



Effect of Continuous Care Model on Lifestyle Modification and Pre- eclampsia Control among Pregnant Women

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ABSTRACT

Context: One of the primary causes of morbidity and mortality in women's health worldwide is preeclampsia, with a higher incidence noted in developing nations. The current study aimed at investigating the effect of the continuous care model (CCM) on lifestyle modification and pre-eclampsia control among pregnant women. **Methods:** The study employs a quasi-experimental (pre/post-test) design. The research took place at the antenatal clinic of Kafr El Sheikh University Hospital on a purposive sample of 50 expectant mothers. Four data collection tools were utilized: the structured interview questionnaire, the knowledge of pre-eclampsia assessment questionnaire, a Health Promotion Lifestyle Profile II, and a physical assessment sheet. Additionally, supplementary material, including an educational booklet in Arabic, was developed. **Results** Following the adoption of the continuous care model, a statistically significant enhancement in the overall knowledge level and lifestyle behaviors concerning pre-eclampsia among the participants were revealed ($p < 0.000$). Furthermore, a statistically significant decrease was observed in the clinical manifestations and health problems associated with pre-eclampsia, encompassing edema, proteinuria, headaches, dizziness, epigastric pain, nausea, and vomiting, in addition to the mean score of blood pressure post-implementation of the model compared to the pre-implementation phase ($p < 0.001$). **Conclusion:** The study evidenced that implementing continuous care was successful in improving knowledge and promoting a healthier lifestyle among pregnant women diagnosed with pre-eclampsia. This resulted in better control of clinical symptoms and health problems associated with pre-eclampsia. Therefore, it is suggested that the continuous care model be incorporated into nursing interventions to enhance women's knowledge and promote a healthier lifestyle related to pre-eclampsia.

Keywords: Continuous care model, lifestyle modification, pre-eclampsia control

Introduction

Preeclampsia is a significant global health concern, particularly prevalent in less developed regions. It continues to be a major contributor to preventable morbidity and mortality among mothers and newborns (**Khan, 2022**). The disorder is manifested by high blood pressure. The systolic/diastolic blood pressure exceeding 140/90 mmHg, proteinuria (>300 mg/24h), and edema developing at or after the 20th week of pregnancy (**Modzelewski et al., 2023**).

Women experiencing preeclampsia may manifest various symptoms, such as alterations in vision, including blurriness, seeing flashing lights, or spots, as well as heightened sensitivity to light. They may also present with a new-onset headache, typically frontal and throbbing, which persists despite analgesic use, along with sensations of dizziness. Additionally, symptoms may include new-onset persistent epigastric pain or abdominal right upper quadrant pain, loss of appetite, episodes of nausea and vomiting, sudden weight gain (typically 2 to 5 pounds in a week), legs, hands, or face swelling due to fluid retention, and difficulties in breathing (**Vigil et al., 2023**).

The exact cause of pre-eclampsia remains multifaceted and elusive, yet several risk factors contribute to its onset. These include factors such as maternal age (being under 18 years old or over 35 years old), maternal race, ethnicity, educational background, socioeconomic status, pre-pregnancy obesity, parity, carrying multiple fetuses, genetic predisposition (familial predisposition to preeclampsia), as well as obesity, previous occurrences of the condition, dietary habits, and preexisting medical conditions like pre-existing diabetes, chronic hypertension, and gestational diabetes mellitus. These factors have been scrutinized as potential determinants of preeclampsia and its various subtypes (**Lin et al., 2021**).

Preeclampsia poses significant risks for acute maternal complications, encompassing cerebrovascular bleeding, severe hypertension, HELLP syndrome (hemolysis, elevated liver enzymes, and low platelet count), acute renal failure, pulmonary edema, and potentially progressing to eclampsia. Alongside maternal risks, pre-eclampsia correlates with adverse neonatal outcomes, often due to induced preterm delivery, a heightened likelihood

of placental abruption, and fetal growth restriction. These outcomes may include fetal or neonatal mortality or conditions like retinopathy of prematurity (**Pittara et al., 2021**).

The term "lifestyle" refers to the manner in which individuals, families, and communities conduct themselves, impacting their health either positively or negatively based on personal behaviors. Health-promoting lifestyles encompass elements like balanced nutrition, regular exercise, emotional well-being, effective stress management, and nurturing interpersonal connections, all of which contribute to enhanced health and overall happiness. Conversely, an unhealthy lifestyle characterized by poor dietary choices, smoking, difficulty managing stress, and a sedentary routine can result in detrimental effects and increased morbidity (**El Sayed and Desoky, 2019**).

The continuous care model, that was developed by **Ahmadi et al. (2001)** represents a theoretical framework comprising four interlinked stages: orientation, sensitization, control, and evaluation. Nurses employing CCM must accurately identify patients' needs, encourage them, and engage both patients and relatives in problem-solving processes. The model is designed to formulate and implement programs that foster acceptance, foster a clearer understanding of health objectives, and manage diseases and potential complications (**Akbari et al., 2022**).

Nurses assume a crucial responsibility in controlling and managing pre-eclampsia through the provision of consistent care to expectant mothers. This involves continuous assessment for indications of disease advancement, vigilant monitoring of blood pressure, fetal surveillance, and offering psychosocial assistance. Additionally, nurses offer counseling and education to women on evidence-based strategies aimed at mitigating the risk of pre-eclampsia occurrence of and safeguarding a well-being of both mother and fetus (**Elagamy et al., 2021**).

Nurses provide continuity of care within the continuous care model, allowing ongoing pre-eclamptic women communication, timely follow-up, and optimizing adherence to healthy lifestyles, such as controlling body weight, consuming a healthy diet with recommended nutrients, maintaining regular physical exercises, compliance with medical regimens, and effective stress management (**El Sayed et al., 2020**).

Significant of the study

Preeclampsia is one of the most serious and frequent pregnancy problems, that impacting 3–8% of pregnancies worldwide. It is accountable about 8–10% of overall preterm births. It plays a significant role in preventable perinatal and maternal morbidity and mortality (Koulouraki et al., 2023).

Annually, four million expectant mothers contend with preeclampsia, resulting in 50,000 to 70,000 maternal deaths and the loss of 500,000 infants to the condition. In Africa, the incidence of preeclampsia among pregnant women varies widely, ranging from 1.8 to 16.7% (Namugongo et al., 2022). In Egypt, preeclampsia's prevalence accounts for between 6–8% of all pregnancies, climbing to around 15% in specialized facilities like university hospitals (Ameen et al., 2023).

Preeclampsia presents considerable threats to pregnancy outcomes, resulting in diverse maternal complications, including elevated rates of cesarean section, placental abruption, eclampsia, postpartum hemorrhage, preterm birth, heightened risk of cardiovascular disorders, elevated incidence of maternal mortality, and venous thromboembolism. Furthermore, neonatal complications such as prematurity, intrauterine growth restriction, birth asphyxia, and admission to neonatal critical care units are prevalent (Abate et al., 2021).

The CCM stands out, aiming to devise a strategy that fosters women's understanding and involvement in ongoing care while managing illnesses and potential complications. Recognizing that educational initiatives might diminish in effectiveness over time without ongoing support, integrating continuous care alongside education offers potential for bolstering adherence to healthy lifestyles among women with preeclampsia. This strategy can help alleviate the risks associated with maternal and neonatal complications, ultimately enhancing the overall quality of life of the patients (EL Sayed et al., 2020). Therefore, the purpose of this study was to assess how the continuous care model affected pregnant women's ability to modify their lifestyle and control their preeclampsia.

Aim of the study:

This study aimed at investigating the effect of the continuous care model on lifestyle modification and pre-eclampsia control among pregnant women through:

- Assessing knowledge and health lifestyle regarding pre-eclampsia among pregnant women.
- Assessing clinical manifestations and health problems related to pre-eclampsia.
- Applying a continuous care model for pregnant women with pre-eclampsia.
- Evaluating the effect of applying the CCM on lifestyle modification and controlling pre-eclampsia clinical manifestations and health problems among pregnant women.

Research hypothesis:

- Implementing the continuous care model will significantly enhance pregnant women's knowledge regarding pre-eclampsia compared to their preintervention level.
- Implementing the continuous care model will significantly improve pregnant women's healthy lifestyle regarding pre-eclampsia compared to their preintervention level.
- Implementing the continuous care model will significantly reduce the clinical manifestations and health problems related to preeclampsia among pregnant women compared to their preintervention level.

Operational definition:

- **Pre-eclampsia control** in this study refers to the control of clinical manifestations and health problems associated with pre-eclampsia, such as increased blood pressure, the presence of edema, proteinuria, headaches, dizziness, epigastric pain, and nausea or vomiting.
- **lifestyle modification:** In this study, lifestyle modification entails implementing behavioral interventions aimed at altering various lifestyle-related health behaviors associated with pre-eclampsia. These interventions target factors such as physical activity, nutrition, stress management, health responsibility, moral development, and interpersonal communication.

Subjects and Methods:

Research design:

To achieve the aim of the current research, a quasi-experimental (pre/posttest) design was utilized. Quasi-experimental designs are utilized to investigate potential causal connections between independent and dependent variables. Unlike

conventional experimental research designs or randomized controlled trials, quasi-experimental designs do not involve random assignment to treatment or control groups (Loewen & Plonsky, 2016).

Setting:

The research took place at the antenatal outpatient clinic within Kafr El Sheikh University Hospital, which offers various services to women such as antenatal, gynecological, and family planning outpatient clinics, as well as delivery units and postpartum inpatient units. This specific setting was chosen due to its high attendance by women with pre-eclampsia, its broad coverage of both rural and urban populations, and its provision of affordable services to expectant mothers.

Subjects:

A purposive sample of 50 pregnant women recruiting in this study according to specific criteria. **Inclusion criteria** comprised women who had been medically diagnosed with preeclampsia, had a gestational age ranging from 20 to 36 weeks, were carrying a single viable fetus, and regularly attended antenatal clinics. Pregnant women with specific conditions were excluded from the study based on predefined criteria. **Exclusion criteria** included women with psychiatric disorders, chronic illnesses such as cardiac disease, renal disease, diabetes mellitus, or chronic hypertension. Additionally, pregnant women experiencing other pregnancy complications such as antepartum hemorrhage, gestational diabetes, anemia, or fetal abnormalities were also excluded from participation.

Sample size equation: Using power analysis, with a Type I error (α) of 0.05 and a confidence level of $(1-\alpha)$ of 0.95, along with a Type II error (β) of 90% and a power test of $(1-\beta)$ of 0.10. The following equation was utilized to calculate the sample size for comparing two means (Gupta et al., 2016).

$$n = 2 (Z_{\alpha} + Z_{[1-\beta]})^2 \times SD^2 / d^2$$

In this formula, n represents the sample size, Z_{α} and $Z_{(1-\beta)}$ are standard values corresponding to predetermined values of α and β . Specifically, Z_{α} equals 1.96 when $\alpha=0.05$, and $Z_{(1-\beta)}$ equals 1.036 when $\beta=0.20$. SD stands for the standard deviation obtained from prior studies (El Sayed et al., 2020), and d represents the effect size.

$$n = 2 (1.96 + 1.28)^2 \times 7.71^2 / 5^2 = 49.9$$

Therefore, the sample size was found to be =50 participants.

Tools for data collection:

I) Structured interview questionnaire:

The researcher developed this questionnaire after reviewing pertinent literature in Arabic (El Sayed & Desoky, 2019; Mou et al., 2021). It comprised 11 multiple-choice and closed-ended questions divided into two sections. The first section focused on gathering general information about the study participants, such as contact details, age, education level, marital status, occupation, and residence (six questions). The second section centered on obstetric history, gathering data on gravidity, parity, gestational age, blood pressure, and the frequency of antenatal visits during the current pregnancy (five questions). The questionnaire typically required approximately 5–10 minutes for completion by the researcher.

II) Pre-eclampsia knowledge questionnaire (pre/post-test):

The researcher developed this questionnaire to evaluate pregnant women's knowledge about preeclampsia based on pertinent literature (Wilkinson and Cole, 2017; Fondjo et al., 2019). The questionnaire consisted of 15 multiple-choice questions covering various aspects of preeclampsia, including the definition of preeclampsia, causes and risk factors of preeclampsia, signs and symptoms, classification, maternal and fetal complications, dietary recommendations, prevention methods, and treatment. The questionnaire was administered in Arabic both before and after the intervention. It typically took participants approximately 15–20 minutes to complete, according to the researcher.

Knowledge Scoring System:

Each correct response was allocated a score of (2), whereas every incorrect response garnered a score of (1). Consequently, the cumulative score for each participant varied between 1 and 30. The total knowledge score was categorized as:

- **Poor** < 50% (1-14 scores)
- **Average** 50%–74% (15–22 scores)
- **Good** \geq 75% (23-30 scores)

III) Health Promotion Lifestyle Profile II (HPLPII):

It adapted from Walker and Hill-Polerecky (1996) and customized by the researcher, the tool is

intended to evaluate the healthy lifestyle practices of pregnant women diagnosed with pre-eclampsia, focusing on six key domains: physical activity, nutrition, moral development, interpersonal communication, health responsibility, and stress management. The scale comprised six subscales, totaling 46 items, each targeting specific aspects of lifestyle behavior. The physical activity section (7 statements) assessed regular engagement in physical exercises, while the nutrition segment (8 statements) evaluated adherence to a balanced diet as per the food guide pyramid recommendations, crucial for overall health and well-being. Moral development (7 statements) examined positive changes in behavior during pregnancy, while interpersonal communication (6 statements) gauged efforts to foster meaningful relationships. Stress management (7 statements) addressed coping mechanisms and healthy responses to stress and tension. Health responsibility (11 statements) focused on individuals' accountability for their well-being through education, self-care practices, adherence to medical recommendations, and active participation in antenatal care. The tool was administered twice by the researcher, once before and after the intervention, and typically required about 15 minutes for completion.

Scoring system:

The Health Promoting Lifestyle Profile II (HPLPII) employs a Likert-type scale consisting of three points: never (1), sometimes (2), and always (3). Scores on the scale range from 1 to 138. The classification of the total healthy lifestyle score is as follows:

- Unhealthy lifestyle < 70%. (1-95 scores)
- Healthy lifestyle \geq 70%. (96-138 scores)

IV) Physical assessment sheet:

The researcher developed it after reviewing the pertinent literature (**Essa & Madian, 2015**) to assess the occurrence of clinical manifestations and health problems related to pre-eclampsia among pregnant women, including edema, proteinuria, headache, epigastric pain, dizziness, nausea, vomiting, and increased or decreased fetal movement. This tool was used twice by the researcher (pre-intervention and post-intervention). The researcher needed ten minutes to complete this tool.

Supportive material (Arabic educational booklet)

The supportive material in form of educational booklet was developed by the researcher following an extensive review of recent literature **Chang et al. (2023); Von et al. (2023); Mohamed et al. (2022); Minhas et al. (2024)** to improve pregnant women's understanding of pre-eclampsia and promote healthy lifestyle practices. Crafted in clear Arabic language and supplemented with illustrative visuals, the booklet comprises an introduction, overarching objectives, and comprehensive content divided into two main sections. The initial section covers fundamental knowledge concerning pre-eclampsia, encompassing its definition, risk factors, causative factors, classifications, clinical indicators, as well as maternal and fetal complications, preventive strategies, and treatment options. The subsequent section underscores lifestyle adjustments tailored for pre-eclampsia management, detailing guidelines for physical activity, recommended exercises, dietary recommendations specific to pre-eclampsia, the significance of adequate rest, stress management techniques, and self-care practices essential for pre-eclampsia management. These practices include regular blood pressure monitoring, weight tracking, urine protein checks, fetal movement monitoring, adherence to prescribed medication regimens and prenatal care schedules, smoking cessation, management of pre-eclampsia symptoms, and identification of warning signs necessitating immediate medical attention.

Validity and reliability:

The data collection instruments underwent content validity assessment by three experts specializing in maternity and neonatal health nursing, as well as two in community health nursing from the faculty of nursing at Kafr El-Sheikh University. The evaluation focused on the clarity of the questionnaire items and the relevance of the content. Following expert feedback, minor adjustments were made to refine certain items. Overall, the tools were deemed valid by the experts.

To evaluate reliability, Cronbach's alpha coefficient was employed. Tool (II) yielded a coefficient of 0.87, while tool (III) and tool (IV) demonstrated coefficients of 0.84 and 0.876, respectively.

Administrative design:

A formal written authorization was provided by the Dean of the Faculty of Nursing at Kafr El Sheikh University to the Director of Kafer El Sheikh University Hospital. This authorization delineated the research title, along with its objectives and scope.

Ethical considerations:

The study received ethical clearance from the Scientific Research and Ethics Committee, Faculty of Nursing at Kafr El-Sheikh University prior to commencement. Participants provided informed consent after being briefed on the study's objectives. No procedures that could cause harm were employed. The women under study were free to leave the research at any time. Human rights were respected all during the research. Data management was done using a coding system, and data confidentiality was guaranteed.

Pilot Study:

A pilot study involving ten percent of the studied women (5 pregnant women) was carried out to judge the clarity and comprehensibility of the research instruments. Following the pilot study results, necessary adjustments were made, including the removal of certain questions to enhance their content and improve clarity and simplicity. The pilot sample was later included in the overall sample, as no substantial alterations were made to the study instruments.

Fieldwork:

The research was conducted spanning six months, starting from August 2023 to January 2024. The researcher visited the designated setting on Sundays, Mondays, and Tuesdays every week, in the morning shift until the required sample size was achieved. The CCM was enacted, consisting of four phases: orientation, sensitization, control, and evaluation.

Orientation stage:

The researcher conducted individual interviews with each woman in the outpatient waiting area. She commenced the interaction by introducing herself and elucidating the study's objectives to establish rapport and instill confidence. Additionally, she inquired about their expectations and provided an overview of the different phases of the CCM. The researcher emphasized the importance of ongoing communication and contact between herself and the

participants, establishing schedules for follow-up phone calls until the intervention's conclusion. Each woman provided verbal consent before proceeding. Subsequently, the researcher collected data on the women's general characteristics, obstetric history, clinical manifestations, and health problems related to pre-eclampsia using tools (I) and (IV). Additionally, the women's knowledge and healthy lifestyle regarding pre-eclampsia were assessed using tools (II) and (III). On average, each interview lasted approximately 35–45 minutes, with three to four women interviewed daily. The data collected in this phase served as the baseline for comparing and evaluating the effectiveness of the intervention.

Sensitization stage:

This stage aimed to engage the participated women in a continuous process of care for preeclampsia. The researcher organized the participants into five subgroups, with each subgroup comprising ten women. These subgroups attended four educational sessions held in a quiet room at the antenatal outpatient clinic, with two sessions conducted each week. Every session lasted between thirty and forty-five minutes.

First session; The researcher delivered fundamental information concerning pre-eclampsia, covering aspects such as its definition of pre-eclampsia, causes and risk factors, classification, fetal and maternal outcomes, protective measures, and treatment. At the conclusion of this session, illustrative booklets were distributed to the pregnant women.

In the second session, the researcher explained the importance of adopting a healthy lifestyle to effectively manage and control preeclampsia. This involves following a recommended diet tailored to preeclampsia management, which aligns with the dietary approach to halt high blood pressure. The dietary recommendations include reducing salt and fat intake while increasing consumption of protein, grains, vegetables, fresh fruits, and complex carbohydrates, along with ensuring adequate daily water intake. Additionally, sufficient rest, quality sleep, and regular physical activity were highlighted as essential components of maintaining a healthy lifestyle.

In the third session, the researcher underscored the significance of consistently monitoring and documenting blood pressure, as well as daily weight

measurements. Additionally, the importance of maintaining a healthy weight was discussed, alongside instruction on how to detect proteinuria using a dipstick and guidance on monitoring fetal movements daily.

In the fourth session, emphasis was placed on stress reduction techniques, including relaxation exercises, to manage the stress associated with preeclampsia. Furthermore, participants were educated on the significance of adhering to antenatal visits schedule and complying with prescribed medications.

- Every session began with a recap of the previous session content and an overview of the specific objectives for the upcoming session, employing straightforward Arabic language suitable for the women's comprehension level. Each session concluded with a recap of its key points, feedback from the pregnant women to ensure comprehension, and a discussion of any questions to rectify misunderstandings.
- A diverse range of teaching methods were employed, including discussion, demonstration, role-playing, and brainstorming. Various suitable teaching aids such as brochures, video presentations, Arabic educational booklets, and PowerPoint slides were utilized.

Control Stage: The researcher maintained regular communication with the participant women through weekly phone calls, totaling six calls per woman over the span of six weeks. These calls were arranged to accommodate the women's schedules, either in the morning or evening. Each weekly call lasted around ten minutes, tailored to address individual educational requirements and queries, aiming to reinforce and internalize a healthy lifestyle. Moreover, any additional educational requirements or health issues were identified, deliberated upon, and directed towards resolution.

Evaluation Stage: The effectiveness of implementing the CCM was evaluated by comparing women's knowledge, healthy lifestyle, clinical manifestations, and health problems associated with pre-eclampsia before and after two months of intervention. This evaluation was conducted either at the outpatient clinic or via phone using the same assessment tools employed prior to the intervention.

Statistical Analysis:

Data were collected and analyzed using the Statistical Package for the Social Sciences (SPSS) version 26 and Microsoft Excel version 2010. Descriptive statistics, such as frequency and percentage distributions, were utilized to present qualitative data, while mean and standard deviation were employed for quantitative data representation. The Shapiro-Wilk test was conducted to examine the distribution of data. Furthermore, the significance of paired qualitative variables was assessed using the Marginal Homogeneity (MH) test and McNemar's test. McNemar's test was specifically applied for dichotomous data. The relationship between categorical variables was examined using T-test statistics. Additionally, the Spearman correlation coefficient was utilized to indicate the direction and strength of correlations between variables. Statistical significance was established at a $p \leq 0.05$, with 0.001 were representing a highly statistically significant difference. Conversely, a $p > 0.05$ considered a non-significant difference.

Results

Table 1 illustrates that half of pregnant women (50%) were between 25 and 30 years old. Their mean age was 26.53 ± 2.34 . Regarding educational level, 56% of the participants had completed secondary education, and 96% were married. Moreover, the majority (82%) identified as housewives, and slightly over half (52%) were from urban regions.

Table 2 demonstrates that 58% of the participants had one to two gravida, while 24% were primigravida. Regarding parity, 48% of the studied sample were more than para 3. The mean gestational age was 26.68 ± 1.14 weeks. Antenatal care visits during the current pregnancy revealed that 40% of the participants attended the clinic 1-2 times per month.

Table 3 highlights a statistically significant difference in participants' knowledge regarding preeclampsia following the CCM implementation compared to before implementation ($p < 0.001$). For instance, post-implementation, 90.0%, 88.0%, 86.0%, and 84.0% of participants demonstrated correct knowledge regarding the definition, preventive measures, management, and clinical manifestations of pre-eclampsia, respectively. This is

in contrast to pre-implementation figures of 13.0%, 18.0%, 16.0%, and 22.0%, respectively.

Figure 1 shows how the study participants' overall knowledge score changed between before and after the CCM was implemented, with a highly statistically significant difference ($P < 0.000$). Prior to the intervention, 64% of them had poor knowledge, which increased to 72%, and 16% had good and average knowledge, respectively, after the intervention.

Table 4 demonstrates the comparison of healthy lifestyle among the studied women pre and post intervention. The table reveals a highly statistically significant difference between pre and post intervention regarding all assessed aspects (nutrition, physical activity, health responsibility, managing stress, moral development, and interpersonal communications) at $p=0.000$.

Figure 2 illustrates the comparison of the total lifestyle score of the women in the women in the studies pre- and post-CCM intervention. A highly statistically significant improvement was revealed in the total healthy lifestyle score after the implementation of the CCM compared to pre-model implementation ($P < 0.001$). 84% of the studied sample had an unhealthy lifestyle prior to the

implementation of the CCM, which improved to 78% of them having a healthy lifestyle after the implementation of the model.

Table 5 demonstrates the comparison of the studied sample blood pressure pre and post intervention. The mean systolic blood pressure was 151.64 ± 6.83 mmHg pre-implementation of the CCM compared to the post-model implementation (141.98 ± 7.32 mmHg). Furthermore, the diastolic blood pressure was 94.45 ± 3.42 mmHg compared to the post-model implementation (89.81 ± 3.87 mmHg). A statistically significant difference was observed between pre- and post-intervention ($P < 0.000$).

Table 6 demonstrates a highly statistically significant decrease in the occurrence of clinical manifestations and health problems related to pre-eclampsia, including edema, protein urea, headache, dizziness, epigastric pain, nausea, and vomiting, after the CCM was implemented compared to pre-model implementation among the studied sample ($P < 0.001$).

Table 7 shows a statistically significant positive correlation ($P < 0.000$) between the study sample's total lifestyle score before and after the intervention and their overall knowledge score.

Results:

Table (1): Frequency and percentage distribution of the studied sample general characteristics: (n = 50)

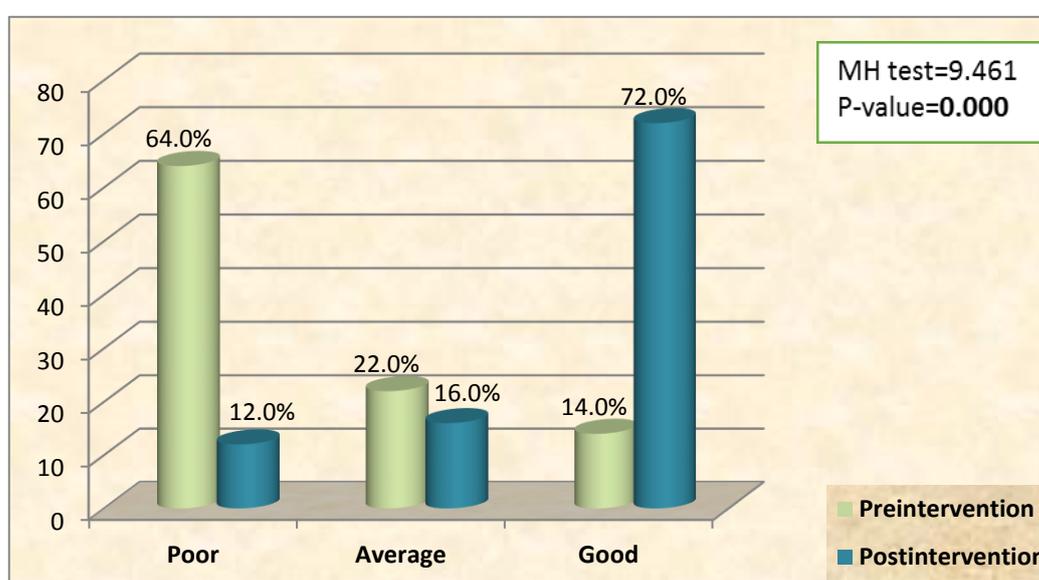
General characteristics	No	%
Age (years)		
18 -< 25	14	28.0
25 -< 30	25	50.0
30 – 35	11	22.0
Mean \pmSD	26.53\pm2.34	
Educational level		
Primary education	7	14.0
Secondary education	28	56.0
University education	15	30.0
Marital status		
Married	48	96.0
widow	2	4.0
Occupation		
Worke	9	18.0
Housewife	41	82.0
Residence		
Rural area	24	48.0
Urban area	26	52.0

Table (2): Frequency and percentage distribution of the studied sample obstetric history: (n = 50)

Items	No	%
Gravida		
Primigravida	12	24.0
1-2	29	58.0
≥ 3	9	18.0
Para		
Nullipara	12	24.0
1-2	14	28.0
≥ 3	24	48.0
Gestational age		
Mean± SD = 26.68±1.14		
Number of ANC visits		
1 – 2 times	20	40.0
3 - 4 times	18	36.0
More than 4 times	12	24.0

Table (3): Comparison of the studied sample knowledge about pre-eclampsia at pre and post-intervention: (n=50)

Knowledge items	Pre-intervention (n=50)				Post-intervention (n=50)				McNemar Test	P-value
	Correct		Incorrect		Correct		Incorrect			
	No	%	No	%	No	%	No	%		
Definition	13	26.0	37	74.0	45	90.0	5	10.0	5.072	0.000**
Risk factors	6	12.0	44	88.0	40	80.0	10	20.0	5.397	0.000**
Classifications	6	12.0	44	88.0	40	80.0	10	20.0	5.397	0.000**
Clinical manifestations	11	22.0	39	78.0	42	84.0	8	16.0	2.806	0.000**
Maternal complications	6	12.0	44	88.0	39	78.0	11	22.0	8.348	0.000**
Fetal complications	7	14.0	43	86.0	37	74.0	13	26.0	7.846	0.000**
Preventive measures	9	18.0	41	82.0	44	88.0	6	12.0	8.183	0.000**
Management	8	16.0	42	84.0	43	86.0	7	14.0	3.697	0.000**

Figure (1): Percentage distribution of the studied sample total knowledge score about pre-eclampsia at pre and post- intervention:(n=50)

MH test= Marginal Homogeneity test

Table (4): Comparison of the studied sample lifestyle regarding pre-eclampsia at pre and post-intervention : (n = 50)

Domains		Pre-intervention (n=50)		Post-intervention (n=50)		MH test	P- value
		No	%	No	%		
Nutrition	Always	5	10.0	37	74.0	8.589	0.000**
	Sometimes	21	42.0	10	20.0		
	Never	24	48.0	3	6.0		
Physical activity	Always	3	6.0	34	68.0	3.674	0.000**
	Sometimes	20	40.0	11	22.0		
	Never	27	54.0	5	10.0		
Health duties	Always	7	14.0	38	76.0	2.904	0.000**
	Sometimes	20	40.0	5	10.0		
	Never	23	46.0	7	14.0		
Stress management	Always	6	12.0	29	58.0	5.973	0.000**
	Sometimes	25	50.0	18	36.0		
	Never	19	38.0	3	6.0		
Moral Development	Always	4	8.0	31	62.0	7.342	0.000**
	Sometimes	17	32.0	14	28.0		
	Never	29	58.0	5	10.0		
Interpersonal communications	Always	5	10.0	37	74.0	4.781	0.000**
	Sometimes	19	38.0	9	18.0		
	Never	26	52.0	4	8.0		

MH test= Marginal Homogeneity test

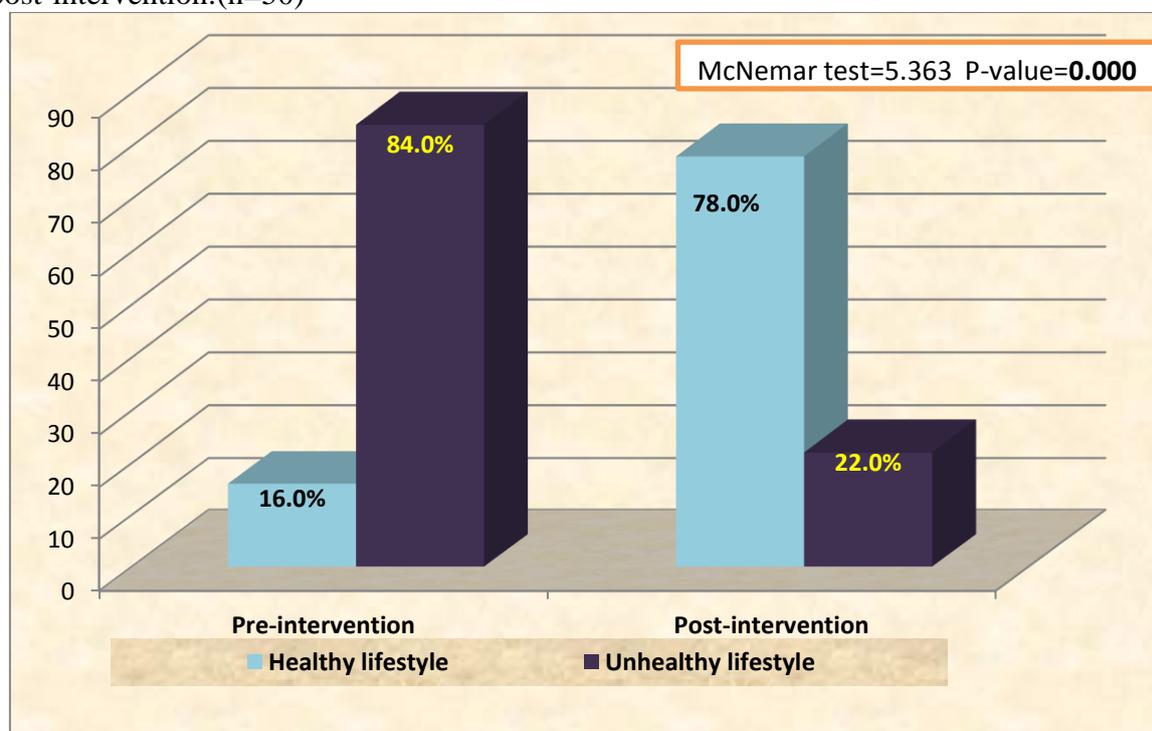
Figure (2): Percentage distribution of the studied sample total lifestyle score about pre-eclampsia at pre and post-intervention: (n=50)

Table (5): Comparison of mean score of the studied sample blood pressure at pre and post-intervention: n= (50)

Items	Pre intervention	Post-intervention	Paired t-test	P Value
	Mean \pm SD	Mean \pm SD		
Systolic blood pressure (mmHg)	151.64 \pm 6.83	141.98 \pm 7.32	3.669	0.000**
Diastolic blood pressure(mmHg)	94.45 \pm 3.42	89.81 \pm 3.87	6.352	0.000**

Table (6): Comparison of the studied sample clinical manifestations and health problems related to pre-eclampsia at pre and post-intervention: n= (50)

Items	Pre-intervention		Post-intervention		McNemar Test	P Value
	No	%	No	%		
Pregnant women's health problems:						
Yes	45	90.00	8	16.00	3.274	0.000*
No	5	10.00	42	84.00		
Types of complains(n=45) #	(n=45)		(n=8)			
Edema	31	62.00	8	16.00	6.932	0.000*
Proteinuria	29	58.00	7	17.00	5.950	0.000*
Headache	15	30.00	4	8.00	3.472	0.000*
Dizziness	16	32.00	5	10.00	5.641	0.000*
Epigastric pain	11	22.00	2	4.00	2.003	0.001*
Nausea or vomiting	10	20.00	1	2.00	3.337	0.001*

More than one answer**Table (7):** Correlation between studied sample total knowledge score and total level of lifestyle regarding pre-eclampsia at pre& post-intervention: (n=50)

Variables	Total level of knowledge			
	Pre-intervention		Post-intervention	
	r	P-value	r	P-value
Total level of lifestyle	0.551	0.030*	0.692	0.034*

Discussion

Preeclampsia is a systemic disorder that can adversely affect pregnancy outcomes. It is typified by varying degrees of hypertension occurring in the latter half of pregnancy or postpartum (Poon et al., 2019). Creating a care plan that would encourage acceptance, appropriate behavior, and management of the illness and any potential complications was the aim of the continuous care model. Monitoring women's behavior may lead to more effective disease control and management. This decreased their mortality rate, hospitalization costs, and frequency of readmission (Baghaei et al., 2021). The current study aimed at investigating the effect of the continuous care model on lifestyle modification and pre-eclampsia control among pregnant women.

The general characteristics of the sample under investigation were outlined in the current study. The study shows that around one-half of the

participants' ages fell between 25 and 30 years, with slightly over half having attained secondary education and residing in urban areas. Additionally, the majority were identified as housewives. These findings align with Ali et al. (2022) research on the influence of modifying lifestyle on fetal and maternal outcomes of expectant mothers diagnosed with mild preeclampsia. Their study reported a mean age of 29.85 \pm 6.99 among participants, with three-quarters being housewives and more than half having secondary education. These parallel results underscore the importance of comprehensive guidance, support, and education from healthcare professionals for addressing prevalent health concerns within the population under study.

The present study's findings regarding women's knowledge about pre-eclampsia revealed significant improvements following intervention. Initially, approximately two-thirds of pregnant women exhibited a poor total knowledge score,

which increased to slightly less than three-quarters displaying a good knowledge level after CCM implementation. This statistically significant improvement was revealed across all pre-eclampsia knowledge dimensions, encompassing its definition, protective actions, management, and clinical manifestations. These findings assured the effectiveness of the CCM in augmenting women's understanding and awareness of pre-eclampsia through ongoing education, support, and researcher-led telephone follow-ups during the intervention phases. Additionally, participants demonstrated high levels of engagement and satisfaction with the instructional sessions and the designed illustrative booklet, which they regarded as a valuable reference resource. The first research hypothesis is supported by these findings.

This outcome is consistent with the findings of **Abd-Elaziz et al. (2023)**, who investigated how the CCM affected pre-eclamptic women's self-care. When comparing the pre- and post-intervention phases, they found that participants' preeclampsia-related knowledge and self-care practices had improved significantly ($p < 0.001$).

Similarly, **Elagamy et al. (2021)** studied the effect of PRECEDE model nursing intervention on high-risk pregnant women's awareness and protective actions regarding pre-eclampsia, it was found that the average knowledge score regarding pre-eclampsia was low before the nursing intervention. However, a statistically significant increase in knowledge mean score immediately and one month after implementation was revealed. This improvement may be credited to the educational intervention provided, which positively influenced pregnant women's understanding. The participation of all women in the program ensured that they received vital information about pre-eclampsia.

Upon examining women's lifestyles in relation to pre-eclampsia, the findings of this study indicate a substantial and statistically significant enhancement in the overall healthy lifestyle score among pregnant women following the CCM implementation compared to before its implementation ($P < 0.001$). This improvement encompasses various aspects, including nutrition, physical activity, adherence to health responsibilities, stress management, moral development, and interpersonal communication.

This result could be attributed to ongoing education and assistance during the CCM implementation, as well as regular phone follow-ups that gave expectant mothers excellent information and encouragement to modify their lifestyles to reduce their risk of preeclampsia and increase their involvement in providing their own care. The second research hypothesis is supported by these findings.

Corresponding to studies by **El Sayed et al. (2020)**, which looked at how CCM affected pregnant women with preeclampsia's quality of life and health-related behaviors. At first, there was no statistically significant difference in the features of preeclampsia-related health behaviors between the control and study groups. Prior to the implementation of the CCM, the mean scores for all health-related behaviors were low for both groups. But once the CCM was put into practice, the study group showed a much higher overall mean score of health-related behaviors than the control group. The similarities in findings between the two studies may be ascribed to the beneficial effects of continuous sensitization processes, which motivated, encouraged, and empowered these women to embrace healthier lifestyles aimed at managing and mitigating the complications associated with preeclampsia. Furthermore, the positive outcomes may have been bolstered by the regular attendance of the sessions coupled with weekly follow-up care via phone calls.

Likewise, **Eldosoky.(2023)** observed a highly statistically significant enhancement in quality of life and self-care practices related to preeclampsia among the studied sample following the CCM implementation (immediately after intervention and one-month later) phases ($P < 0.001$). Moreover, consistent with the findings of **Khodaveisi et al. (2017)**, continuous care was found to positively impact various aspects of patients' lifestyles, encompassing self-care, dietary habits, physical activity, sleep patterns, and stress management. They suggested that this model could be effectively integrated into hospital or healthcare center settings, serving as an appropriate system for enhancing adherence to a healthy lifestyle among patients with chronic conditions.

In a similar line, **Tavakolizadeh. (2021)** investigated how well middle-aged obese people's body mass index and lifestyle were affected by the

CCM. Before the intervention, there was no significant difference in any of the lifestyle aspects between the intervention and control groups. But after the intervention, all CCM domains (physical activity, nutrition, interpersonal relationships, and stress management) showed statistically significant differences between the two groups (post-test) ($P < 0.001$), with the intervention group showing higher mean scores than the controls. As a result, using the CCM model as a foundation for creating preventative strategies aimed at overweight and obesity is advised.

The primary objective of the CCM, as outlined by **Akbari et al. (2022)**, is to enhance client attitude, acceptance, and adoption of proper and healthy lifestyle choices to effectively manage disease and control progression, prevent complications, and enhance overall quality of life.

On examining the influence of the CCM on controlling pre-eclampsia, the current study's findings exhibit a statistically significant reduction in the occurrence of clinical manifestations and health problems experienced by women associated with pre-eclampsia. These include edema, proteinuria, headaches, dizziness, epigastric pain, nausea, vomiting, and changes in fetal movement, accompanied by a decrease in mean blood pressure scores post-intervention. This positive outcome can be ascribed to the successful implementation of the CCM, which facilitated the identification and assessment of the problems and needs of women with pre-eclampsia. Moreover, it provided them with relevant knowledge and skills, thereby promoting self-care practices and lifestyle modifications aimed at monitoring and preventing complications associated with pre-eclampsia and maintaining their overall health status. The third research hypothesis is supported by these findings.

The prior findings corroborated by **Kazemi et al. (2022)** affirmed that the CCM is designed to foster a meaningful, interactive, and ongoing relationship between clients and nurses, who serve as healthcare providers. This relationship aims to assess clients' needs and health issues comprehensively, while also encouraging them to embrace continuous commitment to healthy behaviors and support their ongoing recovery and health enhancement processes. Such an approach is particularly well-suited to the features of chronic

diseases and the evolving nature of their challenges.

These results are echoed by **Ali et al. (2022)**, who noted that implementing lifestyle modification guidelines led to significant reductions in mean systolic and diastolic blood pressure, proteinuria, and gestational weight gain. Moreover, it eliminated the risk of progression to severe pre-eclampsia development and reduced the incidence of liver function abnormalities and cardiac complications with statistical significance. This outcome underscores the beneficial impact of employing the continuous care model in enhancing awareness and promoting healthy lifestyle behaviors among pregnant women in relation to pre-eclampsia, thereby positively influencing blood pressure control.

Similarly, **Elsaid et al. (2021)** conducted a study investigating the impact of health education on pregnancy outcomes among first-time mothers diagnosed with pregnancy-induced hypertension. Their findings revealed that the majority of women in their study encountered no health complications, and none necessitated admission to the intensive care unit. These outcomes suggest favorable maternal results subsequent to the implementation of educational interventions.

Regarding the correlation between healthy lifestyle behavior and overall knowledge, the current study revealed a statistically significant positive correlation between the overall knowledge level of women concerning pre-eclampsia and their overall adoption of a healthy lifestyle both before and after intervention ($P < 0.000$). This suggests that acquiring information about pre-eclampsia enhances the self-determination of pregnant women and improves their adherence to healthy lifestyle behaviors and treatment regimens. These results align with **Abd EL Desoky et al. (2023)** study, which also revealed a statistically significant positive correlation between the total knowledge score and reported total healthy lifestyle associated with pre-eclampsia, both before and after the introduction of the CCM ($P < 0.001$).

In summary, this study stated the remarkable outcome of applying such an educational-based intervention using a CCM on the enhancement of women's knowledge, in addition to lifestyle modification and the reduction of health-problems associated with preeclampsia. The main aim of

successful nursing interventions based on education is to provide clients with the necessary information that improves their condition, gives them full control, and minimizes any health-related hazards or complications. These results align with research hypotheses.

Conclusion:

The present study's findings indicate that implementing CCM has proven to be successful in improving the knowledge and adoption of healthy lifestyles among pregnant women with pre-eclampsia, reflecting better control of pre-eclampsia's clinical manifestations and health problems. Additionally, a highly statistically significant positive correlation was observed between the overall knowledge levels of pregnant women regarding pre-eclampsia and their total lifestyle scores both before and after the intervention. These results effectively fulfill the study's objectives and provide support for the research hypotheses.

Recommendations:

According to the findings of this study, the following were recommended:

- The CCM should be integrated as a clinical nursing intervention for improving women's knowledge and healthy lifestyle regarding preeclampsia.
- Implementing a continuous training program for pre eclamptic women to enhance their knowledge and healthy lifestyle to control and manage pre-eclampsia.
- Implement a continuous training program and in service education for maternity nurses regarding the CCM for addressing such challenging conditions.
- Further research is needed to examine the influence of the continuous care model on pregnancy outcomes among pre-eclamptic women.

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