

Effect of Nutritional Awareness Intervention for Pregnant Women on Maternal and Neonatal Outcomes

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Abstract: Background: Good nutrition is essential for physical and mental development, performance improvement, and productivity throughout life. Healthy nutrition during pregnancy helps to maintain the normal growth and development of the fetus. The purpose of the present study was to assess the effect of nutritional awareness intervention for pregnant women on maternal and neonatal outcomes. **Design:** A quasi-experimental design (study and control groups) was utilized in implementing this study. **Sample:** A purposive sample of 180 women was chosen and randomly divided into two groups: study and control groups (90 for each group). **Settings:** This study was conducted at the (MCH) Shebin El-Kom (Quebly) and Bahari (MCH) Menouf City and obstetric clinics in Menouf General Hospital. **Instruments** of this study were a structured interview questionnaire that included socio-demographic characteristics of women, a women's knowledge assessment instrument; and a maternal and neonatal outcomes assessment instrument. **Results:** Total knowledge scores regarding healthy nutrition were highly improved after the implementation of nutritional intervention (100.0% good knowledge scores) than before (5.6% good knowledge scores), among the studied pregnant women. There was a statistically significant difference between the study and control groups regarding maternal and neonatal outcomes after delivery. **Conclusion:** Pregnant women who received nutritional awareness intervention during pregnancy had higher knowledge scores after intervention than before, better maternal and neonatal outcomes than women who did not receive it. **Recommendations:** Continuous monitoring of pregnant women's nutritional knowledge is required during each antenatal visit.

Keywords: *Maternal outcomes, Neonatal outcomes, Nutritional awareness*

Introduction

Aparicio et al. (2020) clarified that pregnancy is an occasion when women become more aware of the importance

of healthy nutrition and seek out more nutrition-related information. Moreover, Sanghvi et al. (2022) stated

*Effect of Nutritional Awareness Intervention for Pregnant Women on
Maternal and Neonatal Outcomes*

that the adequate implementation of adequate maternal nutrition will contribute to maternal health improvement, support the reduction of maternal morbidity and mortality, and improve knowledge and healthy skills for the provision of maternal and child nutritional services at the health facility level. Furthermore, Johnso (2023) concluded that by promoting awareness about the importance of a balanced diet and specific nutrient requirements during pregnancy, women can make conscious decisions to consume adequate amounts of essential nutrients, vitamins, and minerals. Also, he revealed that this, in turn, helps to reduce the risk of maternal malnutrition and its associated complications.

Similarly, Sebastian et al. (2022) found that one of the key effects of nutritional awareness is the prevention of maternal malnutrition. Meanwhile, they argued that malnutrition during pregnancy can lead to various complications, such as an increased risk of anemia, gestational diabetes, hypertension, osteomalacia, an increased incidence of amenorrhea, miscarriage, and pregnancy toxemia. Likewise, they reported that other risk factors may be increased in fetuses due to insufficient and unbalanced nutrition, such as stillbirth, premature birth, congenital anomalies, low birth weight, fetal death, and mental retardation.

In addition, Mohamady et al. (2022) noticed that maternity nurses play a crucial role in promoting nutritional awareness and its impact on maternal, and neonatal outcomes. Also, they showed that they are at the forefront of providing prenatal care and education, and their involvement can significantly influence the health and wellbeing of the pregnant women and their infants. Additionally, Carter et al. (2022)

suggested that nurses regularly monitor the weight gain, blood pressure, and overall health of the pregnant women to evaluate the impact of nutritional interventions. Also, they can recognize and address the barriers that may hinder pregnant women from achieving optimal nutrition. Moreover, Mekhoa et al. (2022) mentioned that through assessment, education, individualized care planning, monitoring, addressing barriers, providing continuity of care, and advocating for women's needs, nurses contribute significantly to improve maternal and neonatal health outcomes through enhanced nutritional awareness.

SIGNIFICANCE OF THE STUDY

According to Killen et al. (2020), globally, maternal and child malnutrition is the underlying cause of 3.5 million deaths. Also, they stated that the main nutritional issues impacting pregnant women were protein and energy under nutrition and deficiencies of micronutrients, such as iron, floats, calcium, vitamin D, and vitamin A. Moreover, Syarif et al. (2020) stated that awareness of pregnant women about nutrition plays an important role in fulfilling maternal nutrition. In addition, Sienso et al. (2022) explained that deficiencies in essential nutrition during pregnancy are linked to poor health outcomes, such as miscarriage, stillbirths, congenital defects, low birth weight, infant mortality, impaired cognitive development, and cardiometabolic risks in adult life.

THE PURPOSE OF THE STUDY

The present study's purpose is to assess effect of nutritional awareness intervention for pregnant women on maternal and neonatal outcomes.

*Effect of Nutritional Awareness Intervention for Pregnant Women on
Maternal and Neonatal Outcomes*

Research Hypotheses

- 1) Pregnant women who receive nutritional awareness intervention during pregnancy are expected to have higher scores of knowledge than women who do not receive it.
- 2) Total knowledge scores of the pregnant women after intervention are expected to be higher than before.
- 3) Pregnant women who receive nutritional awareness intervention during pregnancy are expected to have better maternal outcomes than women who do not receive it.
- 4) Pregnant women who receive nutritional awareness intervention during pregnancy are expected to have better neonatal outcomes than women who do not receive it.

Method

Research design:

A quasi-experimental research design (study and control) was used to carry out this study.

Research Setting:

The study was conducted in three settings: Shebin El-Kom (Maternal and Child Health Care Center) (Quebly and Bahary), Menouf City (Maternal and Child Health Care Center) and obstetric clinics in Menouf General Hospital.

Sample size estimation:

The sample was calculated using the following equation: By using G* power software with an independent sample t-test, with a P-value of 0.05, a power of 0.95, and a medium low effect size of 0.15. The needed sample size of 180 women was chosen and randomly divided into two groups.

A purposive sample of 180 women was selected. They were equally divided into a study and control groups (each with 90 participants).

Inclusion criteria for the sample are as follows:

- 1) Women at reproductive age 20-35 years old.
- 2) Nulliparous and multiparous.
- 3) Women who are free from medical disorders because they may have maternal and neonatal complications as a result of their medical disorders.

Instruments for data collection consisted of:

Instrument One: Structured interview questionnaire (Appendix A):

It was developed by the researcher after reviewing related literature (Desta et al., 2019) to collect the necessary data about the study participants. It includes the following parts:

- **Part 1:** Women's socio-demographic characteristics: It was used to collect data about: age, level of education, marital status, occupation, residence, and family income.
- **Part 2:** Previous and current reproductive history: such as gravidity, parity, spacing period, number of abortions, number of still births, number of living children, mode and place of past deliveries, previous complications during pregnancy, and delivery, previous fetal and neonatal complications. Also, it included the last menstrual period (LMP) and the expected date of delivery (EDD).

*Effect of Nutritional Awareness Intervention for Pregnant Women on
Maternal and Neonatal Outcomes*

Instrument two: Nutritional assessment instrument:

Women's knowledge assessment interview: It was developed by the researcher after reviewing of related literature (Sunuwar et al., 2019). It included four parts:

- **Part 1:** Knowledge regarding healthy nutrition during pregnancy: It included questions regarding the importance of balanced diet during pregnancy, the risks of not following a healthy diet, the healthy behaviors regarding nutrition and the healthiest ways to prepare food.
- **Part 2:** Knowledge regarding the ingredients of healthy nutrition: It included questions regarding proteins, carbohydrates, sugar, fats and vitamins.
- **Part 3:** knowledge regarding nutritional supplements during pregnancy: It included questions regarding nutritional supplements such as iron, calcium, iodine salts, vitamin A , E, D, B12, folic acid and omega3, for each item, ask questions about the importance, duration, food sources, and health risks for the mother and her fetus related to deficiencies.
- **Part 4:** Knowledge regarding the integrated meal during pregnancy: It included questions regarding components of breakfast, lunch, dinner, numbers of meals per day, the largest portions of food should be taken and drinks should be taken in between meals.

The score of each item was summed up and then converted into percent score, adapted from Ahamed et al. (2018).

Scoring system:

- Complete answers were scored as 2.
- Incomplete answers were scored as 1.
- Don't know were scored as zero .

The total score for knowledge was calculated as follows:

- Good knowledge: 75-100%.
- Fair knowledge: 50- < 75%.
- Poor knowledge: 0- < 50%.

Instrument three: Outcome assessment instrument:

This instrument was developed by the researcher and used to evaluate the maternal and neonatal outcome. It includes two parts.

- **Part 1:** Maternal outcomes: It included the following: mode of membrane rupture (spontaneous or artificial), mode of delivery (vaginal, forceps, or cesarean section), occurrence of complications during labor, such as prolonged labor, premature rupture of membrane, intrapartum hemorrhage, and cord prolapse. In addition, complications that occurred during postpartum period, such as early postpartum hemorrhage, uterine sub- involution and occurrence of puerperal sepsis.
- **Part 2:** Neonatal outcomes: It included the following: birth weight, gestational age, and viability status (alive or stillborn), gender (male or female), full term or preterm, and raised complications such as underweight, signs of neonatal respiratory distress syndrome, abnormalities in Apgar scores results, and neonatal jaundice.

Effect of Nutritional Awareness Intervention for Pregnant Women on Maternal and Neonatal Outcomes

Validity of the Instruments:-

The validity of the instruments was established by five qualified experts (three experts from the Maternal and Newborn Health Nursing department at the Faculty of Nursing, one expert from the Faculty of Home Economics Nutrition Department and one physician from the Obstetrics and Gynecology department at the Faculty of Medicine). They reviewed the instruments for content accuracy and internal validity. They also were asked to judge the items for completeness and clarity (content validity). Suggestions were incorporated into the instruments and modifications were made.

Reliability of the Instruments:-

The reliability of the instruments was applied by the researcher to test the internal consistency of the instruments using test-retest reliability, and these methods were done by administering the same instruments to the same subjects under similar conditions on one or more occasions.

Pilot Study:

A pilot study was implemented to test the applicability of the instruments, the feasibility of the study, and the time needed for data collection. It was performed on 10% of the total participants, which is 18 participants.

Ethical considerations

The protocol was approved by the Ethical and Research Committee in Menoufia University's Faculty of Nursing. An oral consent was obtained from the participants regarding their approval to share in the study. They

were assured of the confidentiality and anonymity of the collected data.

Procedure:

- An official letter was submitted from the Dean of the Faculty of Nursing at Menoufia University to the directors of the Maternal and Child health Care Center in Shebin El-Kom (Quebly and Bahary), Menouf City and obstetric clinics in Menouf General Hospital. The letter contained the purpose of the study and methods of data collection. The data collection for the study took eight months, from (August) 2022 to the end of (March) 2023. The researcher visited the previously mentioned settings three days a week (Monday and Wednesday) from 9.30 Am to 12 pm in the maternal & child health care centers and Tuesday in the obstetric clinic.
- At the study's beginning, the researcher introduced herself and explained its purpose and nature to the participants. Women who fulfilled the inclusion criteria came to the previously stated settings during the second stage of pregnancy. Telephone numbers were taken to facilitate communication and follow up. The researcher started to give health education sessions immediately after the interviewing phase according to pregnant women needs derived from pre –test. An educational booklet was used as a guide to facilitate explanation and to be a reference for them.
- The nutritional program consisted of three sessions; the duration of each session was 10- 15 minutes. The sessions were provided in group containing between 8 - 10 pregnant women according to the availability of cases. The first session was about definition of nutritional awareness

*Effect of Nutritional Awareness Intervention for Pregnant Women on
Maternal and Neonatal Outcomes*

and the importance of proper nutrition during pregnancy. The second session contained an overview of important nutritional requirements for pregnant women. The third session contained nutritional guidelines, balanced meal and dietary behaviors.

- Evaluation was conducted one month after the intervention (post-test) and after six months (after delivery) to evaluate the results of the intervention on maternal and neonatal outcomes.
- Data were collected, tabulated, and statistically analyzed using an IBM personal computer with Statistical Package of Social Science (SPSS) version 25 (SPSS, Inc, Chicago, Illinois, USA), where the following statistics were applied:

Statistical Analysis:

- **Descriptive statistics:** in which quantitative data were presented in the form of mean, standard deviation (SD), and qualitative data were presented in the form of numbers and percentages.
- **Analytical statistics:** used to find out the possible association between the study factors and the targeted variables. The used tests of significance included:

Chi squared test (χ^2):

- It is a test of significance used for comparison between two groups having qualitative variables.
- Student t-test: it is a test of significance used for comparison between two groups having quantitative variables.

The statistical significance of the results was explained as follows:

- $P \leq 0.001$ indicates highly significant,
- $P \leq 0.05$ indicates significant, and

Results

Table (1) shows that there were no statistically significant difference regarding the socio-demographic characteristics of the studied pregnant women in the study and control groups in terms of age, educational, marital status, occupation, residence and family income.

Table 2 shows that there was no statistically significant difference and pregnant women having different reproductive characteristics in the two groups ($P > 0.05$).

Figure 1 shows knowledge of pregnant women in the study group about healthy nutrition. Their level of knowledge increased from 28.90% (poor knowledge scores) pre intervention to 100.00% (good knowledge scores) post intervention.

Figure 2 shows that the total knowledge scores regarding ingredients of healthy nutrition increased from 20.0% (poor knowledge scores) pre-intervention to 100% (good knowledge scores) post-intervention.

Table 3 shows that there was very highly statistically significant difference regarding the total knowledge scores about the nutritional supplements during pregnancy among the study group before and after the intervention (p value ≤ 0.001). It was clear that the knowledge regarding the nutritional supplements during pregnancy extremely increased to be

*Effect of Nutritional Awareness Intervention for Pregnant Women on
Maternal and Neonatal Outcomes*

100.0% (good knowledge scores) post-intervention.

Figure 3 shows that there was highly statistically significant difference regarding the total knowledge scores about the integrated meal among the study group pre and post-intervention. It was clear that knowledge score regarding the integrated meal during pregnancy was highly increased from 10.0% good knowledge scores pre-intervention to 100.0% good knowledge scores post-intervention.

Table 4 shows that there was no statistically significant difference regarding the total knowledge scores of the participants in the study and control groups pre-intervention (p value > 0.05). It is clear that 72.2% and 75.6%, respectively of the study and control groups had poor knowledge regarding nutrition during pregnancy before implementation of educational intervention.

Table 5 shows that there was a very highly statistically significant difference between participants in the study group pre and post-intervention

(p value < 0.001). Also, total knowledge scores very highly improved after implementation of the educational intervention..

Table 6 reveals the comparison between the study participants regarding their maternal outcomes. It is clear that there was no statistically significant difference between the study and control groups regarding mode of delivery and mode of membrane rupture. Also, it is obvious that participants in the study group had fewer complications during and after delivery than participants in the control groups. So, there were statistical and very highly statistical significant differences (p value < 0.05, < .001).

Table 7 reveals the comparison between the study participants regarding their neonatal outcomes. It is clear that participants in the study group had fewer complications for their fetuses than participants in the control groups. So, there were statistical and very highly statistical significant differences (p value < 0.05, < .001).

Effect of Nutritional Awareness Intervention for Pregnant Women on Maternal and Neonatal Outcomes

Table (1): Socio-demographic Characteristics of the Study Participants (N = 180)

Variables	The study participants (N = 180)				X2	P Value
	Study (N = 90)		Control (N = 90)			
	No.	%	No.	%		
Age						
Mean ± Standard Deviation	27.62±4.87		27.52±4.73		T .140	.889
Minimum	20.00		20.00			
Maximum	35.00		35.00			
Education						
Basic education	4	4.4%	3	3.3%	.652	.722
Secondary education	33	36.7%	38	42.2%		
University education	53	58.9%	49	54.4%		
Marital status						
Married	90	100.0%	90	100.0%	a	A
Occupation						
Working	45	50.0%	41	45.6%	.356	.655
Not working	45	50.0%	49	54.4%		
Residence						
Urban	17	18.9%	20	22.2%	.306	.713
Rural	73	81.1%	70	77.8%		
Family income						
Sufficient	51	56.7%	53	58.9%	.091	.880
Insufficient	39	43.3%	37	41.1%		

Table 2: Reproductive History of Pregnant Women (N = 180)

Variables	The participants (N = 180)				X2	P Value
	Study group (N = 90)		Control group (N = 90)			
	No.	%	No.	%		
Gravidity						
Primigravida	25	27.8%	22	24.4%	.763	.858
Twice	16	17.8%	20	22.2%		
Three times	30	33.3%	31	34.4%		
Four times or more	19	21.1%	17	18.9%		
Parity						
Nulliparous	26	28.9%	24	26.7%	.596	.897
Once	25	27.8%	29	32.2%		
Twice	33	36.7%	30	33.3%		
Three or more	6	6.7%	7	7.8%		
Abortion						
None	67	74.4%	68	75.6%	.031	.985
Once	22	24.4%	21	23.3%		
Twice	1	1.1%	1	1.1%		
Time of last pregnancy						
Less than two years	10	15.4%	16	23.5%	1.402	.278
More than two years	55	84.6%	52	76.5%		
Number of living children						
None	30	33.3%	28	31.1%	.822	.844
One	18	20.0%	23	25.6%		
Two	33	36.7%	30	33.3%		
Three or more	9	10.0%	9	10.0%		
The number of still births						
None	87	96.7%	88	97.8%	.206	1.000
One	3	3.3%	2	2.2%		

Effect of Nutritional Awareness Intervention for Pregnant Women on Maternal and Neonatal Outcomes

Figure (1): Total knowledge scores of the study group regarding healthy nutrition during pregnancy pre and post- intervention

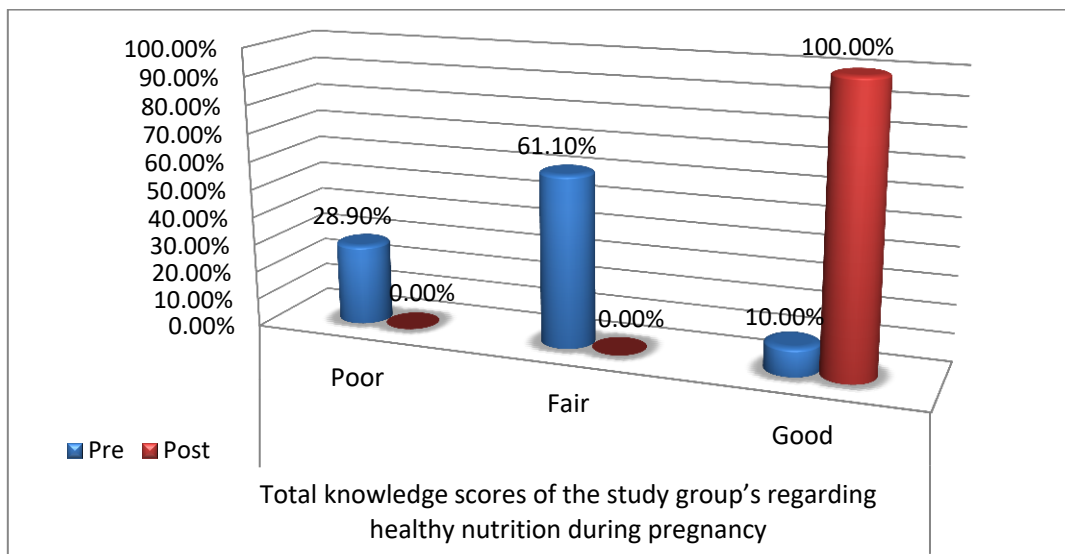


Figure (2): Total knowledge scores of the study group about the ingredients of healthy nutrition pre and post-intervention

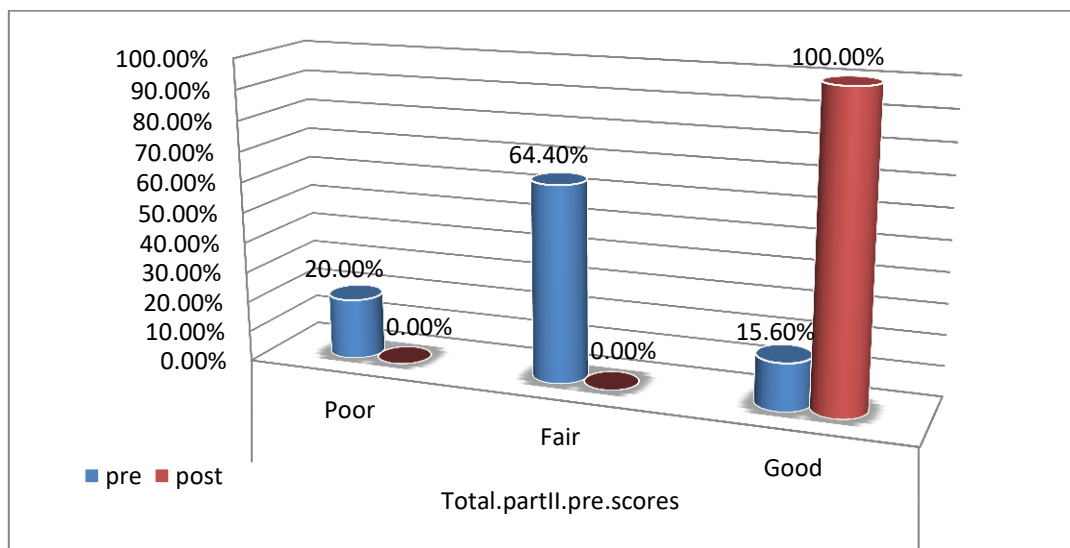


Table (3): Total Knowledge Scores of Study Group about Nutritional Supplements

Variables	The study group (N = 90)				X2	P value
	Pre		Post			
	No.	%	No.	%		
Total knowledge scores regarding nutritional supplements						
Poor	66	73.3%	0	0.0%	171.558	0.004
Fair	22	24.4%	0	0.0%		
Good	2	2.2%	90	100.0%		

Effect of Nutritional Awareness Intervention for Pregnant Women on Maternal and Neonatal Outcomes

Figure (3): Total knowledge scores of the study group regarding the integrated meal during pregnancy pre and post-intervention.

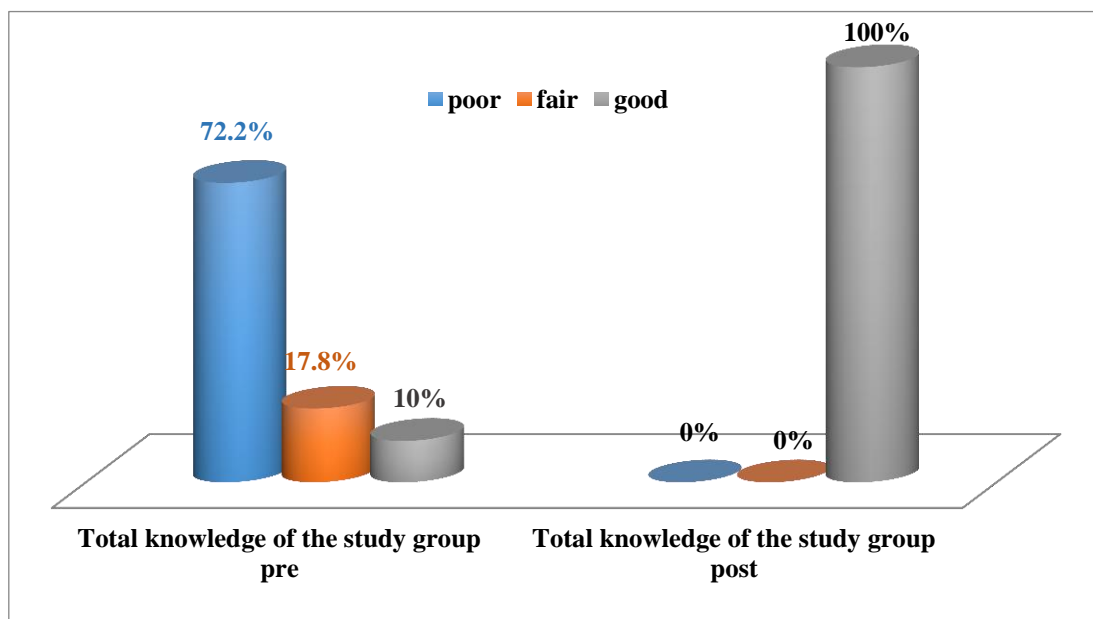


Table (4): Total Knowledge Scores of Participants in the Study and Control Groups Pre-Intervention

Variables	The participants (N = 180)				X2	P value
	Study (N = 90)		Control (N = 90)			
	No.	%	No.	%		
Total knowledge scores of the participants pre-intervention						
Poor	65	72.2%	68	75.6%	17.845	.947
Fair	20	22.2%	19	21.1%		
Good	5	5.6%	3	3.3%		

Table (5): Total Knowledge Scores of Participants in the Study Group Pre and Post-Intervention

Variables	The study group (N = 90)				X2	P value
	Pre		Post			
	No.	%	No.	%		
Total knowledge scores of the study group						
Poor	65	72.2%	0	0.0%	412.144	.000
Fair	20	22.2%	0	0.0%		
Good	5	5.6%	90	100.0%		

**Effect of Nutritional Awareness Intervention for Pregnant Women on
Maternal and Neonatal Outcomes**

Table (6): Comparison between the Participants in the Study and Control Groups Regarding their Maternal Outcomes (N = 180)

Variables	The participants (N = 180)				X2	P Value
	Study group (N = 90)		Control group (N = 90)			
	No.	%	No.	%		
Mode of delivery.						
Normal	12	13.3%	10	11.1%	.207	1.000
Cesarean section	78	86.7%	80	88.9%		
Mode of rupture of membrane.						
Spontaneous	30	33.3%	31	34.4%	.025	1.000
Artificial	60	66.7%	59	65.6%		
Complications during delivery.						
Yes	3	3.3%	20	22.2%	16.77	0.0001
No	87	96.6%	70	77.8%		
What are the complication?						
No	87	96.6%	70	77.8%	17.02	0.002
Premature labor	1	1.1%	6	6.7%		
Premature rupture of membranes	2	2.2%	9	10.0%		
Intrapartum hemorrhage	0	0.0%	4	4.4%		
Cord prolapses	0	0.0%	1	1.1%		
Complications after delivery.						
Yes	2	2.2%	12	13.3%	7.745	0.01
No	88	97.7%	78	86.7%		
What are the problems?						
Early postpartum hemorrhage	1	1.1%	5	5.6%	1.296	0.005
Puerperal fever	1	1.1%	7	7.8%		
Uterine sub involution	0	0.0%	5	5.6%		

Table (7): Comparison between the Participants in the Study and Control Groups Regarding their Neonatal Outcomes (N = 180)

Variables	The participants (N = 180)				X2	P Value
	Study (N = 90)		Control (N = 90)			
	No.	%	No.	%		
Newborn weight						
> 2.5 kg	89	98.9%	79	87.8%	8.92	0.005
< 2.5 kg	1	1.1%	11	12.2%		
The gestational age of the newborn						
Full > 37 weeks	89	98.9%	80	88.9%	7.843	0.009
Premature < 37 weeks	1	1.1%	10	11.1%		
The state of the newborn						
Alive	90	100.0%	86	95.5%	5.143	0.05
Dead	0	0.0%	4	4.4%		
The gender of the newborn						
Male	65	72.7%	50	55.6%	5.418	0.02
Female	25	27.8%	40	44.4%		
Did the newborn have any complications after birth						
Yes	2	2.2%	13	14.4%	8.800	0.003
No	88	97.8%	77	85.6%		
What are these complications						
Under weight	1	1.1%	11	12.2%	0.288	0.591
Signs of respiratory distress syndrome	0	0.0%	5	5.6%		
Neonatal jaundice	1	1.1%	6	6.7%		
Abnormalities in Apgar score results	0	0.0%	5	5.6%		

*Effect of Nutritional Awareness Intervention for Pregnant Women on
Maternal and Neonatal Outcomes*

Discussion

Nutrition during pregnancy has a major impact on the outcome of pregnancy and accredited as an important determinant for a healthy and successful pregnancy including the life-long health of future generation. This study aimed to assess the effect of nutritional awareness for pregnant women on maternal and neonatal outcomes.

Regarding knowledge of participants about healthy nutrition during pregnancy on pre-intervention, this study revealed that nearly one-third of the study and control groups had poor knowledge, nearly two-thirds of them had fair knowledge, and a few of them had good knowledge regarding healthy nutrition during pregnancy.

Findings of this study were supported by Abd El-Hamied et al. (2021), who conducted a study about effect of instructional package on pregnant women's knowledge and attitude regarding healthy nutrition at Benha University Hospital, Egypt, and found that there was a highly statistically significant difference regarding knowledge about healthy nutrition among the studied pregnant women at pre- and post-instructional package implementation. Besides, educational intervention plays a very important role in helping pregnant women acquire knowledge regarding healthy nutrition during pregnancy.

Contrarily, these findings disagreed with those of Weerasekara et al. (2020), who conducted a study on food and nutrition-related knowledge, attitudes, and practices among reproductive-age women in

marginalized areas of Sri Lanka, and found that most women have a positive attitude towards receiving nutritional knowledge and low-level practice about a healthy diet.

Regarding the knowledge about the ingredients of healthy nutrition, the current study revealed that nearly one-fifth of the study and control groups had poor knowledge, more than two-thirds of them had fair knowledge, and few of them had good knowledge regarding the ingredients of healthy nutrition. Also, knowledge about the ingredients of healthy foods was extremely increased in the post-test after the intervention, with a highly statistically significant difference among the studied pregnant women at pre- and post-implementation of the educational intervention. On the same line, a study conducted in Sir Ganga Ram Hospital, Lahore, Pakistan, by Kaleem et al. (2020) to evaluate the effects of antenatal nutrition counseling on dietary practices and nutritional status of pregnant women: A quasi-experimental hospital-based study. They showed an improvement in the number of women taking recommended portions of bread and cereals, vegetables, milk, and dairy products. The frequency of women taking the recommended diet as per the food guide pyramid improved, and vitamin D status also showed improvement in the number of women with normal levels of serum vitamin D after nutritional counseling. Regarding to the researcher's point of view, this may be due to these studies indicated that the level of knowledge about

Effect of Nutritional Awareness Intervention for Pregnant Women on Maternal and Neonatal Outcomes

specific elements of nutrition improved after the implementation of nutritional interventions. On the other hand, this result is contradicted with Najpaverova et al. (2020), who conducted a study on the relationship of nutritional energy and macronutrient intake with pregnancy outcomes in Czech pregnant women and found a decrease in macronutrients intake with the advancing stage of pregnancy. This could be attributed decrease the sample size of the previous study.

Regarding the knowledge about nutritional supplements during pregnancy, this study revealed that most of the study and control groups had poor knowledge, and a few of them had fair knowledge about nutritional supplements before the intervention. Also, knowledge about nutritional supplements during pregnancy extremely increased in the post-test after educational intervention. In the same line, a quasi-experimental study was conducted by Teweldemedhin et al. (2021), and they reported that the level of knowledge regarding the necessity of supplementation because of the inadequacy of nutrients in foods increased at the immediate post-intervention time than at the pre-intervention time, and again in 6 weeks' time.

Also, these findings were supported by Soyly (2019), who conducted a study on the effects of nutrition education on the general health and nutrition status of pregnant women and proved that there were significant increases in the nutritional knowledge score and mean intake of calcium, iron, vitamin A, and

weight gain in the intervention group, as well as increases in the mean intake of energy, protein, and vitamin C. On the other hand, this result contradicts Weerasekara et al. (2020), who found that the majority of participants did not know about vitamins and minerals.

For knowledge about the integrated meal during pregnancy, this study revealed that more than two-thirds of the study and control groups had poor knowledge, and a few of them had fair and poor knowledge about the integrated meal during pregnancy, with no statistically significant difference between the study and control groups pre-intervention. Also, knowledge about the integrated meal during pregnancy was extremely increased in the post-test after educational intervention.

These findings were supported by Abd El-Hamied et al. (2021), who found that there was a highly statistically significant difference regarding knowledge about the integrated meal during pregnancy among the studied pregnant women at the pre- and post-phases of instructional package implementation. From the researcher's point of view, this may be attributed to the socioeconomic status, which has effects on women's knowledge, as income is considered one of the greatest factors that influenced women's ability to have a healthy integrated meal. Contrarily, Savard et al. (2019), who studied trimester-specific assessments of diet quality in a sample of Canadian pregnant women in Québec City, Canada, found that women with poorer nutrition knowledge had a lower diet quality.

*Effect of Nutritional Awareness Intervention for Pregnant Women on
Maternal and Neonatal Outcomes*

In relation to women's total knowledge about nutrition during pregnancy, the present study revealed that the total knowledge scores regarding healthy nutrition were greatly improved after the implementation of educational intervention than before.

These findings were supported by Abd El-Hamied et al. (2021), who found that there was a highly statistically significant difference regarding knowledge about nutritional supplements among studied pregnant women during the pre- and post-phases of instructional package implementation. This result reflects the positive effect of providing the program and implicates the positive impact of nutritional promotion on improving the knowledge of pregnant women during pregnancy. Moreover, Saaka et al. (2021), who conducted a study in Northern Ghana about the effect of nutrition behavior change communication delivered through radio on mothers' nutritional knowledge, child feeding practices, and growth, showed that mothers in the intervention communities had a nutrition-related knowledge, attitudes, and practices score that was significantly higher than their colleagues in the comparison communities. Regarding the researcher's point of view, nutritional education and counseling were useful in increasing the level of nutritional awareness and knowledge. Besides, the educational intervention plays a very important role in helping pregnant women to acquire knowledge regarding healthy nutrition during pregnancy.

Regarding maternal outcomes, the current study revealed that there were no statistically significant differences regarding the mood of delivery or the mood of rupture of membranes between the study and control groups. These findings were supported by El-Kholy et al. (2021), who found it evident that there was no statistically significant difference between the mode of delivery and the anemic status of the studied women. Also, anemic status did not significantly affect the mode of rupture of the membrane.

However, this study revealed that there was a statistically significant difference between the study and control groups regarding complications during and after delivery. The control group complained of problems including premature labor, premature rupture of membrane, intra-partum hemorrhage, cord prolapse, early postpartum hemorrhage, puerperal fever, and infection more than the study group. This may be due to increased nutritional awareness about proper nutrition during pregnancy and its effect on maternal outcomes among the study group after the implementation of educational interventions.

For newborn outcomes, the current study found that their newborns in the study group had fewer complications than newborns in the control groups. However, the newborns of the control group complained of problems such as abnormalities in Apgar score, underweight, and prematurity more than the study group. This may be due to increased nutritional awareness about proper nutrition during pregnancy and its effect on newborn

Effect of Nutritional Awareness Intervention for Pregnant Women on Maternal and Neonatal Outcomes

outcomes among the study group after the implementation of educational interventions.

These findings were supported by Marshall et al. (2022), who conducted a study to assess the importance of nutrition in pregnancy and lactation: lifelong consequences in the United States. They proved that poor maternal nutritional status is causally associated with abnormal fetal growth patterns, including low birth weight, small gestational age or fetal growth restriction, macrosomia, and large gestational age, each of which is associated with increased risks of developing childhood and adult chronic diseases.

In addition, Carbonneau et al. (2022) who conducted a study in Canada on a community prenatal intervention in social nutrition: evaluating the impact on pregnancy and birth weight outcomes, reported that children whose mothers are anemic are at increased risk of developing anemia because their iron stores may be low at birth because iron supplementation reduces the risk of maternal anemia and iron deficiency in pregnancy.

Conclusions

Based on the findings of the present study about the effect of nutritional awareness intervention during pregnancy on maternal and neonatal outcomes, the study concluded that pregnant women who received nutritional awareness intervention during pregnancy had higher knowledge scores than women who did not receive it. This result accepts the first study hypothesis. Also, total

knowledge scores of the pregnant women after intervention were higher than before. This result accepts the second study hypothesis. In addition, pregnant women who received nutritional awareness intervention during pregnancy had better maternal outcomes than women who did not receive it such as, few maternal complications during and after delivery. This result accepts the third study hypothesis. Additionally, pregnant women who received nutritional awareness intervention during pregnancy had better neonatal outcomes than women who did not receive it such as, few neonatal complications after delivery. This result accepts the fourth study hypothesis.

Therefore, the findings of this study proved that the nutritional program sessions were a useful tool for increasing levels of nutritional awareness.

Recommendations

Based on the findings of the present study, the following recommendations can be suggested:

- Continuous monitoring of pregnant women's nutritional awareness is required during each ante-natal visit.
- Nutritional awareness for pregnant women should be provided early in pregnancy, through initial healthcare visits and consultations with doctors and nutrition-specialized nurse.
- Educational materials such as posters and pamphlets about specific nutrition during pregnancy are required.

***Effect of Nutritional Awareness Intervention for Pregnant Women on
Maternal and Neonatal Outcomes***

- Further studies on larger sample size are required to generalize the results of the study in the community.

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