Effect of Applying Pregnancy Centered Care Model on Pregnant Women's Health Behaviors

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Abstract

Background: Pregnancy centered care is the most often recommended group antenatal care model which has been shown to be effective, holistic and possibly superior to individual antenatal care. ***Aim of research:*** The research aimed to investigate the effect of applying pregnancy centered care model on pregnant women's health behaviors. ***Research design:*** A quasi-experimental (non-equivalent groups) research design was used to fulfill the aim of the study. ***Setting:*** The research was conducted at the obstetrics and gynecology outpatient clinic in Benha University Hospital. ***Sample:*** A purposive sample of 140 pregnant women divided randomly into control group comprised (70) women and study group comprised (70) women. ***Tools of data collection:*** three tools were utilized for collecting data; a structured interviewing questionnaire, health promotion lifestyle Profile-II as well as patient participation and satisfaction questionnaire. ***Results:*** There was a highly statistically significant improvement of the total knowledge regarding pregnancy after applying pregnancy centered care model, in study group compared with control group ($P \leq 0.001$). There was a highly statistically significant improvement of the total health promotion lifestyle profile II and related dimensions (health responsibility, physical activity, nutrition, interpersonal relations and stress management) after applying pregnancy centered care model, in study group compared with control group ($P \leq 0.001$). Most of the study group had high participation and satisfaction with the pregnancy centered care model. ***Conclusion:*** Pregnancy centered care model was effective in improving knowledge, health behaviors and higher participation and satisfaction with the pregnancy centered care model. ***Recommendation:*** Implementation of pregnancy centered care model as a standard practice considering a proper antenatal room design.

Keywords: *Health behaviors, Pregnancy Centered Care, Pregnant women.*

Introduction

Antenatal care is one of the key preventive health care services provided for pregnant women around the world. In most countries, health care during pregnancy traditionally involves a schedule of one-to-one individual visits with an obstetrician, a midwife or a general practitioner in a hospital or clinic setting. On the other hand, an emerging way of providing antenatal care involves use of a group model rather than an individual approach ***(Gultom, 2024).***

The most often recommended group antenatal care model is pregnancy centered care (PCC) which has been shown to be effective, holistic and possibly superior to individual antenatal care ***(Wiseman et al., 2024).*** PCC model often involves a group of 6–12 women of similar gestational age who follow a facilitative two hours group in-depth discussion. The groups meet every 2-4 weeks for a total of 10 visits over a 6-month period allowing providing resources tailored to women specific needs ***(Keenan-Devlin et al., 2023).***

Healthy behaviors during pregnancy is an essential factor as it affects the health of both the woman and the growing fetus ***(Uzan et al., 2024)***. PCC model improves the likelihood of a healthy behaviors and motivate pregnant woman to change through comprehensive regular care

early in pregnancy that support health promoting behaviors. Likely through education, risk screening and physical assessments were included in prenatal care visits, besides an additional element of social support and empowerment under the guidance of the professional care provider (***Maghalian, et al., 2024; Fathnezhad-Kazemi et al., 2021).***

There is evidence that the women enrolled in PCC model develop or maintain healthy behaviors and change or quit risky ones. Such behaviors include healthy nutritional habits, physical activity, adherence to a regular sleeping pattern on the other hand limiting caffeine and cola drinks, abstinence from drugs, alcohol or tobacco are key modifiable behavioral risk factors for better pregnancy outcomes. Moreover, reducing the risk for preterm delivery, low birth weight, stillbirth and fetal malformation ***(Yu et al., 2023***)

Pregnancy centered care model has the potential to act upon each aspect of health behavior domains**.** According to ***Walker (1987)*** health promoting lifestyle is a combination of six dimensions which are health responsibility, physical activity, nutrition, spiritual growth, interpersonal relationships and stress management. Health promoting lifestyle is a multidimensional model of self-initiated perceptions and actions that help the continuation and reinforcement of health and self-actualization creating a prominent opportunity for change ***(Moshki et al., 2023).***

Ideally, maternity nurses play a crucial role in improving the quality of antenatal care in the light of pregnancy centered care model through providing careful assessment, education and support. At the same time, the nurses can provide health promotion and psychosocial services and make appropriate referral. Also, nurses play a vital role in providing anticipatory guidance to foster the women's responsibility for self-care practices and helping to clarify misconceptions ***(Hlongwane et al., 2021).***

Moreover, nurses emphasizing the health-related activities in which pregnant women may engage. Educating the pregnant women to identify threats to safety created by lifestyle or behavioral factors and highlighting ways to modify for avoiding adverse outcomes, which can positively affect the health of pregnant women ***(Jafaru, 2022).***

Significance of the research

The United Nation’s Sustainable Development Goals call for decreasing the global maternal mortality ratio to below 70 per 100,000 live births and the newborn mortality rate to below 12 newborn deaths per 1000 live births by the year 2030 ***(UNICEF and WHO, 2023)***

Globally, around 223 women/ 100.000 live births die annually from pregnancy-related causes and 86% of these maternal deaths happen in developing countries. In Egypt, the maternal mortality ratio is 17/100.000 live births and approximately three quarters of them are considered avoidable. This underscores the importance of implementing measures to improve maternal and fetal health ***(WHO, 2024***).

Hibusu et al., (2024) and Renbarger et al., (2021), pointed out that deficiency of social and psychological support was perceived by 56.1% of the pregnant women and 86.3% reported dissatisfaction with the short time spent in receiving care after long waiting, lack of continuity of caregivers and inappropriate familial contribution in care. Additionally, in Egypt most clinical sites provide antenatal care in an individual approach with PCC is little known. Therefore, the present research was conducted to investigate the effect of pregnancy centered care model on women's health behaviors and birth outcomes.

Aim of the research

The research aimed to investigate the effect of applying pregnancy centered care model on pregnant women's health behaviors.

Research hypotheses

H 1: Pregnant women who receive pregnancy centered care model will have improved knowledge related to pregnancy than those who don't receive it.

H 2: Pregnant women who receive pregnancy centered care model will engage in health behaviors than those who don't receive it.

H 3: Pregnant women who receive pregnancy centered care model will exhibit higher participation and satisfaction with the model.

Operational definitions:

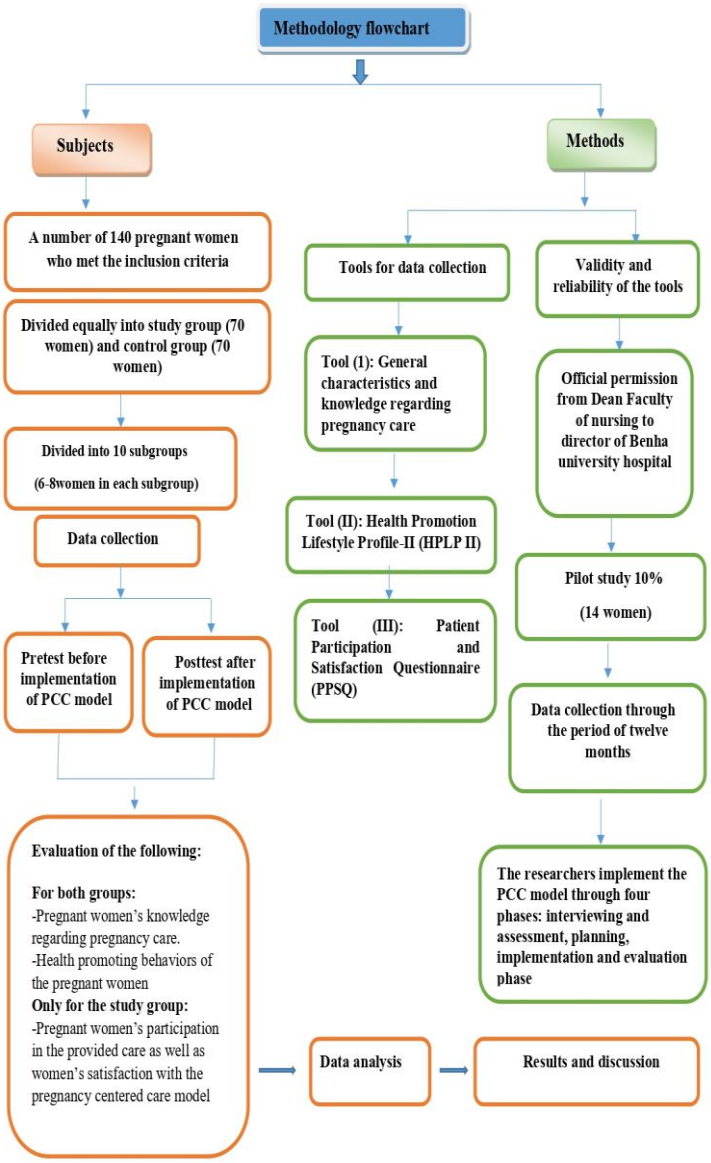
Pregnancy Centered Care (PCC): PCC is a group prenatal care model composed of pregnant women divided into subgroups with similar gestational age who would receive educational sessions about healthy behaviors related to pregnancy.

Health behaviors: refers to certain behaviors that pregnant women follow to enhance health such as health responsibility, regular physical activity, proper nutrition, interpersonal relationship, relaxation and stress reduction techniques. Health behaviors were measured using Walker's health promotion lifestyle profile-II.

Subjects and method:

Research design:

A quasi-experimental (non-equivalent groups) research design was used to fulfill the aim of the study. Quasi-experimental studies involve manipulation of independent variables to observe the effect on dependent variables referred to a pre-post intervention designs and often used to explore casual relationships. Quasi-experiments may lack the randomization and/or the control group characteristics of true experiments ***(Sharma, 2022).***



Setting:

The research was conducted at the obstetrics and gynecology outpatient clinic in Benha University Hospital. This setting was considered the main governmental hospital at Qaliobeya governorate and surrounding governorates. The clinic included 2 rooms located in the ground floor and provided obstetrics health care services that included antenatal care, care for high-risk pregnancy, family planning counseling and gynecological checkups. Working hours from 9 Am to 1 Pm except Friday and official holidays.

Sample type:

A purposive sample was used from the above-mentioned research setting.

Sample Size:

A total number of 140 pregnant women were recruited in the current study. Which represented 10 % of the total pregnant women (1400 pregnant women) according to Benha university hospital statistical center in the year of 2022 ***(Benha university hospital statistical center, 2022).*** The study group included 70 women who received the pregnancy centered care model in addition to the routine hospital care, the control group included 70 women who received the routine hospital care only.

Inclusion criteria:

Primigravida, singleton pregnancy with gestational age between the 12^{th} and 16^{th} week, low-risk pregnant women without any medical or obstetric complications, can read and write and willing to participate in the study.

Tools of Data collection:

Three tools were utilized for collecting data;

Tool (I): A structured interviewing questionnaire: It was constructed by researcher after reviewing a related literatures ***(Ahrne et al., 2023; Gebremariam et al., 2023; Afulani et al., 2021)*** and was written in Arabic language in the form of close-ended questions. It encompassed the following two parts:

Part (1): General characteristics of the studied women included (age, level of education, occupation and residence) as well as telephone number for further follow up.

Part (2): Assessment of women's knowledge regarding pregnancy included 39 items divided into four sections; section (1) included general knowledge regarding pregnancy (14 items), section (2) included knowledge regarding healthy behaviors during pregnancy (6 items), section (3) included knowledge regarding minor discomforts during pregnancy (16 items), section (4) included knowledge regarding danger signs during pregnancy (3 items).

Knowledge's scoring system- :

Each knowledge item was weighted according to correct answer (2 points), incorrect answer/don't know (1 point). The total knowledge score was calculated by summation of the scores of all items. The total score of knowledge was ranged from (39-78) and was categorized as the following:

- Adequate knowledge when the total score was ≥ 60% (47≥78).
- Inadequate knowledge when the total score was < 60% (39<47).

Tool II: Health Promotion Lifestyle Profile-II (HPLP II): It was developed by ***Walker et al., (1987),*** and was adapted by the researchers and was translated into Arabic language to assess pregnant women's health promoting behaviors related to pregnancy in the past 2 weeks. HPLP II consisted of 43 items divided into five dimensions as follows; health responsibility (9 items), physical activity (7 items), nutrition (11 items), interpersonal relations (8 items) and stress management (8 items).

Scoring system:

Each item was rated based on a three-point Likert scale varying between 3 = often, 2= sometimes and 1 = never. The total HPLP II was scored by summing all items of the dimensions and ranged from 43 to 129 and was measured by the mean score of the responses to all 43 HPLP II items with a higher score indicated a greater engagement in health promoting behaviors. The total HPLP II score was further classified into two levels:

- Healthy behaviors: when the total score was ≥ 60% (77 ≤ 129).
- Unhealthy behaviors: when the total score was < 60% (43 < 77).

Tool III: Patient Participation and Satisfaction Questionnaire (PPSQ):

The PPSQ is a self-reported questionnaire that was developed by ***Littlefield et al., (1987),***

was adapted by the researcher and translated into an Arabic language to assess the women's participation in the provided care as well as women's satisfaction with the pregnancy centered care model. This tool was composed of 16 items divided into two subdimensions. Participation in the provided care (4 items) and satisfaction with the pregnancy centered care model (12 items).

Scoring system:

Responses were rated based on a 3-point Likert scale ranging from 3= agree, 2 = neutral and 1 = disagree. The total score was scored by summing all items of the two dimensions and ranged from 16 to 48 with higher scores indicating greater participation and satisfaction with the pregnancy centered care model. Total score was classified into:

- -High participation and satisfaction when total score was ≥ 75 % (36 ≤ 48).
- -Moderate participation and satisfaction when total score was 60% < 75% (29 < 36).
- -Low participation and satisfaction when total score was < 60% (16 < 29).

Validity and reliability of tools:

Tools of data collection were reviewed by a panel of three experts in obstetrics and gynecology nursing to ensure its validity for comprehensiveness, accuracy and relevance. Reliability of the tools was assessed by using Cronbach's alpha coefficient test which indicated that the three tools consisted of relatively homogenous items and were moderate to high reliability. Internal consistency for knowledge regarding pregnancy care was 0.892, internal consistency for HPLP II was 0.846 and internal consistency for PPSQ was 0.875.

Ethical considerations:

Ethical aspects were considered before starting the research as the following: approval of the faculty ethics committee for scientific research was obtained for the fulfillment of the study (code:REC-OBSN-P72). An official permission from the selected research settings was obtained for the fulfillment of the study. The aim of the research was explained to each woman before applying the study. The researchers took oral consent from women to participate in the research and confidentialities were assured. The data was collected and treated confidentially. All women were given the freedom to withdraw from the research at any time without any reason. The research didn't have any physical or psychological risk on pregnant women and the educational booklet was provided to pregnant women in the control group at the end of the study to benefit in subsequent pregnancies.

Pilot Study

The pilot study was conducted on 10% of the total sample (14 women, 7 from each group) to test the clarity, objectivity, feasibility, relevance and applicability of the tools and to find out the possible obstacles and problems that might face the researcher and interfere with data collection. Also, it helped to estimate the time needed for data collection. No modifications were done. So, pregnant women who shared in the pilot study were included in the main study sample.

Field work

The research was carried out throughout the period from beginning of September 2023 till the end of August 2024, covering twelve months. The researchers visited the previously mentioned research setting two days/week (Sunday and Thursday) from 9 Am to 1 Pm. This research was conducted through the following sequential phases:

Interviewing and assessment phase:

At the beginning of the interview the researcher greeted each pregnant woman. The researcher distributed a pre-test of structured interviewing questionnaire to assess general

characteristics of women, women's knowledge regarding pregnancy and health promotion lifestyle profile-II to assess health promoting behaviors of the pregnant women.

Planning phase:

Based on the results obtained from pretest assessment of pregnant women and review of relevant literature, the researchers identified the actual needs for pregnant women accordingly, set goals and objectives. An educational booklet with colorful pictures in an Arabiclanguage was constructed by the researcher to improve the pregnant women's deficit of knowledge and health behaviors regarding pregnancy

Implementation phase:

The control group was received the routine individual prenatal care with a healthcare provider, there was no a structured plan for the education or skill building. Otherwise, answering any women's questions about pregnancy care as needed.

The study group: implementation of the PCC model was carried out at the pre-mentioned setting in an adjacent room prepared with adequate number of seats, data show and supportive materials for providing educational sessions. The pregnant women were divided into ten subgroups, each group included 6-8 women in similar gestational age. The overall sessions were conducted through ten sessions for each subgroup.

First session: the researchers started by an overview of pregnancy and pregnancy trimesters, meaning of antenatal care, importance, types and schedule of antenatal care in addition to routine antenatal investigations.

Second session: the researchers provided the pregnant women with knowledge about physiological changes during pregnancy and minor discomforts in the 1^{st}, 2^{nd} and 3^{rd} trimester.

Third session: the researchers provided the pregnant women knowledge about danger signs during pregnancy that necessitate medical supervision.

Fourth session: this session included knowledge about preparation of delivery with highlighting the advantages and disadvantages of each type.

Fifth session: the researchers trained pregnant women regarding physical assessment such as (measuring blood pressure, blood glucose, weight, fundal height, auscultate fetal heart tones and calculate the expected delivery date using the gestational wheel calculator and check urine for glucose or protein).

Sixth session: in this session the women were trained to count daily fetal movement as well as the practical skills for lifestyle changes during pregnancy such as healthy eating habits, proper weight gain during pregnancy, regular physical activity, enough rest and sleep.

Seventh session: the researchers demonstrated procedures for breast care, appropriate skills for preparing breasts for lactation, breastfeeding technique and positions with highlighting importance of breastfeeding for both mother and newborn.

Eighth session: this session included skills for stress management and effective coping for positive birth outcomes. Some of these skills included positive thinking, re-framing, good assertiveness skills, developing a social support network, humor, relaxation techniques such as (meditation, massage, yoga and imagination) as well as skills for sexual adaptation during pregnancy.

Ninth session: the researchers demonstrated procedures of perineal care as well as parenting skills included eye and cord care for newborn.

Tenth session: this session included skills for facilitating vaginal birth during pregnancy and measures to alleviate labor pain.

Evaluation phase:

For both groups, the researchers used the same format of tools; tool I part 2 to assess women's knowledge regarding pregnancy care,

tool II to assess health promoting behaviors of the pregnant women. Tool III to assess women's participation and satisfaction with the pregnancy centered care model only for the study group.

Statistical design:

Data was verified prior to computerized entry. The Statistical Package for Social Sciences (SPSS version 25) was used followed by data analysis and tabulation. Descriptive statistics were applied (e.g., mean, standard deviation, frequency and percentages). Also, tests of significance; independent t-test, Chi-square test (X^2) and Fisher Exact Test (FET) were applied to test the study hypothesis. Pearson correlation coefficients (r) were used.

- No statistically significant difference was considered when P> 0.05.
- A statistically significant difference was considered when P≤0.05.
- A highly statistically significant difference was considered when P≤0.001.

5. Results

Table (1) clarifies that 50% of the study group were in age group 25 < 30 years while 64.2% of the control group were less than 25 years with a mean age of 25.11 ± 1.84 years and 24.71 ± 1.42 years in the study and control groups, respectively. Concerning level of education, it was clear that 44.3% of the study group had secondary education while, 40% of the control group had university education. According to occupation 55.7% and 68.6% of the study group and control group respectively were working women. Moreover, 51.4% of study groups were lived in urban areas while, 57.1% of the control group were lived in rural areas, respectively. Additionally, there was no statistically significant difference between both groups regarding general characteristics (p > 0.05).

Figure (1) clarifies that 64.3% and 70% of women in the study and control groups respectively had inadequate knowledge regarding pregnancy before applying PCCM. Meanwhile, 88.6% of study group compared with 38.6% of the control group had adequate knowledge regarding pregnancy after applying PCCM.

Table (2) shows that there was no statistically significant difference in the mean scores of the total health promotion lifestyle behaviors and related dimensions with a mean score of 65.87 ±10.12 in the study group compared with 63.85 ± 11.07 in the control group before applying PCCM (p > 0.05). However, after applying PCCM there was a highly statistically significant difference of the total health promotion lifestyle profile II and related dimensions with a mean score of 112.65 ± 5.65 in the study group compared with 70.40 ± 11.33 in the control group (P ≤ 0.001).

Figure (2) shows that before applying PCCM 81.4% and 70.0% of women in the study and control groups respectively had unhealthy behaviors in relation to total health promotion lifestyle behaviors. Meanwhile, after applying PCCM 87.1% of the study group compared to 22.9% of the control group had healthy behaviors in relation to total health promotion lifestyle behaviors.

Figure (3): represents that 94.3% of the study group had high participation and satisfaction with the pregnancy centered care model.

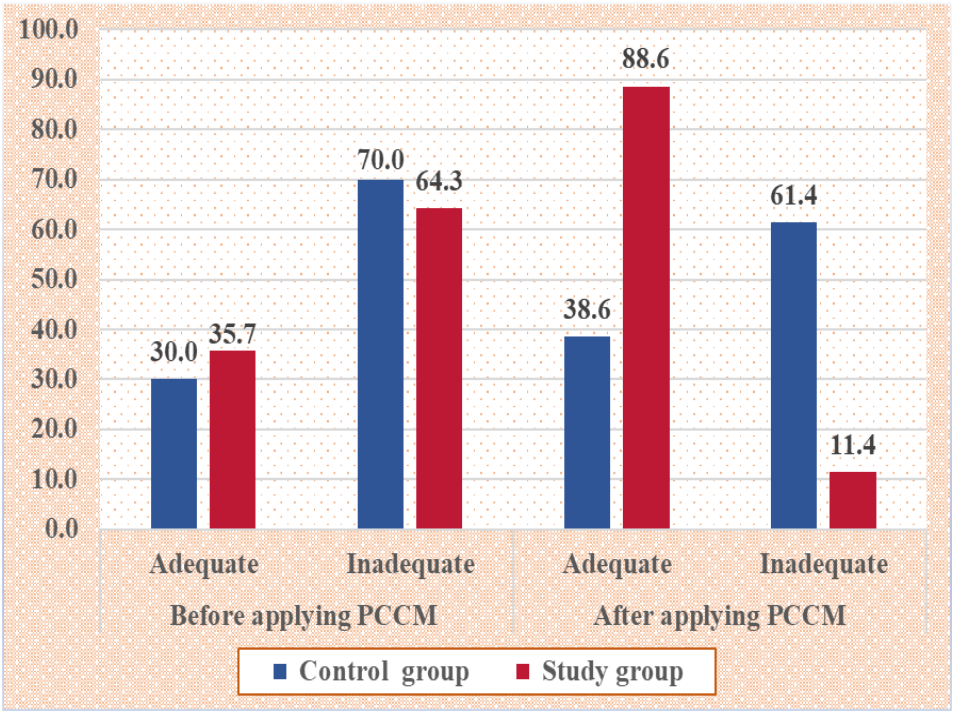
Table (3) reveals that there was a highly statistically positive correlation between total knowledge score and total health promotion lifestyle profile II scores before and after applying pregnancy centered care model in the study and control groups (P ≤ 0.001).

Table (4): clarifies that there was a highly statistically positive correlation between total knowledge, total health promotion lifestyle profile II scores and total patient's participation and satisfaction score after applying pregnancy centered care model in the study group (P ≤ 0.001).

Table (1): Distribution of the studied pregnant women in the study and control groups according to general characteristics (n=140).

Groups / Variables	Control group n=70		Study group n=70		X^2/ FET	P-value
	No.	%	No.	%		
Age (years)						
< 25	45	64.2	34	48.6		
25 < 30	23	32.9	35	50.0	4.348€	0.114
30 < 35	2	2.9	1	1.4		
Mean ± SD	24.71 ± 1.42		25.11 ± 1.84		t=1.443	0.151
Educational level						
Read and write	6	8.6	4	5.7		
Primary	10	14.3	13	18.6	1.950€	0.583
Secondary	26	37.1	31	44.3		
University	28	40.0	22	31.4		
Occupation						
Working	48	68.6	39	55.7	2.459	0.117
House wife	22	31.4	31	44.3		
Residence						
Urban	30	42.9	36	51.4	1.032	0.310
Rural	40	57.1	34	48.6		

€ Fisher Exact Test t= independent t-test



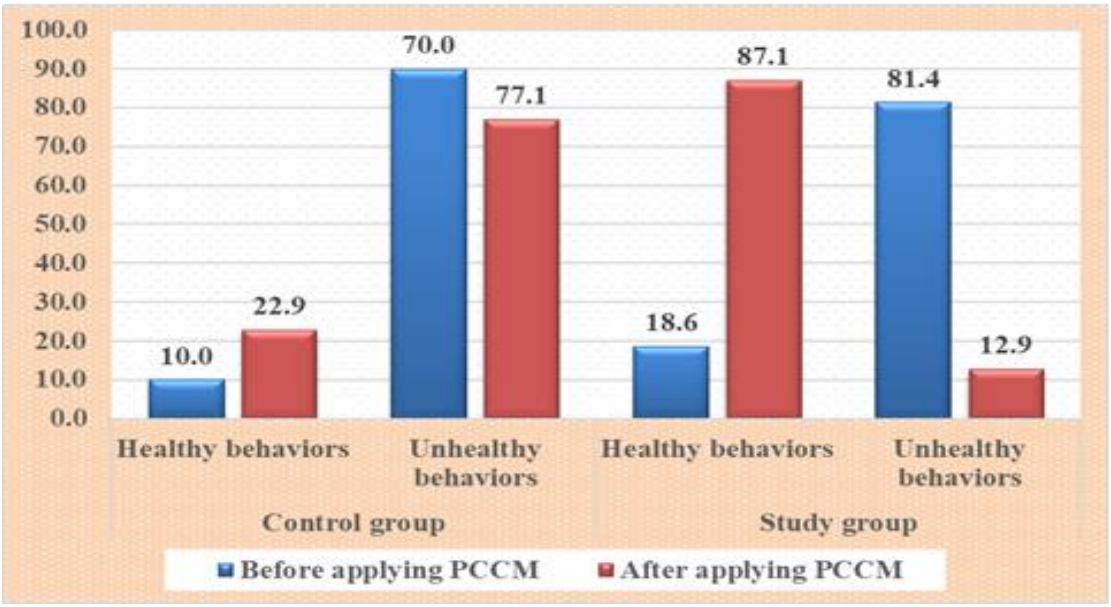
PCCM: Pregnancy Centered Care Model

Figure (1): Percentage distribution of the studied pregnant women according to total score of knowledge regarding pregnancy before and after applying pregnancy centered care model in the control and study groups (n=140)

Table (2): Comparison of mean subtotal and total health promotion lifestyle behaviors scores before and after applying pregnancy centered care model in the study and control groups(n=140).

Dimensions	Possible score	Phases	Control group n=70	Study group n=70	Independent t t-test	P-value
			Mean ± SD	Mean ± SD		
Health responsibility	27	Before applying PCCM	12.51 ± 2.10	12.23 ± 1.97	0.829	0.409
		After applying PCCM	13.27 ± 2.16	25.10 ± 1.87	34.550	0.000**
Physical activity	21	Before applying PCCM	9.07 ± 1.75	9.61 ± 1.85	1.733	0.085
		After applying PCCM	10.00 ± 1.94	16.38 ± 1.56	21.387	0.000**
Nutrition	33	Before applying PCCM	18.17 ± 4.46	19.31 ± 5.21	1.394	0.165
		After applying PCCM	20.08 ± 5.47	29.75 ± 2.93	13.022	0.000**
Interpersonal relations	24	Before applying PCCM	12.56 ± 2.51	12.81 ± 2.76	0.576	0.565
		After applying PCCM	13.82 ± 2.61	20.15 ± 1.98	16.228	0.000**
Stress management	24	Before applying PCCM	11.53 ± 2.04	11.91 ±1.99	1.136	0.258
		After applying PCCM	13.22 ± 2.53	21.26 ± 1.54	22.634	0.000**
Total	129	Before applying PCCM	63.85 ± 11.07	65.87 ±10.12	1.124	0.263
		After applying PCCM	70.40 ± 11.33	112.65 ± 5.65	27.899	0.000**

****A high statistical significance difference (P ≤ 0.001).** **PCCM: Pregnancy Centered Care Model**



PCCM: Pregnancy Centered Care Model

Figure (2): Percentage distribution of the studied pregnant women according to total health promotion lifestyle behaviors score in the control and study groups (n=140).

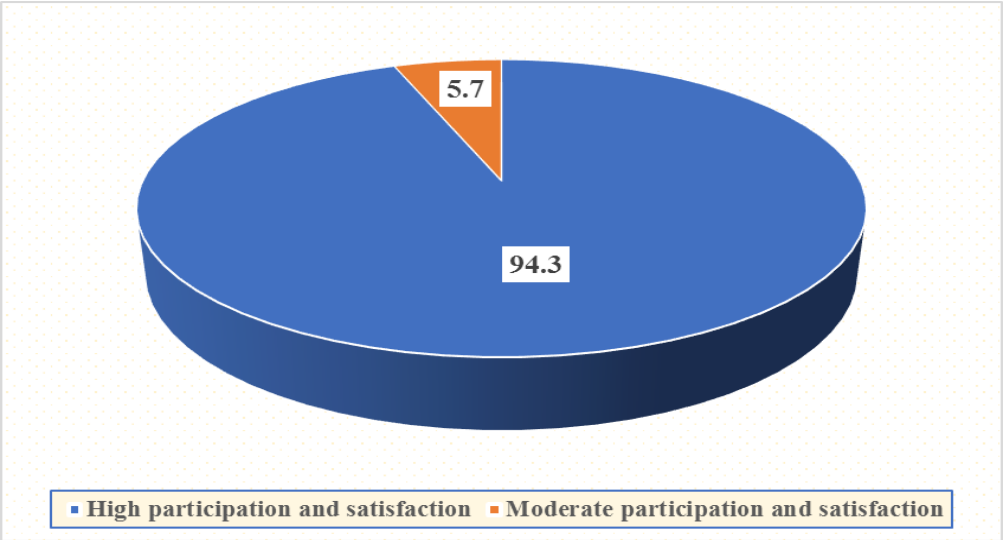


Figure (3): Percentage distribution of the pregnant women in the study group according to patient's participation and satisfaction with the pregnancy centered care model (n=70).

Table (3): Correlation coefficient between total knowledge and total health promotion lifestyle profile II score before and after applying pregnancy centered care model in the study and control groups (n=140).

Variables		Total knowledge score			
		Control group n=70		Study group n=70	
		r	p	r	p
Total health promotion lifestyle behaviors score	Before applying PCCM	0.424	0.000**	0.513	0.000**
	After applying PCCM	0.468	0.000**	0.590	0.000**

****A high statistically significant correlation (P ≤ 0.001)** **r: Pearson correlation coefficient**
PCCM: Pregnancy Centered Care Model

Table (4): Correlation coefficient between total knowledge, health promotion lifestyle behaviors scores and patient's participation and satisfaction with the provided care after applying pregnancy centered care model in the study group (n=70)

Variables	Total patient's participation and satisfaction score	
	r	p
Total knowledge score	**0.629**	**0.000****
Total Health Promotion Lifestyle behaviors score	**0.538**	**0.000****

****A high statistically significant correlation (P ≤ 0.001)** **r: Pearson correlation coefficient**

Discussion

Pregnancy Centered Care model is considered as innovative approach of GANC emphasizing group activities, women-led discussions and self-care to break down traditional "expert/woman" hierarchies and empower women. PCC includes risk assessment, interactive learning, education and support with a well-documented efficacy and engagement ***(Veenstra-Kwakkel et al., 2024; Wiseman et al., 2022).***

According to general characteristics of the studied sample, the results of the current study showed that half of study group were in age group 25 < 30 years and less than two thirds of control group were less than 25 years with a mean age of 25.11 ± 1.84 years and 24.71 ± 1.42 years in the study and control groups, respectively. *This result may be due to* all women were primigravida and this is the common age of marriage in Egypt.

Concerning level of education, it was clear that more than two fifths of study group had secondary education and two fifths of the control group had university education. According to occupation more than half and more than two thirds of the study group and control group respectively were working. Moreover, more than half of study groups were lived in urban areas, while slightly less than three fifths of the control group were lived in rural areas. Additionally, there was no statistically significant difference between both groups regarding general characteristics ($p > 0.05$) that reflected groups homogeneity.

The above-mentioned results are congruent with ***Elsehrawy et al., (2022)*** in Egypt and showed that more than one third of the studied women were in the age group 20 to 25, two fifths had university education and more than half are occupied. Also, a study carried out in Egypt by ***Khalil et al., (2023)*** and revealed that almost two thirds of pregnant women live in rural communities.

As regards total knowledge of the studied women regarding pregnancy, the results of the current study clarified more than three fifths and more than two thirds of women in the study and control groups respectively had inadequate knowledge regarding pregnancy before applying PCC model. However, the results of the current study demonstrated that majority of study group compared with slightly less than two fifths of the control group had adequate knowledge regarding pregnancy after applying PCC model. *This result may be due to* PCC model fostered comprehensive education that was delivered in a longer, more detailed visits which covered essential aspects of pregnancy. Also, the group sessions encouraged women to be more engaged with the content, actively participated in discussions and felt more empowered to ask questions leading to improved understanding and retention of pregnancy related knowledge.

This result comes in the same line with a study carried out in Holand by ***Wagijo et al., (2023)*** and reported that after applying centering pregnancy women had higher knowledge scores regarding pregnancy than pretest scores. Also, this result is agreed by ***Ratzon et al., (2022)*** and stated that almost two thirds of women in the group antenatal care demonstrated a significant improvement in knowledge compared to only quarter of women in control group with a highly statistically significant difference ($p<0.001$).

Concerning health promotion lifestyle behaviors, the results of the current study revealed that the majority and more than two thirds of women in the study and control groups respectively had unhealthy behaviors during pregnancy before applying PCC model. While, the majority of the study group compared to more than one fifth of the control group had healthy behaviors during pregnancy after applying PCC model. *This result may be due to* the PCC provided comprehensive education on health promoting behaviors such as nutrition, proper weight gain, physical activity and stress management. On the other hand, avoiding health impairing behaviors such as caffeine, avoid foods containing saturated fats, high sugar or processed foods.

This result is supported by ***Tsiamparlis-Wildeboer et al., (2023)*** in Netherlands and proved that centering pregnancy support health responsibility of women to a higher extent, women exhibit autonomy on health behavior

changes than women in individual appointments with a statistically significant difference ($p \leq 0.05$).

Also, this result is nearly similar to the study carried out by ***Wagijo et al., (2023)*** who revealed that women participating in PCC have an increased healthy eating, drinking enough fluids and regular physical activity, consume less coffee, alcohol and lower smoking rates at six weeks postpartum compared to women in the individual care.

The result of current study is supported by ***Grenier et al., (2022)*** who pointed that pregnant woman had higher engagement of health promoting behaviors in group antenatal care than individual antenatal care. Furthermore, ***Buultjens et al., (2021)*** who indicated that most of the women participating in centering pregnancy had adapted healthy eating recommendations and physical activity as well as abstained from alcohol and smoking. Also, a higher rate of early initiation of breast feeding was observed.

Moreover, this result is nearly similar to a study carried out by ***Wagijo et al., (2022)*** who reported that most women undergo PCC model had higher scores on healthy lifestyle including healthy eating habits and regular physical activity good dental care and higher pregnancy knowledge.

Additionally, this result is consistent with ***Renbarger et al., (2020)*** who studied "The influence of four constructs of social support on pregnancy experiences in group prenatal care" in United States and stated that group prenatal care provided a means to the formation of positive interpersonal relationships with health care providers and with other peers in the group.

In relation to participation and satisfaction with the pregnancy centered care model, the results of the current study showed that most of the study group had high participation and satisfaction with the pregnancy centered care model.

This result is consistent with ***Short et al., (2024)*** and showed that all group prenatal care participants were satisfied to very satisfied with the program. In addition, ***Sadiku et al., (2024)*** in London and reported higher satisfaction with group antenatal care than with individual ANC and greater willingness for service utilization and higher access to care.

The result of current study is also supported by ***Sawtell et al., (2023)*** stated that the most of women reported higher satisfaction with the antenatal care and active participation in antenatal care was allowed. Additionally, ***Mehay et al., (2023)*** in London and revealed that GANC had a positive effect on women's satisfaction and active participation in the antenatal care.

As regards correlation between total knowledge and total health promotion lifestyle behaviors score, the finding of the current study revealed that there was a highly statistically positive correlation between total knowledge score and total health promotion lifestyle behaviors scores before and after applying pregnancy centered care model in the study and control groups. *This result may be due to* PCC emphasizes interactive, group-based learning which enabled women to translate knowledge into actionable health-promoting behaviors.

This result is in accordance with ***Rafat, et al., (2025)*** in Iran and demonstrated that there was a significant and positive correlation between total health-related knowledge and total health promoting lifestyle ($r = 0.53$, $p < 0.001$).

This result is nearly similar to ***Fathnezhad-Kazemi et al., (2021)*** in Iran and reported that there was a direct and significant correlation between the scores of social support and health-promoting behavior ($r=0.36$; $P<0.001$).

Concerning correlation between total knowledge, health promotion lifestyle behaviors scores and patient's participation and satisfaction with the model, the findings of the

current study clarified that there was a highly statistically positive correlation between total knowledge, total health promotion lifestyle behaviors scores and total patient's participation and satisfaction score after applying pregnancy centered care model in the study group.

This result may be due to increased knowledge equipped women with a better understanding of health behaviors, empowering women to take an active role in health promoting behaviors related to pregnancy. This active engagement leading to higher participation and satisfaction levels.

This result is approximately similar to the results of ***Masjoudi et al., (2022)*** in Iran and showed that there was a significant positive correlation between health-promoting behaviors with social support ($r = 0.427$, $p < 0.001$) and satisfaction ($r = 0.246$, $p = 0.001$). Also, social support had a significant positive association with satisfaction ($r = 0.184$, $p < 0.001$).

Also, this result is nearly similar to ***El Sayed and Abd-Elhakam (2018)*** in Egypt and pointed that there was a highly statistically significant positive correlation between total prenatal health behaviors and pregnancy-related empowerment scores between the centering pregnancy and individual prenatal care groups pre and after intervention ($P \leq 0.001$).

Conclusion:

Based on the results of the current study, it was concluded that; pregnancy centered care model was effective in improving knowledge, health behaviors as well as high participation and satisfaction with the pregnancy centered care model. Additionally, there was a highly statistically significant improvement in relation to health promotion lifestyle behaviors and related dimensions regarding health responsibility, physical activity, nutrition, interpersonal relations and stress management after applying pregnancy centered care model in study group compared with control group. Moreover, most of women in the study group had high participation and satisfaction with the pregnancy centered care model. Therefore, the study hypotheses were supported and the study aim was achieved.

Recommendations:

- Implementation of pregnancy centered care model as a standard practice considering a proper antenatal care clinics and rooms design for promoting healthy behaviors.
- Dissemination of the booklet and posters regarding pregnancy centered care model to educate and improve pregnant women's knowledge and health behaviors .

Further studies:

- Rigorous research is essential focused on best practices for training antenatal care providers to deliver PCC in new contexts and investigating barriers to implement to be widely used in Egypt.
- Future research is crucial to conduct a similar study on a larger sample size in different clinical settings for generalization of the findings.

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