152	0.252

Table 3B. Pregnant women compliance with preeclampsia treatment between intervention group and control group post intervention. No= 54

	Intervention						Control						Significance test	
	Always		Sometimes		Never		Always		Sometimes		Never		X^2	p
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%		
Measuring blood pressure daily	10	18.5	35	64.8	9	16.7	3	5.6	27	50.0	24	44.4	11.620	0.003*
Checking and recording weight daily	10	18.5	30	55.6	14	25.9	4	7.4	20	37.0	30	55.6	10.390	0.006*
Checking urine for proteinuria by dipstick daily	18	33.3	31	57.4	5	9.3	4	7.4	24	44.4	26	48.1	24.026	<0.001**
Consuming the recommended diet	19	35.2	30	55.6	5	9.3	9	16.7	24	44.4	21	38.9	14.084	<0.001**
Drinking 8 to 10 glasses of water daily	13	24.1	32	59.3	9	16.7	5	9.3	31	57.4	18	33.3	6.571	0.037*
Participating in regular physical activity	12	22.2	36	66.7	6	11.1	7	13.0	26	48.1	21	38.9	11.262	0.004*
Compliance with prescribed medications	17	31.5	32	59.3	5	9.3	10	18.5	25	46.3	19	35.2	10.841	0.004*
Taking rest and adequate sleep	11	20.4	31	57.4	12	22.2	5	9.3	22	40.7	27	50.0	9.548	0.008*
Managing and copingwith stress(Benson	19	35.2	30	55.6	5	9.3	9	16.7	21	38.9	24	44.4	17.608	<0.001*

	Intervention						Control						Significance test	
	Always		Sometimes		Never		Always		Sometimes		Never		X^2	p
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%		
relaxation) Counting fetal kicks daily	12	22.2	35	64.8	7	13.0	8	14.8	23	42.6	23	42.6	11.816	0.003*
Compliance with recommended antenatal visits.	11	20.4	30	55.6	13	24.1	1	1.9	28	51.9	25	46.3	12.192	0.002*
Taking aspirin tablets at regular time daily to prevent pregnant women from preeclampsia	20	37.0	28	51.9	6	11.1	7	13.0	16	29.6	31	57.4	26.424	<0.001*
Compliance with different types of exercise daily	13	24.1	34	63.0	7	13.0	10	18.5	25	46.3	19	35.2	7.303	0.026*
Total score (mean ±SD)	27.5 ±2.5						21.8 ±2.2						12.718	<0.001*

* Statistical Significant at P<0.05
**Highly Statistical Significant at P<0.001

Figure 4. Distribution of the presence of hypertension, proteinuria and edema pre- and post-intervention in the intervention and control groups.
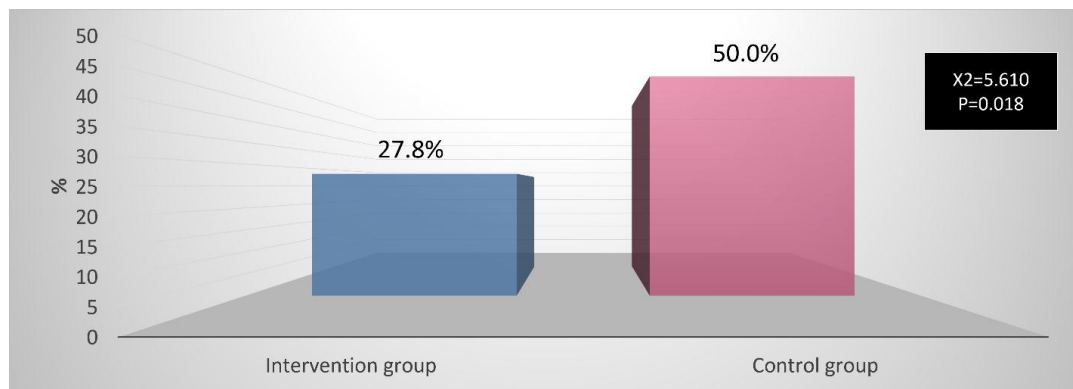

Figure 5. Comparison of the development of PE after applications of preeclampsia bundle of care in the intervention and control groups.
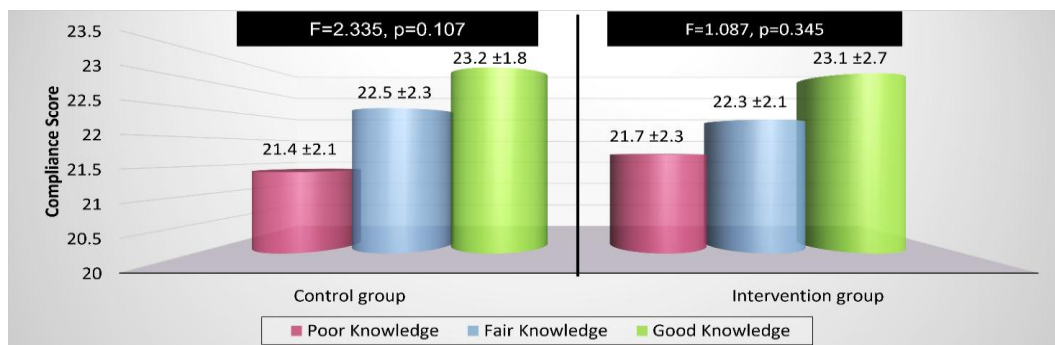
Figure 6 a. Association between preeclampsia total knowledge and compliance scores among intervention and control groups pre-intervention
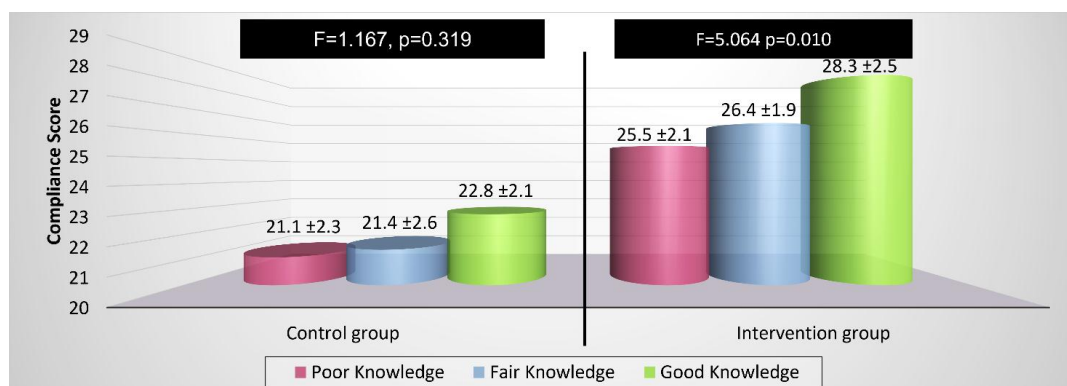

Figure 6 b. Association between preeclampsia total knowledge and compliance scores in intervention and control groups post-intervention

Discussion

This study aimed to assess the effect of guided instructions using bundle of care on knowledge and compliance with treatment among pregnant women high risk for preeclampsia. This aim was accomplished through the present study findings which revealed that, there was a statistical significant increase in both; total knowledge score and total score of pregnant women compliance with preeclampsia treatment after applications of preeclampsia bundle of care compared to pre intervention among both groups. Therefore, the hypothesis of the current study "pregnant women high risk for preeclampsia who receive a bundle of care exhibit higher knowledge level and compliance with treatment than those who do not" was reinforced.

Concerning the pregnant women total knowledge score regarding preeclampsia between the intervention and control groups, the current study revealed that there was a

highly statistical significant increase in total knowledge score post intervention compared to pre intervention among pregnant women in both groups. Also, shows that more than two thirds of the pregnant women in the intervention group had poor knowledge regarding preeclampsia pre intervention whereas post intervention knowledge level increased and became less than two thirds of them had good knowledge. Less than one tenth of women in the control group had good knowledge regarding preeclampsia pre and post intervention. This result demonstrated that guided instructions using bundle of care was very effective in improving the pregnant women's knowledge level regarding preeclampsia. Poor knowledge level may be attributed to that the higher percentages of both intervention and control groups had basic education, education plays a role in acquiring knowledge to promote maternal and neonatal health. Also, more than half of pregnant women lived in rural areas. This may be one of

the causes of poor knowledge level and resource deficiency in rural areas than urban areas.

This result agree with **Abd Elhaleem et al., (2021)** study to assess the effect of nursing intervention guided by PRECEDE Model on knowledge and practice of preventive behavior of high-risk pregnant women regarding preeclampsia, reported a highly significant increase in total knowledge score post than pre intervention.

Regarding antenatal visit, the majority of subjects in the intervention and control groups had irregular antenatal visit during the current pregnancy pre intervention while three quarters in the intervention group had regular antenatal visits compared to less than half in the control group post intervention with statistical significant difference among both groups. This finding may be due to the clarity of teaching materials that direct high risk women for pre eclampsia towards the importance of regular checkup and compling with antenatal care so they can prevent developing into pre-eclampsia or eclampsia after taking guided instructions using bundle of care. In addition, general characteristics such as working & income plays a role in compling with antenatal care.

This finding is in consistent with **(Kamal & El -Sayed ., 2020)** study about the impact of health promotion model and self-determination theory based intervention on preeclampsia prevention among pregnant women at Beni-Suef Governorate, reported that after applying the intervention, about three quarters of the intervention group had regular antenatal visit.

Concerning the gestational age, the present study showed that the average gestational age of the current pregnancy in the intervention and control groups was (16.9 ±4.2 & 18.1 ±4.3 respectively) with more than one third of the pregnant women were at gestational age 15 – 20 weeks., this gestational age was suitable for early detection, controlling of disease also, prevent for further development, this finding was parallel with **Costa et al.,(2011**) study entitled early screening for preeclampsia and reported that preeclampsia prevention is more likely to be successful if high-risk women are identified and scheduled

for proper prenatal care and efforts should be made to screen women before 18 weeks.

.Moreover the results of the present study highlighted that the common source of knowledge varies from family ∕relative ∕friends and social media (more than one quarter), and few percentage from healthcare provider among intervention and control groups. In disagreement with this finding, **Abd Elhaleem et al., (2021)** who reported that about two thirds of subjects get their information from healthcare providers.This reflected the importance of medical advice to increase high risk pregnant women knowledge to comply with treatment and encourage a good life style that control the disease.

As regards total score of the pregnant women compliance with preeclampsia treatment pre and post intervention among both groups, the current study revealed that there was no statistical significant difference among both groups pre intervention while post-intervention, there was a statistical significant increase in total score of compliance with preeclampsia treatment bundle of care in the intervention group compared to the control group. According to **Briceno et al., (2019)** who conducted a study about "Prediction and prevention of preeclampsia," found that, prevention of preeclampsia is dependent on primary interventions to prevent complications such as (recording weight daily, consuming the recommended diet, complying with the prescribed medications, with the recommended antenatal visits and with the different types of exercise daily, measuring their blood pressure daily, checking urine for proteinuria by dipstick daily, participating in regular physical activity, drinkeing 8 to 10 glasses of water daily, taking rest and adequate sleep, managing and coping with stress, counting fetal kicks daily and taking aspirin tablets at regular time daily).

Additionally, **Thomson et al., (2011)** study found an increase in post-test scores on the adequacy of taking rest, nutrition, dietary restriction in the intervention group for pregnant women. Moreover, this result was in line with **Briceno et al., (2019)** who reported that PE prevention is based on the primary interventions, such as bed rest, activity

restriction or regular exercise, lowering salt intake, antioxidants such as vitamins C and E, marine oil, garlic, and bed rest may help prevent this syndrome.

Moreover, the present study stated that there was a highly significant improvement in the women compliance with taking aspirin at regular time daily to prevent pregnant women from developing preeclampsia. This is in line with a study about aspirin non-adherence in pregnant women high risk for preeclampsia conducted by **Vinogradov., (2021)** who found that antenatal adherence to aspirin prophylaxis is critical for reducing the occurrence of pre-eclampsia, and that up to 75% of pregnant women high risk of pre-eclampsia do not take aspirin as prescribed. Additionally, **Mohamed et al., (2020)** study emphasized that model of education based on HPM was proven to be effective in disease prevention during pregnancy in the study group and compliance with treatment was improved in the study group compared to the control group.

Prevention of any disease like PE may be through 1ry, 2nd ry or tertiary level of prevention (**Alkema et al., 2016**). Primary prevention includes avoiding predisposing factors among pregnant women high risk for PE, avoiding pregnancy until improving women's nutrition, changing their lifestyles to reduce the occurrence of the disease, reducing the stressors associated with these pregnancies and improving mental health in mothers with high-risk pregnancies (**Hadian et al., 2018).** This supported that preeclampsia treatment bundle of care had positive effect on controlling and correcting unhealthy behaviors which divert study participants to comply with beneficial practices involved in preeclampsia treatment bundle of care .

Moreover, the present study findings revealed that, after application of preeclampsia bundle of care intervention on the pregnant women high risk for preeclampsia there was nearly three quarters of women in the intervention group didn,t develop PE compared to half in the control group. This may be related to helping women to detect their condition and controllling the predisposing factors that reflected on

preventing the occurrence of the disease and can divert health status in normal curve rather than development of the disease.

Similarly, **Masoumeh and Hamzeh., (2019)** study about the effect of self-care before and during pregnancy for prevention and control of preeclampsia in high-risk women" reported that counseling, screening, health promotion, and self-care training were effective in the prevention and control of preeclampsia in women high risk for preeclampsia. Also, the current study showed that there was a statistical significant decrease of the presence of hypertension, proteinuria and edema post than pre intervention in the intervention group with no statistical significant decrease in the control group. This reflect the level of study participants compliance with preeclampsia treatment bundle of care (PTBC), which plays a role in prevention of deviation from normal.

The present study findings showed that, there was a significant association between preeclampsia total knowledge and compliance scores post-intervention among intervention group. This may be attributed to the fact that providing women with sufficient information about preeclampsia contributes to increased their compliance with treatment. This finding was in line with (**Neer et al., 2013),** who concluded that implementation of model of care is effective for improving pregnancy outcomes and maternal-fetal health through increased pregnant women awareness and compliance with treatment and access to health care facilites.

Furthermore, these findings are consistent with a study conducted by **Wallis et al., (2013)**, who investigated the effect of prenatal education on improved outcomes among pregnant women with hypertensive disorders during pregnancy. They found that having enough knowledge about any problem during pregnancy allows pregnant women to comply with healthy behaviours and detect any signs and symptoms, resulting in early disease diagnosis and management, which may prevent complications and reduce morbidity and mortality. Additionally, **Abd Elhaleem et al., (2021)** study concluded that there was a statistically significant relationship between

knowledge, enabling factors score and preeclampsia compliance with preventive behaviors of the pregnant women throughout the intervention phases.

Finally, it was evident that application of guided instructions using bundle of care had positive effect on knowledge of pregnant women high risk for preeclampsia, in addition improving their compliance with treatment thus reducing and preventing further complications.

Conclusion:

Based on the present study results, the tested hypothesis was accepted where applying guided instructions using bundle of care was an effective intervention on improving knowledge and compliance with treatment among pregnant women high risk for preeclampsia in the intervention group compared to the control group. Also more than one quarter only of women in the intervention group compared to half in the control group developed preeclampsia post intervention.

Recommendations:

Findings incite the following recommendations:

- Guided instructions using bundle of care should be incorporated as a nursing intervention into the routine antenatal care in the study setting.
- Encouraging routine antenatal follow-up for early detection and management of preeclampsia.
- **Further studies** are recommended for applying guided instructions using bundle of care on different settings and larger sample size.

Conflicts of interest disclosure

The authors declare that there is no conflict of interest.

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