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Study Hyperemesis Graviderum Requiring Hospital Admission during Pregnancy: Effect of Nursing Implication on Its Progress

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Abstract **Background:** Hyperemesis gravidarum (HG) refers to an extreme form of morning sickness that causes severe nausea and vomiting during pregnancy. It is potentially lethal if not treated. **Aim**: This study aimed to identify risk factors for hyperemesis graviderum requiring hospital admission during pregnancy and evaluate the effect of an educational program on women's knowledge and severity of hyperemesis gravidarum. **Subject & Methods:** Case-control design had been utilized within antenatal in-patient/outpatient wards at Ain-Shams Maternity Hospital, Egypt. One hundred pregnant women (50 of them were previously admitted hyperemesis compared with 50 ones with no previously admissions for hyperemesis) were chosen. A structured interviewing questionnaire schedule, and Pregnancy Unique-Quantification of Emesis (PUQE) questionnaire sheet were utilized. Pre/post evaluation questionnaire had been used to assess attendant's severity and information around the hyperemesis graviderum. **Results:** There is a significant difference regarding risk factors of hyperemesis graviderum in two groups, women who have a previous history for admission to hospital were more liable for hyperemesis graviderum than no-admitted ones. Regarding PUQE, there is a positive significant correlation between PUQE score with age among hyperemesis graviderum group. **Conclusion:** Women who are housewives, middle age, improper level of education, rural dwellers, insufficient income, moreover, multigravida, multiple gestations, and previous history of abortion or who admitted to hospital for a history of motion sickness, previous usage of oral contraceptives were liable for hyperemesis graviderum than other ones. All women with hyperemesis graviderum achieved both better score in their knowledge and symptoms degree after implementing the educational program than before it. There is a progression in knowledge score and regression in PUQE score. **Recommendations**: Replication of this study on a larger sample, on a broad area and different settings of the study is recommended in order to generalize the results.

Keywords: *hyperemesis gravidarum, risk factors, hospital admission, nursing implication*

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1. Introduction

Nausea and vomiting affecting 80.0% of pregnant women as common symptoms during early pregnancy. Hyperemesis graviderum (HG) represents an extreme form of these symptoms. It is most often characterized by severe nausea and vomiting that interferes with nutritional intake and metabolism, causes fluid and electrolyte imbalances and commonly requires hospital management. Moreover, it considers as the most common indication for hospital admission during early pregnancy. [1] Hyperemesis graviderum affects approximately 0.3% to 3.6% of pregnancies. Reported HG recurrence rates vary from 15.2% in a Norwegian hospital registry study to 81% if using self-reported diagnosis. [2]

In the light of a study conducted by Mahmoud (2012), it can be concluded that the overall hospital rate of hyperemesis graviderum at the Woman's Health Center, Assiut University, Egypt was 4.5% which was considered a high prevalence in relation to the universal prevalence of hyperemesis graviderum. The most common risk factors of hyperemesis graviderum were gastrointestinal diseases, urinary tract infection, and multiple pregnancies. [3]

The onset of nausea & vomiting of pregnancy (NVP) is in the 1st trimester. It typically starts between the 4th & 7th weeks of gestation, peaks in approximately the 9th week and resolves by the end of 20th week of gestation in 90% of women. It is worth noting that NVP that develops after pregnancy week 9-10 is rare and if the initial onset is after 10+ weeks of gestation, and the presence of fever, abdominal pain and tenderness, diarrhea, constipation, headaches, and palpable goiter is atypical in women

with NVP, other causes need to be considered than NVP. [2,4,5]

The International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10) uses the codes O21.0 & O21.1 for 'Mild hyperemesis graviderum & 'Hyperemesis graviderum with metabolic disturbance', respectively. [6] Mild HG is defined as 'HG, mild or unspecified, starting before the end of the 22nd week of gestation', whereas HG with metabolic disturbance is defined as 'HG starting before the end of the 22nd week of gestation, with metabolic disturbance such as: carbohydrate depletion, dehydration and/or electrolyte imbalance'. [6] However, no universally accepted criteria distinguish between the mild and severe disease. [7] However, the national guidelines issued by the Norwegian Society of Obstetrics and Gynecology (NGF) categorizes NVP in three categories: mild, moderate and severe, according to the 24-hour Pregnancy-Unique Quantification of Emesis (PUQE) scale. [5,8]

There are numerous theories regarding the cause of hyperemesis graviderum, but the causes remain controversial. It is thought that hyperemesis graviderum risk factors have been reported as nulliparity, low maternal age, multiple gestations, fetal anomalies, a previous pregnancy complicated by hyperemesis graviderum, female sex, psychiatric conditions, and both high/low maternal pre-pregnancy weight. One other factor is an adverse reaction to the hormonal changes of pregnancy, in particular, elevated levels of β-Human Chorionic Gonadotrophin. [4,5,9]

Hyperemesis graviderum can be diagnosed when there is protracted nausea & vomiting of pregnancy (NVP) with the triad of more than 5% pre-pregnancy weight loss, dehydration, and electrolyte imbalance. [2,10] Hyperemesis graviderum can cause severe weight loss from 10.0% upwards to 40.0% of one's pre-pregnancy weight. It may also be life-threatening if not treated promptly due to severe electrolyte imbalances that occur from severe, continuous vomiting. Also, unlike morning sickness, hyperemesis graviderum can last throughout the pregnancy and usually comes with constant vomiting, but always with constant nausea. A small percentage of patients with hyperemesis graviderum rarely vomit, but nausea still causes most (if not all) of the same issues that hyperemesis graviderum with vomiting does. [11]

hyperemesis graviderum of pregnancy is associated with severe nausea or persistent vomiting (which adequate hydration couldn't maintain), ptyalism (inability to swallow saliva leading to spitting), dehydration (loss of skin turgor, furry tongue, ketotic breath, postural hypotension, tachycardia), and muscle wasting/weakness. [5,12] There is evidence that severe HG is associated with a higher incidence of babies with low birth weight (LBW), small for gestational age (SGA) babies and preterm delivery. [5]

Hyperemesis graviderum may lead to hyponatraemia, hypokalaemia, low serum urea, raised haematocrit, and ketonuria with a metabolic hypochloraemic alkalosis. If severe, a metabolic acidaemia may develop. In two-thirds of women with HG, there may be abnormal thyroid function tests (based on a structural similarity between thyroid-stimulating hormone (TSH) and (HCG) with a biochemical thyrotoxicosis and raised free thyroxine levels with/without a suppressed thyroid-stimulating hormone level. These patients rarely have thyroid antibodies and are euthyroid clinically. The biochemical thyrotoxicosis resolves as the HG improves, and treatment with anti-thyroid drugs is inappropriate. Liver function tests are abnormal in up to 40% of women with HG with the most likely abnormality being a rise in transaminases. Bilirubin level can be slightly raised but without jaundice, and amylase level can be mildly raised too. These abnormalities improve as the HG resolves. Recurrent intractable vomiting may lead to gastro-oesophageal reflux disease, oesophagitis or gastritis. Oesophageal gastroduodenoscopy is safe in pregnancy [13] and indicated if there is haematemesis or severe epigastric pain. A therapeutic trial with a proton pump inhibitor is appropriate for treatment/prevention and it is safe in pregnancy. [14]

Wernicke's encephalopathy due to vitamin B1 (thiamine) deficiency classically presents with blurred vision, unsteadiness, confusion, drowsiness, and memory problems. On examination, there is usually nystagmus, ophthalmoplegia, hyporeflexia or areflexia, and finger–nose ataxia. In HG, the presentation tends to be episodic and of slow onset. Wernicke's encephalopathy is a potentially fatal but reversible medical emergency. In the context of HG, it is totally preventable and studies [15,16] have stressed the association between Wernicke's encephalopathy and administration of intravenous dextrose and parenteral nutrition. One of these studies [15] reported that complete remission occurred in only 29% and permanent residual impairment was common. The overall pregnancy loss rate including intrauterine death and termination was 48.0%. [15] Therefore thiamine supplementation is recommended for all women with protracted vomiting. [2,3]

The management of hyperemesis graviderum depends on the severity of the symptoms. These ranged from explanation/emotional support, use of oral anti-emetics, as well as dietary modification, to more aggressive prompt treatment to correct fluid/electrolyte imbalances by hospitalization. [5,17] In-patient intervention should be considered if there is at least one of the following: (1) continued nausea/vomiting and inability to keep down by oral anti-emetics; (2) continued nausea and vomiting associated with ketonuria and/or weight loss (greater than 5% of body weight), despite oral anti-emetics; (3) confirmed or suspected comorbidity such as inability to tolerate oral antibiotics and/or urinary tract infection (UTI). When all other medical therapies have failed, enteral/parenteral intervention should be considered with a multidisciplinary approach. Serum electrolyte & Urea levels should be checked daily in women requiring IV fluids. [2,12]

Termination of pregnancy should be considered after failure of all therapeutic measures which have been tried for a wanted pregnancy. The Hyperemesis Education and Research (HER) Foundation in the USA reports that 10% of pregnancies complicated by HG end in termination in women who wouldn't otherwise have chosen this. Pregnancy Sickness Support in the UK found that many of these women have not been offered the full range of treatments available and fewer than 10% had been offered steroids. Hyper-emetic women should be offered to counsel before & after a decision of pregnancy termination is made. An ultrasound scan should be

scheduled to confirm fetal viability/gestational age and to rule out trophoblastic disease or multiple pregnancy. Unless there are other medical reasons for an urgent scan, this can be scheduled for the next available appointment as long as the NVP has resolved with treatment. [2,5]

1.1. Significant of the Study

Many of the previous studies of hyperemesis have been limited in their statistical power and generalizability as a result of being facility-based and relatively small in size. Therefore, upgrading pregnant women's information for the selected cases of HG is mandatory to be safe and convenient. It is hoped that the outcome of this study may engender a change around the severity of hyperemesis graviderum, as well as raise women's knowledge regarding hyperemesis graviderum.

1.3. Aim of the Study

The aim of this study was to identify risk factors for hyperemesis graviderum requiring hospital admission during pregnancy and evaluate the effect of an educational program on the severity of symptoms and women's knowledge about HG and appropriate management of this condition.

1.4. Research hypotheses

1. Women's knowledge regarding hyperemesis graviderum and its appropriate management will progress after implementing the program than before.
2. Women with hyperemesis graviderum will progress after program implication than before.
3. The severity of hyperemesis graviderum symptoms will regress after implementing the program than before.

2. Subjects and Methods

2.1. Research Design

Case-control descriptive study design was utilized in this study.

2.2. Research Setting

Antenatal in-patient ward (high-risk pregnancy wards) and antenatal clinic at Ain Shams Maternity Hospital, Egypt.

2.3. Subjects

A sample of 100 women (50 women with one or more antepartum hospital admitted for hyperemesis compared with 50 women with no previously admitted for hyperemesis during the period between the 1st January 2018 till the end December 2018 was included. Women's were chosen haphazardly throughout an investigation period.

2.4. Tool of Data Collection

2.4.1. Data Collection Passed to 3 Tools

Tool (I): Structured interview questionnaire:

Assessment of risk factors for hyperemesis graviderum requiring hospital admission during pregnancy. A structured knowledge questionnaire, that includes the following sections, was designed and used:

The first section: personal, sociodemographic, obstetrical, current antenatal history and current antenatal risk factors aggravate Hyperemesis Graviderum such as; age, parity, problems encountered during the present pregnancy, desire regarding pregnancy, previous history of hospital admission for hyperemesis graviderum attack.

The second section: Maternal assessment record which includes the finding of laboratory investigations for pregnant women with hyperemesis graviderum and included ultrasonography; blood and urine analysis, blood glucose, Sodium and Potassium levels, and others.

The third section: Medication record; the sheet included the drugs administered to the study subjects during their hospital stay i.e. the dose, route, frequency and side effects of each drug.

Tool (II): Pregnancy Unique-Quantification of Emesis (PUQE) questionnaire:

It is an objective and validated index used to measure symptoms of nausea and vomiting of pregnancy (NVP). [2,8] The PUQE scale was developed by Motherisk, Toronto, Canada. The Pregnancy-Unique Quantification of Emesis (PUQE) score can be used to assesses and classify the severity of NVP and classify the women into three groups according to the severity of their symptoms. It consists of three points; the number of hours of nausea, the number of episodes of retching, and the number of episodes of vomiting within the last 24 hours. Each item is scored from 1 to 5 points. The PUQE score is calculated by adding the values from each category, resulting in a total score ranging from 3 to 15 points. A score of ≤ 6 points is classified as mild NVP, 7-12 points as moderate and a score ≥ 13 as severe.

Table 1. Pregnancy-Unique Quantification of Emesis (PUQE) index. [2,8] Total score is the sum of replies to each of the three questions. PUQE-24 score: Mild ≤ 6; Moderate = 7-12; Severe = 13-15

Motherisk PUQE-24 scoring system					
In the last 24 hours, for how long have you felt nauseated or sick to your stomach?	Not at all (1)	1 hour or less (2)	2 - 3 hours (3)	4 - 6 hours (4)	More than 6 hours (5)
In the last 24 hours have you vomited or thrown up?	I did not throw up (1)	1 - 2 times (2)	3 - 4 times (3)	5 - 6 times (4)	7 or more times (5)
In the last 24 hours how many times have you had retching or dry heaves without bringing anything up?	No time (1)	1 - 2 times (2)	3 - 4 times (3)	5 - 6 times (4)	7 or more times (5)

PUQE-24 score: Mild ≤ 6; Moderate = 7–12; Severe = 13–15.

Tool (III): Pre-test/post-test knowledge assessment sheet:

Evaluation the effect of the implemented educational program on women's knowledge about HG and appropriate management of this condition. Concerning the educational program for hyperemesis pregnant women, 25 women were selected randomized from antenatal in-patient wards in at Ain Shams Maternity Hospital. Women's knowledge questionnaire was developed by the researchers. It was designed for pre-post assessment to assess women's knowledge regarding hyperemesis graviderum and its appropriate management. Additionally, the severity of hyperemesis graviderum was assessed, by Pregnancy Unique-Quantification of Emesis (PUQE) questionnaire, pre/post program implementation.

2.4.2. Scoring System

By scoring the items of knowledge regarding HG to assess women's level of knowledge:

a. A score equal (2) was given for each correct/complete answer, (1) was given for each correct/incomplete answer, and (0) for either unknown or wrong/incorrect ones. Summing the scores of all items to get a total score for each section. Maximum points of the nurses' knowledge regarding hyperemesis graviderum (HG) were equaled (32).
b. Total knowledge score about HG was calculated as (0-32)

i. Satisfactory (Good): Score 16-32 degree was considered a good knowledge level (50.0%-100.0%)
ii. Unsatisfactory (Poor): Score 0-15 degree was considered a poor knowledge level (<50.0%)

2.5. Methods and Phases of Data Collection

2.5.1. Validity/Reliability of the Tool

A panel of 3 experts in the field of maternity, Obstetrics and Gynecologic Nursing reviewed the tool to test its content validity. Modifications were done accordingly based on their judgment. The reliabilities of the tool were biased on of Cronbach Alpha (0.85).

2.5.2. Administrative/Ethical Considerations

Official permission was obtained by submission of an official letter from the Faculty of Nursing, Helwan University, to the responsible authorities of the study setting (Ain Shams Maternity Hospital) to obtain their permission for data collection for our study. All ethical issues were taken into consideration during all the phases of the study; the researcher maintained the anonymity/confidentiality of the women. The researcher introduced herself to every woman and briefly explained the nature, and the objectives of the study before participation. Participant women were enrolled voluntarily after the oral informed consent.

2.5.3. Pilot Study

The pilot study was carried out on 10% of the studied women in the study setting (that were excluded from the study sample) to test the applicability/clarify and the feasibility of the study tools as well as to estimate the time needed to complete the tools. It also helped to find out any obstacles and problems that might interfere with data collection, based on findings of the pilot study, certain modifications of the tools were done. Following this pilot study, the process of data collection was performed.

2.5.4. Field Work

Data collection took 12 months' period. The researcher visits the previously mentioned setting twice/week. In this section, data collection was conducted in two areas related to these core elements:

2.5.4.1. Assess the risk factors of women who developed symptoms of hyperemesis graviderum requiring hospital admission during pregnancy. One hundred pregnant women; 50 of them were previously admitted for hyperemesis (study group) compared with 50 ones (control group) with no previously admissions for hyperemesis graviderum were chosen. A structured interviewing questionnaire schedule was used to obtain personal, sociodemographic, obstetrical history and current antenatal risk factors aggravate Hyperemesis Graviderum for both study and control groups. Pregnancy Unique-Quantification of Emesis (PUQE) questionnaire sheet was utilized to assess the severity of nausea and vomiting of pregnancy (NVP) and hyperemesis graviderum for both groups (tool I and II).

2.5.4.2. Implement and evaluate the effect of an educational program on the severity of hyperemesis graviderum and women's knowledge regarding HG and appropriate management of this condition (tool III). The program involved 3 scheduled sessions. Each session took about 30 - 45 minutes using simple language to suit women's level of understanding. At the end of each session, feedback was invited; women's' questions were discussed to explain any misunderstanding. Different methods of teaching were used such as lectures, group discussion, and audio-visual material as power point and videos. The program had both general and specific objectives. The general one was to improve knowledge of pregnant women with HG & their practices regarding proper intervention. Moreover, the specific ones mentioned as each woman, after completion of the program, should be able to:

- Define and differentiate between NVP & HG.
- List causes, and predisposing factors of NVP & HG.
- Identify high-risk women for NVP & HG during pregnancy.
- List signs & symptom of NVP & HG.
- List complication of NVP & HG on the mothers & their fetuses.
- Enumerate the most effective measures for alleviating NVP & HG.

A slid of women (25) with hyperemesis graviderum in the study group was chosen to participate in the program as the following:

a. The 25 participated women in the educational program were, previously, assessed by Pregnancy Unique-Quantification of Emesis (PUQE) questionnaire sheet to evaluate the severity of

hyperemesis graviderum before implementing the program, then they passed through 3 sessions.

- *The first session* covered definition, time, causes, ones who are high-risk of hyperemesis gravidrum.
- *The second session* aimed to increase the women's knowledge regarding signs and symptom, diagnosis, complications for mother & fetus of Hyperemesis gravidrum.
- *The third session* aimed to raise women's awareness regarding examination & investigation measures, instructions for dietary intake & treatment of Hyperemesis gravidrum.

b. Follow up and evaluation phase: During this phase, the effect of the educational program was evaluated by using the same format of data collection tools. The evaluation was conducted two weeks[#] later to evaluate the effect of the program on women's knowledge and the severity of hyperemesis graviderum after implementing the program.

2.5.5. Statistical Analysis

All data were collected, tabulated and statistically analyzed using SPSS 20.0 for windows (SPSS Inc., Chicago, IL, USA).

- Quantitative data were expressed as the mean ± SD & range.
- Qualitative data were expressed as absolute frequencies (number) & relative frequencies percentage (%).
- Paired τ test was used for paired data normally distributed.
- Wilcoxon Signed Ranks test was used to compare between two dependent groups of non-normally distributed variables.
- Mc-Nemar test was used to compare between two dependent groups of categorical variables.
- Percent of categorical variables were compared using Chi-square test or Fisher exact test when appropriate.
- Pearson correlation coefficient was calculated to assess the relationship between various study variables, (+) sign indicates direct correlation while (-) sign indicates inverse correlation, also values near to 1 indicates strong correlation & values near 0 indicate weak correlation.
- Column chart is used for graphic presentation.
- All tests were two-sided. p-value < 0.05 was considered statistically significant (S), and p-value ≥ 0.05 was considered statistically insignificant (NS).

3. Results

Table 2 illustrates a statistically significant difference between the two groups (study & control) in relation to occupation (p = 0.009), family income (p = 0.002). It is evident that housewives were liable for hyperemesis graviderum 3 times more than employer women; Odds 3(1.2 - 7). Insufficient income group were more liable to HG 5.8 times compared to sufficient and save groups; Odds 5.8 (0.95 - 45).

Table 3 reveals that the women who have a previous history for admission to hospital, for a history of motion sickness, were more liable for hyperemesis graviderum 55 times more than no admitted; Odds 55 (13 - 311) and difference statistically significant (p = 0.0001). Women who had a history of previous usage of oral contraceptives were liable for hyperemesis graviderum 2.25 times more than other women; Odds 2.25 (0.94 - 5.4).

Table 4 and Figure 1 demonstrate that there is a statistically significant difference between Hyperemesis graviderum group and control group regarding PUQE grade p < 0.05. It is evident that one-tenth (10.0%) of HG group have a mild PUQE grade, one half (50.0%) have a moderate degree and two-fifths (40.0%) have a severe degree compared to the control group (34.0%, 0.66.0% and 0.0% respectively).

Table 5 and Figure 2 show a positive significant correlation between PUQE score with age among Hyperemesis gravidrum group (p = 0.007).

Table 6 shows the socio-demographic characteristics of women involved in health education program, it was observed that women's age ranged between 19 and 31 years with a mean age of 25.6 ± 4.0. More than two-fifths (44.0%) of them have basic education, most of them were rural resident and housewives (60.0% & 72.0%), respectively.

Table 7 presents the distribution of women's knowledge regarding hyperemesis gravidrum before and after two weeks later of the health education program. It is clear that women's knowledge was improved regarding all measured items.

Table 8 and Figure 3 portrays comparison between pre-intervention & post intervention program regard PUQE grade for hyperemesis gravidrum group. This table shows that there is statistically significant difference between hyperemesis gravidrum group pre-intervention & post-intervention program regard PUQE grade p<0.05.

Table 9 and Figure 4 point to a statistically significant difference between knowledge level about hyperemesis gravid rum before and after health education program (p = 0.0001).

Table 10 shows, however, total knowledge score after health education program affected by participants' socio-demographic characteristics; a statistically insignificant difference between socio-demographic characteristics of studied groups and their level of knowledge after health education program (p>0.05). This meaning that health education program has the same effect on all age groups have any level of education for both rural or urban residence.

[#] To be sure that participated ones are still in their 1st trimester. Therefore, changes in the severity of symptoms will be, only, related to the implemented program.

Table 2. Demographic risk factors for hyperemesis graviderum requiring hospital admission during pregnancy

Variables	Study group (Hyperemesis Gravidrum; n=50)	Control group (n=50)	χ^2	P-Value	Odds (95%CI)
Age per years					
<20	3 (6)	8 (16)	2.9	0.23	
20-35	32 (64)	26 (52)			
>35	15 (30)	16 (32)			
Mean ± SD	30 ± 7.6	29.6 ± 8			
Range	18 - 44	18 - 44			
Education					
Illiterate	11 (22)	13 (26)	3.04	0.38	
Basic education	17 (34)	18 (36)			
Secondary education	7 (14)	4 (8)			
University education	15 (30)	15 (30)			
Residence					
Rural	28 (56)	20 (40)	2.56	0.11	
Urban	22 (44)	30 (60)			
Occupation					
House wives	33 (66)	20 (40)	6.78	0.009(S)	3 (1.2 - 7)
Workers	17 (34)	30 (60)			
Income					
Sufficient	15 (30)	23 (46)	7.6	0.002(S)	2.3 (0.35 - 18.5)
Insufficient	33 (66)	20 (40)			5.8 (0.95 - 45)
Sufficient and save	2 (4)	7 (14)			1
BMI					
Obese	9 (18)	7 (14)	0.29	0.58	
Normal	41 (82)	43 (86)			

P < 0.05 (significant), $\chi 2$= chi square test, Odds= odds ratio, 95% CI= 95% confidence interval.

Table 3. Obstetric risk factors for hyperemesis gravidrum requiring hospital admission during pregnancy

Variables	Study group (Hyperemesis Gravidrum; n = 50)	Control group (n = 50)	χ^2	P-Value	Odds (95% CI)
Gravida					
primi	13 (26)	15 (30)	1.4	0.49	
2 - 3	23 (46)	26 (52)			
≥ 4	14 (28)	9 (18)			
Type of pregnancy					
Multiple pregnancies	26 (52)	28 (56)	0.16	0.69	
Uni pregnancy	24 (48)	22 (44)			
Abortion					
Yes	14 (28)	12 (24)	0.21	0.64	
No	36 (72)	38 (76)			
Pregnancy is wanted					
yes	36 (72)	41 (82)	1.4	0.23	
No	14 (28)	9 (18)			
Danger sign of pregnancy					
Present	37 (74)	35 (70)	0.2	0.65	
Absent	13 (26)	15 (30)			
Previous admission to hospital for history of motion sickness					
Yes	39 (78)	3 (6)	53.2	0.0001	55 (13 - 311)
No	11 (22)	47 (94)			
Median (range)	1 (1 - 4)	1 (1 - 2)			
Gestational age per weeks					
Mean ± SD	8.9 ± 2.4	8.3 ± 2.5	1.2	0.2	
Range	5 - 14	5 - 13			
Previous usage of oral contraceptives					
Yes	30 (60)	20 (40)	4	0.046 (S)	2.25 (0.94 - 5.4)
No	20 (40)	30 (60)			

P < 0.05 (significant), $\chi 2$= chi square test, Odds= odds ratio, 95% CI= 95% confidence interval.

Table 4. Comparison between hyperemesis gravidrum group and control group regarding PUQE grade

PUQE grade	Study group (Hyperemesis Gravidrum; n=50)	Control group (n=50)	χ^2	P-Value
Mild	5 (10)	17 (34)		
Moderate	25 (50)	33 (66)		
Severe	20 (40)	0 (0)	27.6	0.0001 (S)

P < 0.05 (significant), $\chi 2$= chi square test.

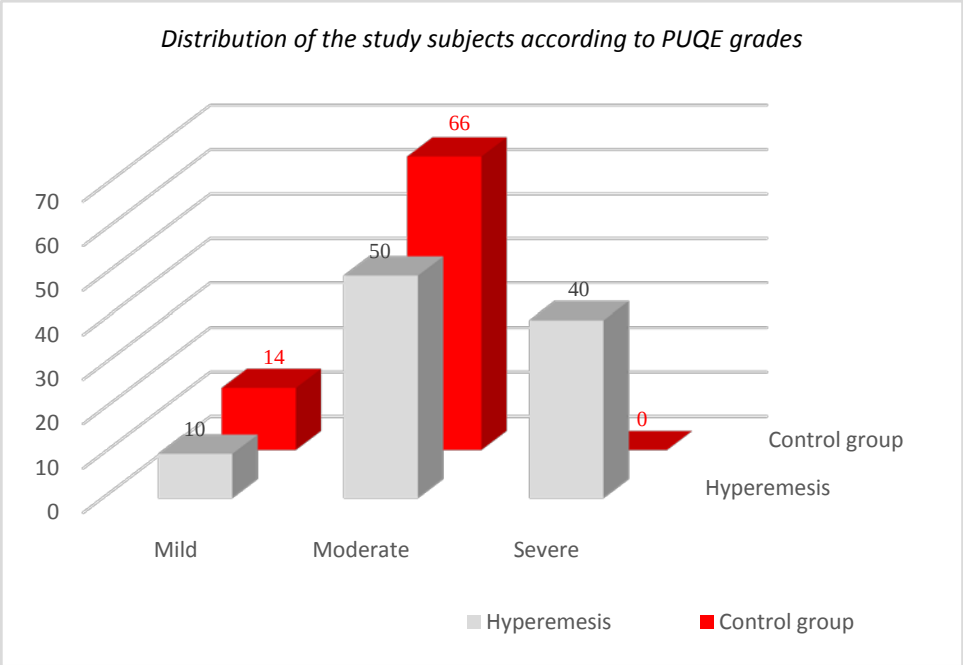

Figure 1. Distribution of the study subjects according to PUQE grades

Table 5. Correlation of PQUE score among Hyperemesis gravidrum group and control group with age, body mass index and gestational age

PUQE score	Study group (Hyperemesis Gravidrum; n=50)		Control group (n=50)	
	r	***p***	***r***	***p***
Age	0.38	0.007 (S)	0.002	0.98
BMI	- 0.12	0.4	- 0.11	0.4
Gestational age	- 0.08	0.57	- 0.06	0.65

r = correlation coefficient, P < 0.05 (significant).

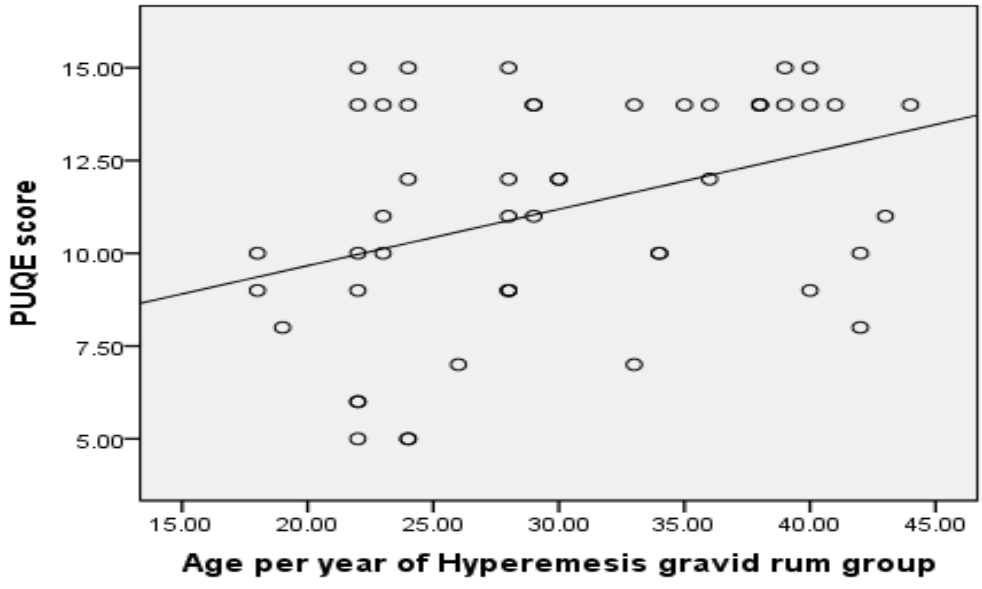

Figure 2. Correlation of PQUE score and age of hyperemesis gravid rum group

Table 6. Distribution of program participants studied women according to their general characteristics (n = 25).

Variables	No (25)	Percent (100%)
Age per years		
<20	3	12
20-35	22	88
Mean ± SD		25.6 ± 4
Range		19 - 31
Education		
Illiterate	6	24.0
Basic education	11	44.0
Secondary education	5	20.0
University education	3	12.0
Residence		
Rural	15	60.0
Urban	10	40.0
Occupation		
House wives	18	72.0
Workers	7	28.0

Table 7. Distribution of women's knowledge regarding hyperemesis gravidrum before and after two weeks later of health education program (n = 25)

Hyperemesis knowledge level	Time of assessment		Wilcoxon sign rank test ***(p)***
	Before	After	
	No (%)	No (%)	
Definition of Hyperemesis gravidrum			
Wrong	12 (48)	5 (20)	0.01 (S)
Incomplete	10 (40)	12 (48)	
Complete	3 (12)	8 (32)	
When Hyperemesis gravidrum occurs? (Time)			
Wrong	7 (28)	3 (12)	0.01 (S)
Incomplete	13 (42)	12 (48)	
Complete	5 (20)	10 (40)	
Causes of Hyperemesis gravidrum			
Wrong	12 (48)	12 (48)	1 (NS)
Incomplete	10 (40)	10 (40)	
Complete	3 (12)	3 (12)	
Who is high-risk for hyperemesis gravidrum			
Wrong	14 (56)	6 (24)	0.01 (S)
Incomplete	7 (28)	11 (44)	
Complete	4 (16)	8 (32)	
Difference NVP & Hyperemesis gravidrum			
Wrong	14 (56)	5 (20)	0.002 (S)
Incomplete	10(40)	14(56)	
Complete	1 (4)	6 (24)	
Symptom Hyperemesis gravidrum			
Wrong	12 (48)	5 (10)	0.006 (S)
Incomplete	10 (40)	10 (40)	
Complete	3 (12)	10 (40)	
Diagnosis Hyperemesis gravidrum			
Wrong	20 (80)	16 (64)	0.12(MC) (NS)
Incomplete	5 (20)	9 (36)	
Complete	-	-	
Complications for mother			
Wrong	18 (72)	15 (60)	0.046 (S)
Incomplete	6 (24)	8 (32)	
Complete	1 (4)	2 (8)	
Complication for fetus			
Wrong	9 (36)	3 (12)	0.015 (S)
Incomplete	15 (60)	16 (64)	
Complete	1 (4)	6 (24)	

Hyperemesis knowledge level	Time of assessment		Wilcoxon sign rank test (*p*)
	Before	After	
	No (%)	No (%)	
Examination Hyperemesis gravidrum			
Wrong	18 (72)	8 (32)	0.004 (S)
Incomplete	6 (24)	10 (40)	
Complete	1 (94)	7 (28)	
Investigation Hyperemesis gravidrum			
Wrong	17 (68)	8 (32)	0.013 (S)
Incomplete	6 (24)	9 (36)	
Complete	2 (8)	8 (32)	
Dietary intake during Hyperemesis gravidrum			
Wrong	6 (24)	5 (20)	0.058 (NS)
Incomplete	15 (60)	8 (32)	
Complete	4 (16)	12 (48)	
Instructions for Hyperemesis gravidrum			
Wrong	8 (32)	5 (20)	0.13 (NS)
Incomplete	15 (60)	16 (64)	
Complete	2 (8)	4 (16)	
Treatment of Hyperemesis gravidrum			
Wrong	10 (40)	10 (40)	1 (NS)
Incomplete	13 (52)	13 (52)	
Complete	2 (8)	2 (8)	
Precautions for Hyperemesis gravidrum			
Wrong	15 (60)	9 (36)	0.023 (S)
Incomplete	8 (32)	12 (48)	
Complete	2 (8)	4 (16)	
Dangers of Hyperemesis gravidrum			
Wrong	13 (52)	6 (24)	0.015 (S)
Incomplete	9 (36)	12 (48)	
Complete	3 (12)	7 (28)	

MC= MC-Nemar test of significant.

Table 8. Comparison between pre-intervention & post-intervention program regard PUQE grade for hyperemesis gravidrum group (n=25)

PUQE grade	Study group (Hyperemesis Gravidrum; n=25)		Wilcoxon sign rank test P-Value
	Pre-intervention	Post-intervention	
Mild	2 (8)	11 (44)	0.001 (S)
Moderate	16 (64)	14 (56)	
Severe	7 (28)	0	

Wilcoxon sign rank test, P < 0.05 (significant).

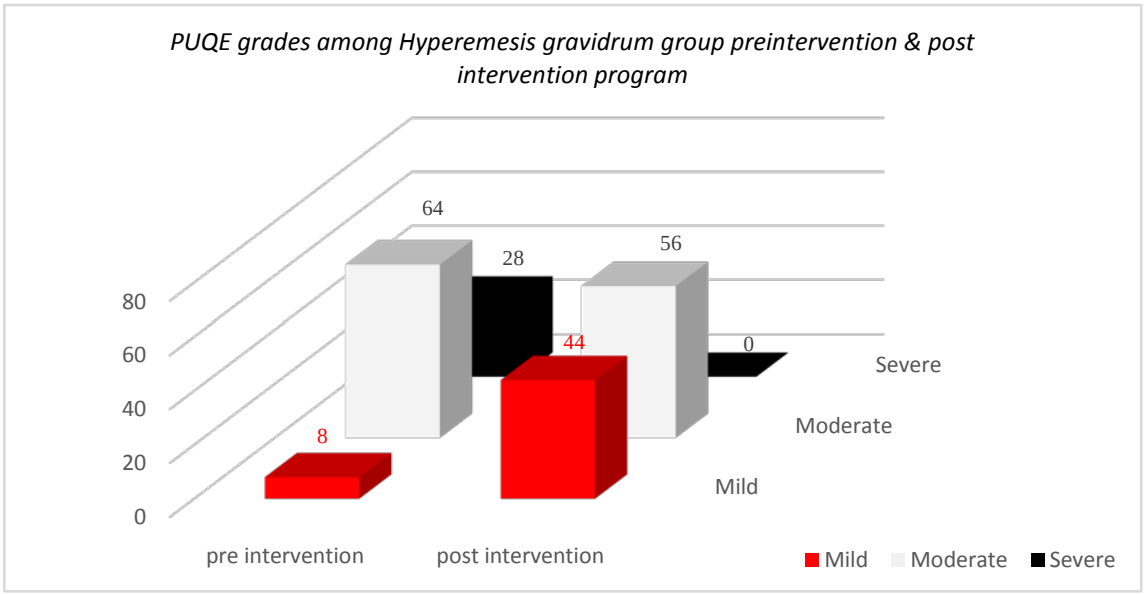

Figure 3. Percent of PUQE grades among Hyperemesis gravidrum group pre-intervention & post-intervention program

Table 9. Distribution of women's total knowledge level about hyperemesis gravidrum before and after two weeks later of the health education program (n = 25)

Hyperemesis knowledge level	Time of assessment		*Paired t-test*	*p*
	Pre-intervention	Post-intervention		
	No (%)	No (%)		
Poor (Unsatisfactory) <50%	25 (100)	11 (44)	9.2	0.0001 (S)
Good (Satisfactory) 50% - 100%	0	14 (56)		
Mean ± SD	9 ± 2	15 ± 3		
Range	5 - 13	10 - 21		

t = Paired t-test, P < 0.05 (significant).

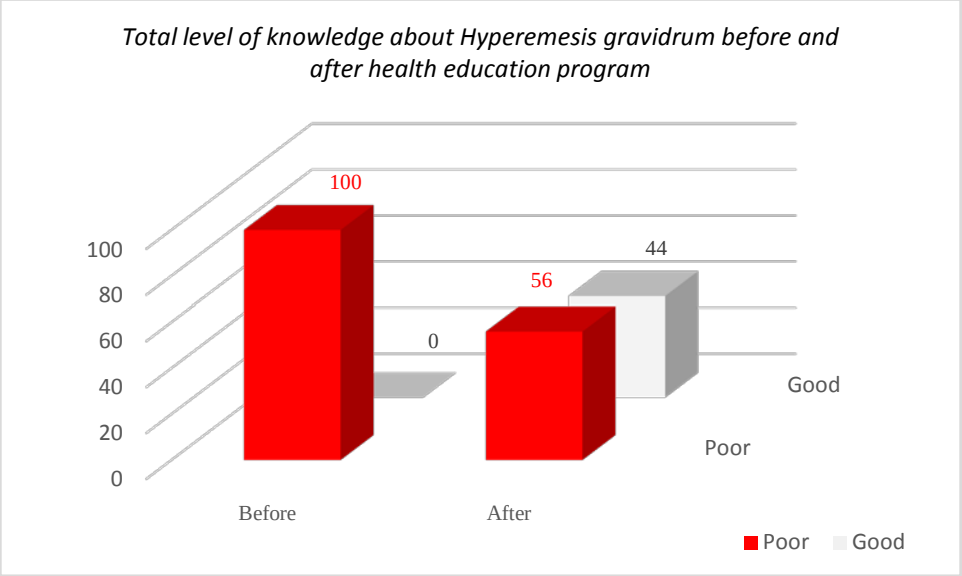

Figure 4. Total level of knowledge about Hyperemesis gravidrum before and after the health education program

Table 10. Correlation between level of total knowledge score two weeks later of the health education program and socio-demographic characteristics of participating educational program studied group (n = 25)

Variables	Number (n = 25)	Total knowledge score two weeks later of health education program		Test of significance	P-Value
		Good; no (%)	Poor; no (%)		
Age per years					
<20	3	0	3 (100)	F	0.072 (NS)
20-35	22	14 (63.6)	8 (36.4)		
Education					
Illiterate	6	2 (33.3)	4 (66.7)	$\chi^2 = 1.7$	0.64 (NS)
Basic education	11	7 (63.6)	4 (36.4)		
Secondary education	5	3 (60)	2 (40)		
University education	3	2 (66.7)	1 (33.3)		
Residence					
Rural	15	9 (60)	6 (40)	F	0.7 (NS)
Urban	10	5 (50)	5 (50)		
Occupation					
House wives	18	9 (50)	9 (50)	F	0.4 (NS)
Workers	7	5 (71)	2 (39)		

F = Fisher exact test of significant, χ^2 = chi square test, NS = non-significant.

4. Discussion

Pregnancy is a basic life event and vital to the maintenance of humankind. However, pregnancy is considered physiological processes, it could represent a burden on the women, resulting to qualitatively or quantitatively escalated, they may result in pathological issues in the maternal organism. The most common complication affecting women in the 1st trimester is nausea/vomiting of pregnancy (NVP). [4]

The present study was aiming to assess the risk factors of women who developed symptoms of hyperemesis graviderum requiring hospital admission during pregnancy, at Ain Shams Maternity Hospital, Egypt, and evaluate the

effect of an educational program on women's knowledge about HG and appropriate management of this condition. Thus, evaluate the effect of an educational program on women's knowledge as well as the severity of symptoms. The study findings demonstrated that the implementation of the educational program led to a positive women's pregnancy outcome and reduction of the risks of complications.

The study was conducted using a case-control descriptive design with a study/control groups. In order to reach valid results, the two study/control groups need to be comparable in the factors that may confound the outcome namely knowledge. The findings demonstrated that the two, study/control, groups were similar in their personal/socio-demographic characteristics and obstetric history which make the comparison of the outcomes in two groups valid. The study and control group had an equal range of age (18 - 44), however, almost equal mean age distribution (30 ± 7.6 & 29.6 ± 8), respectively. Most of both groups had basic education (34.0% & 36.0%), respectively. Around half (46.0% & 52.0%) of them had 2-3 gravida, 74.0% & 70.0%, respectively, complained from danger sign during their pregnancies, and their pregnancies gestational age were ranged around 5-14 & 5-13 weeks with mean 8.9 ± 2.4 and 8.3 ± 2.5, respectively. This gestational age often reported in the literature for NVP and HG. [4]

The results of the current study declared that few pregnant women (3; 6.0%) with hyperemesis aged less than 20 years old while, hyperemesis was most observable (32; 64.0%) among women aged 20-35 years old (Mean ± SD was 30 ± 7.6 & Range was 18 – 44 years). Additionally, a great portion (41; 82%) of them had normal body weight and only (9; 18.0%) were obese. Those results are contradicted Hyperemesis Education and Research Foundation (HER; 2006) documentation which denote that women being less than 20 years of age, and high saturated fat diet will be more risk for hyperemesis graviderum during their pregnancies. [18] The present study results may explain the severity of PUQE score for the studied group with Hyperemesis Gravidrum (r = 0.38; p = 0.007) compared to control group (r = 0.002; p = 0.98). The severity of HG was affected positively by women's age, significant differences, (p = 0.007) was found in the studied group. On the other hand, women's BMI affects negatively on PUQE score for the studied group with Hyperemesis Gravidrum (r = - 0.12) and the control group (r = - 0.11). No significant differences were found neither in the studied group (p = 0.4) nor in the control group (p = 0.4).

The results of the present study revealed that mean of gestational age per weeks for study and control group were 8.9 ± 2.4 & 8.3 ± 2.5, respectively, without statistically significant differences between both groups (p = 0.2). This result is in accordance with many authors who noted that the onset of NVP is in the first trimester. It typically starts between the fourth and seventh weeks of gestation, with peaks in intensity around the 8-13 week. [2,4,5] The results of the present study reported that 40.0% of the studied group scored severe PUQE grade compared to 0.0% of the control group, a statistically significant difference between both groups was noticed (p = 0.0001). A negative association correlation between severity of NVP (PUQE score) and gestational age for both study (r = - 0.08) and control group (r = -0.06), respectively. However, this correlation is not significant (p = 0.57 & 0.65), respectively. This is in line with previous researches which noted that NVP gradually declining during the second trimester and completely resolves by the 20th week of gestation in 90% of women. [2,4,5]

According to HER; 2006, the most common risk factors for HG among pregnant women are a history of motion-sickness, food aversions before pregnancy, multiple gestation, sensitivity to oral contraceptives, and poor diet. [18] The current study results revealed that a great portion (33; 66.0%) of the studied pregnant women, with HG, were poor and had insufficient income which, in-turn, may deprive pregnant women of adequate and sufficient diet as well as proper follow up and medical care. Moreover, this is clear from the results that, most (37; 74.0%) of our studied participants were multigravida and (26; 52.0%) had multiple gestation which may aggravate the condition of morning sickness leading to HG as a result of increasing level of blood human chorionic gonadotrophin (HCG) hormone. [4,5,9] Additionally, it was noticed that 39 women (78.0%) from whom suffered from HG had a history of previously admission to hospital for a history of motion sickness (Median & Range) are 1 & (1-4). Moreover, 30 women (60.0%) used oral contraceptives, previously. These results may explain the severity of PUQE grade for the studied group with Hyperemesis Gravidrum (20; 40.0%) compared to control group (0; 0.0%) with observable significant differences, (p = 0.0001). These results are in line with many authors. [3,5,18]

The second section of the study was carried out to implement an educational program on a slide of women with HG to decrease the severity of symptoms of HG and improve pregnant women's knowledge about HG and appropriate management of this condition. Thus, evaluate the effect of an educational program on women's knowledge and symptoms' severity.

A woman's ability to function on a day-to-day, usual daily activities and quality of life, which negatively affect woman's social functioning and relationships with her partner/family, might be adversely affected by nausea and vomiting of pregnancy (NVP) and hyperemesis graviderum (HG). Health-care providers should address the severity of women's symptoms in relation to their quality of life (QOL) and social situation. [4,5,19,20,21,22] Woman with HG should be advised that there is a risk of recurrence in future pregnancies. [2] In women with severe HG, input may be required from other professionals, such as midwives, nurses, dieticians, pharmacists, endocrinologists, nutritionists and gastroenterologists, and a mental health team, including a psychiatrist. As nurses are comprising the greatest portion of the health-care system and they are responsible of the quality of care provided to women's lifespan, however, maternity nurses play a vital role in providing women with accurate, clear information, and encourage women to ask questions and get the information they need. Potter et. al, (2006) as cited in Nasr & Hassan (2016) stated that educating the clients is a role for nurses in all health care settings; the nurse is often the main source of information about health

promotion that is why they have a very important role in the educational program. [23,24,25] Therefore, this educational program aimed to improve women's knowledge regarding hyperemesis graviderum and its appropriate management.

The present study results revealed that a great slid of women hadn't the correct/complete knowledge regarding, definition, time, causes, high-risk ones, symptom, diagnosis, complications for mother & fetus, examination & investigation, instructions & dietary intake, treatment, of Hyperemesis gravidrum. This lack/incorrect/incomplete of knowledge may be related to that a considerable slid of them (68.0%, 60.0%, 72.0%) were had a lack of proper level of education (illiterate/basic education), rural dwellers and housewives, respectively. These circumstances may affect and limit the chances to get correct/complete knowledge regarding HG.

The results of our study illustrated an improvement of the overall items (Definition, time, causes, high-risk ones, symptom, diagnosis, complications for mother & fetus, examination & investigation, instructions & dietary intake, treatment) of Hyperemesis gravidrum. Statistically significant was found between pre/post program for the most of item. A considerable rise at the posttest women's total knowledge level about hyperemesis gravidrum before and after two weeks later of the health education program. The results revealed that all the participant studied women in the program (25; 100.0%) were score poor knowledge level compared to no none (0; 0.0%) scored good level. After the program, more than half of them (56.0%) scored a good level of knowledge. Moreover, Mean ± SD of knowledge improved from 9 ± 2 (pre-program) to 15 ± 3 (post-program) with a statistically significant relationship ($p = 0.0001$). The better implementing in the study group of the current work, before implementing the program in comparison with post-implementation, might be attributed to the attendance and the effect of the intervention program in dealing with such influential factors. [26] In this respect, Masters K. [27] and Yeh et al. [28] mentioned that it is widely cited that people remember 10% of what they hear, 20% of what they read. [29,30] The improvement in mothers' knowledge could have led to better self-care, with proper management of related problems.

While assessing the effectiveness of the program; it was found that there was an improvement of the study group in relation to the progress of PUQE grade (severity of symptoms of HG was decreased). Follow-up of women's progression rate of HG signs & symptoms done two weeks later of the implementation of the program, it shows a decrease in the progression rate of HG among the studied women. In brief, the total PUQE grade of women's' regarding the level of HG was significantly improved significantly improved $p = 0.001$). Mild HG changed from (2; 8.0%) in pre-program to (11; 44.0%) in post-program, while moderate HG changed from (16; 64.0%) in pre-test to (14; 56%) in post-program, moreover, all women with severe HG (7; 28.0%) in pre-program reported, completely, regression of HG symptom (0; 0.0%) in post-program. This improvement could be attributed to researcher's usage of wide varieties of educational methods as lectures, and audiovisual materials, and discussion as well as Arabic booklet which distributed to every woman at the end of the program to be available to them everywhere and every time. [29] The distributing of the written materials in the form of booklets can remind women of the topics they have already learned in other ways. They can provide additional information about any health practice for those who have a special interest in it. Booklets are best used when they are brief, written in plain language, full of good pictures and when they are used to back-up other forms of education. This is in accordance with Edgar Dale's or the NTL's Pyramid of Learning as cited by Masters K. [27] as the pyramid illustrated that individuals can retain 10% of what he read and 20% of what he sees and hear (audiovisual). The same authors added that ones can retain 50% of what he learned by discussion. [31,32]

Finally, the results of our study portrayed the correlation between the level of total knowledge score two weeks later of implementation of health education program and socio-demographic characteristics of participating educational program studied group. The results of the current study revealed improvement of total knowledge score after implementation of the health education program with regard all items and sub-items of participants' socio-demographic characteristics; however, a statistically insignificant difference between socio-demographic characteristics of studied groups and their level of knowledge after health education program ($p > 0.05$) was found. This meaning that health education program has the same effect on all age groups have any level of education for both rural or urban residence.

The positive effect of the present study intervention program on women's knowledge was further confirmed by multivariate analysis, which demonstrated that intervention was a statistically significant independent positive predictor of the knowledge score. This success of the program may be attributed to the fact that it was custom-tailored to women's needs, in addition to its simplicity and practicability. The response to women's needs of information is essential in such programs as indicated in previous studies that showed that pregnant women were struggling to understand information and that they depended mainly on nurses who gave them explanatory and illustrated booklets. [26]

5. Conclusion

The study findings have confirmed the need for an individualized approach to women suffering from NVP. Women who are housewives, middle age, improper level of education, rural dwellers, insufficient income, moreover, multigravida, multiple gestations, and previous history of abortion/admission to hospital for a history of motion-sickness and previous usage of oral contraceptives, were more likely to have hyperemesis graviderum than their counterparts. Half of hyperemesis women had a moderate degree and two-fifths of them had sever degree. Based on the results of the present study, it is presumed that the hypothesis of the study is accepted. All women with hyperemesis graviderum achieved both better score in their knowledge and symptoms degree after implementing the educational program than before it.

There is a progression in knowledge score and regression in PUQE score. This is mirrored the effect of the program.

6. Recommendations

Based on the findings of the present research, the following recommendations are suggested:

1. Identification of factors associated with hyperemesis is useful in determining women at high risk for developing hyperemesis; those woman undergoing hyperemesis gravidrum should be closely monitored by the nurse-midwife for receiving the best possible management.
2. In their practice, maternity nurse and midwife should focus on educating pregnant women and explaining the causes of nausea/vomiting in the antenatal outpatient settings, and conduct continuous various educational programs for the high-risk ones to increase and raise their awareness regarding causes, prevention & early detection of HG, they should also introduce women to preventive options and subsequently elucidate factors that alleviate nausea.
3. Design and distribute a simply illustrated guideline, brochures, pamphlets, and booklet in the Arabic language for the high-risk group, about the causes, effect, the preventive measure, and the proper intervention of hyperemesis graviderum.
4. Upgrading nurses' knowledge, by training programs, is needed for nurses in antenatal in-patient/outpatient wards to increases their awareness about hyperemesis graviderum and its appropriate management and how to give health teaching for hyperemesis graviderum women.
5. Replication of this study on a larger sample, on a broad area and different settings of the study is recommended in order to generalize the results.

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