Effect of Health Belief Model Based Education on Preventive Behaviors of Hepatitis B among pregnant Women.

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Abstract

Background: Hepatitis B is a potentially fatal infection that affects the liver and remains a serious public health problem worldwide. Pregnant women were vulnerable group so they need special preventive practice. **Aim*:*** The present study was aimed to investigate the effect of health belief model based education on preventive behaviors of hepatitis B among pregnant women. **Design:** Quasi-experimental design was utilized to fulfill the aim of the study. **Settings:** The study was conducted at antenatal clinics in Benha university hospital. **Sample:** A convenient sample of 100 pregnant women who attend the previous mentioned setting. **Data:** were collected through an interviewing questionnaire sheet and health belief model constructs. **Results:** There was highly statistically significant difference (p<0.000) in pregnant women' knowledge, health beliefs and their health behaviors to prevent hepatitis B in the intervention group compared to the control group two months after   program implementation. **Conclusion** Educational intervention based on HBM was effective in improving pregnant women' knowledge, health beliefs and health behaviours regarding hepatitis B. **Recommendations:** The present study recommended increase awareness of pregnant women about hepatitis B through regular health educational program based on health belief model.

Keywords: Health Belief Model, Preventive Behaviors Hepatitis B & Pregnant Women.

Introduction

Hepatitis B is becoming an emerging public health concern and one of the most important liver diseases. It's defined as an acute inflammatory disease of the liver caused by the hepatitis B virus (HBV) **(Taylor et al., 2015).** It's ranked as the third worldwide transmitted disease and the 9th cause of worldwide mortality. People with hepatitis B infection are considerably at risk of liver cirrhosis and hepatocellular carcinoma (HCC) which is of important health problems in the world (**Chernet et al., 2016).**

Hepatitis B virus (HBV) infection is a serious global public health problem. It's affecting all countries. A staggering 2 billion people are infected with the hepatitis B virus (HBV) worldwide. According to the latest global estimates, 350–400 million of those individuals become chronically infected with the virus with more than 686,000 deaths annually due to chronic infection and another 130,000 from acute HB. (**Grossblatt, 2016).**

Hepatitis B virus (HBV) is an important cause of liver disease in pregnancy. It can be transmitted vertically from mother to fetus or neonate during pregnancy, labor or breast feeding or horizontally via intimate contact blood transfusion ,nosocomial transmission, transplantation ,tattooing and also through exposure to body fluids like blood, semen or vaginal discharge. Sexual contact, sharing contaminated needles, razors, shared tooth brushes and exposure through non-intact skin or mucous membranes. Vertical transmission is responsible for

35% - 40% of the HBV incident cases worldwide. (**Black, et al., 2016).**

Treatment of HBV during pregnancy, and prevention of mother-to-child transmission is an important component of global efforts to reduce the burden of chronic HBV. (**Han et al., 2015)** Prevention is the only safeguard against the epidemic of viral hepatitis B. Knowing facts and having proper knowledge, attitudes, and practice are critical to prevent the spread of viral hepatitis infections. All pregnant women should be screened for hepatitis B. There are different blood tests for hepatitis B virus infection. (**Hannah & Anna, 2015).**

Health belief model (HBM) is one of the health educational models, the effectiveness of which has been proven in various fields of behavioral sciences (**Hall, 2016).** This model is based on individuals' motivation for action. According to this model, people must first feel threatened by a disease or illness to take preventive actions (perceived susceptibility), then understand the depth of the risk and the seriousness of its effects on their physical, psychological, social, and economic dimensions (perceived threat and perceived severity) and believe in the usefulness and applicability of the prevention program (perceived benefits) by positive signs perceived from surroundings environments (cues to action) and finally find inhibiting factors less expensive than benefits (perceived barriers) and as a result, act to the preventive action (**Khorsandi et al., 2014).**

Nurses play a key role in training and consulting with high-risk groups and preventive intervention in treatment centers. Despite of the importance of hepatitis B prevention in pregnant women, a few studies have been carried out in this field; hence the purpose of the present study was to investigate the effect of educational intervention based on health belief model on preventive behaviors regarding hepatitis B among pregnant women (**Khodaveisi et al., 2016).**

Significance of the study

Recently, the health status of mothers and children in relation to hepatitis B infection has become a matter of concern worldwide (**Ahmad, 2016**). Women of childbearing age can potentially transmit HBV to their babies (**Kebede et al., 2015**) Worldwide, about 2 billion people are infected with hepatitis B virus (HBV) generally and 9.4% among pregnant women. Nearly 1 million die every year of the consequences of hepatitis, like cirrhosis or liver cancer. (**Ramniwas et al., 2015**). Infection with hepatitis B virus (HBV) poses a public health challenge, as it is 50–100 times more contagious than human immune deficiency virus (HIV) (**Allen et al., 2015**) . In Egypt viral hepatitis is a major public health challenge but little is known about its epidemiology and risk factors for infection in the Egyptian context. The prevalence of HBsAg in Egypt is of intermediate endemicity (2–8%). Nearly 2-3 million Egyptians are chronic carriers of HBV. In Egypt, it appears that HBV transmission is a mixture of perinatal and horizontal transmission. However, the majority of HBV infection is acquired by horizontal transmission (**Ismail et al., 2014).**

Aim of the study

Aim of the present study was to investigate the effect of health belief model based education on preventive behaviors of hepatitis B among pregnant women.

Research hypothesis

Pregnant women who received education based on HBM are expected to have better knowledge and health behaviors to prevent hepatitis B compared to control group.

Subjects and Method

Research design

Quasi- experimental design was utilized (time-series design) pre/post, two groups were studied.

Setting

The study was carried out at antenatal clinic in Benha university hospitals. This clinic is located at the ground floor of the outpatient building which includes only one room divided into diagnostic and examination area as well as waiting area for women admission where the researchers interviewed the pregnant women to implement educational program.

This clinic provides services of obstetrics and gynecological care, family planning counseling and any outpatient procedures. It starts from 9AM to 12 PM.

Sampling

Subject type and criteria: A convenient sample of 100 pregnant women was included in the current study, among those attending the above mentioned setting. The inclusion criteria include the following: pregnant women, women free from any medical disease and agree to participate in the study .Women were randomly divided into two groups (control group (50) women who received routine care and study group (50) women who received educational intervention based on HBM.

Tools of data collection: Two tools were used for data collection.

First tool: A structured interviewing questionnaire: That was designed by the researchers in simple Arabic language after revising of related literature. It comprised two parts:

Part I: Socio - demographic data it consisted of (age, educational level, occupation, residence and income).

Part II: Knowledge of the studied women regarding hepatitis B and its prevention.It was adopted from (**Kassahun Haile, 2016).** This part was used before and after implementation of the HBM which included 20 questions about knowledge regarding hepatitis B which include meaning, causes, mode of transmission, high risk groups symptoms, complications, screening ,vaccination, prevention and treatment of hepatitis B.

Scoring system of knowledge

Each questions was assigned a score of (1) given when the answer was correct, a score (0) was given when the answer was incorrect. The total score of each section was calculated by summation of the scores of its items. The total score for the knowledge of a participant was calculated by the addition of the total score of all sections. The mean and standard deviation was calculated. As well As women total knowledge score was classified as the following:

- Adequate ≥ 60 % of total knowledge score.
- Inadequate $< 60\%$ of total knowledge score.

Second tool: Health belief model constructs: The HBM was adapted from (**Bonar & Rosenberg, 2015**) .Modifications was done by the researchers on Arabic language. This tool composed of two parts:

Part (1): Composed of the five HBM constructs: perceived susceptibility to Hepatitis B (three items), perceived severity of Hepatitis B (three items), perceived barriers of Hepatitis B prevention (six items), perceived benefits of Hepatitis B prevention (six items). And self- efficacy to Hepatitis B (five items).

Scoring system of Health Belief Model: The answers to the questions about each of the above mentioned constructs of hepatitis B were recorded on a Likert scale rating from 1 to 5 i.e. from totally agree to totally disagree, respectively. Accordingly, each of the options was scored as follows: "totally agree" was scored 5 points, "agree" was scored 4 points, "no idea" was scored 3 points, "disagree" was scored 2 points, and "totally disagree" was scored 1 point. The total score for the five HBM constructs of a participant was calculated by the addition of the total score of all sections and a higher score indicated a more positive belief toward hepatitis B prevention behaviors. Total score classified as the following:

− High ≥ 75 %
− Moderate 50-75
− Low < 50%

Part (2): Composed of the

preventive behaviors of hepatitis B (with 11 questions) regarding hepatitis B preventive behaviors. **Scoring:** For each behavior, the positive response scored "two", and the negative response scored "one". The total behavior score was calculated by adding the scores for the positive one and classified as the following:

· Satisfactory ≥ 60 % of total knowledge score.
· Unsatisfactory < 60% of total knowledge score.

Administrative approval

This study was conducted under the approval of the Faculty of Nursing Ethical Committee, Benha University. An official permission was obtained from the directors of the pre-mentioned setting (antenatal clinic in benha university hospital) to conduct the study after explaining its purpose.

Tools validity

Content validity was done to assure that the utilized tools measure what it was supposed to measure. Tools developed by the researchers were examined by a panel of five experts to determine whether the included items clearly and adequately cover the domain of content addressed.

Reliability

Test-retest was repeated to the same sample of pregnant women on two occasions and then compares the scores The Cronbach's coefficient alpha of knowledge questionnaire was 0.79% .And 0.82% for health belief model and for preventive behaviors equal 0.42%.

Ethical considerations

Each pregnant woman in both groups was informed about the aim of the study then consent was obtained before data collection. Strict confidentiality was safeguarded throughout the study. The women were assured that all data was used only for research purpose. They were informed that they could withdraw from the study at any time before the completion of the study. After the study was completed, handout about hepatitis B was distributed to control group.

A Pilot study

Pilot study was conducted on 10% of studied sample (10) pregnant women to assess the clarity, objectivity and feasibility of the tools. As well to estimate the time needed for data collection. Those pregnant women in pilot study were included in the main study sample as no modifications done.

Field work

The researchers obtained a written letter from the Faculty of Nursing Dean, then directed to Benha University Hospital Director. Written official letter was taken and delivered to the Director of obstetrics and gynecological outpatient Clinic, in order to obtain their approval to conduct the study after explaining its purpose. At the time of data collection a verbal agreement was taken from every participant in the study after clear and proper explanation: assessment, planning, implementation, and evaluation. These phases were carried out from beginning of April 2016 to the end of September 2016, covering along a period of six months. The previous mentioned setting was visited by the researchers three days/week (Saturdays, Tuesdays and Thursdays) from 9.00 am to 12.00 pm.

Assessment phase

After obtaining official permissions to conduct the study, the researchers interviewed each woman individually in both control and intervention groups introduced herself to participants, explained the purpose and procedures of the study, and asked for participation. After obtaining consent to participate in the study, the women were interviewed to assess their general characteristics and knowledge regarding hepatitis B and its prevention, health belief model and health behaviors to prevent hepatitis B. The information obtained during this phase constituted the baseline for further comparisons to estimate the effect program. Control group was assessed first then intervention group to avoid cross contamination of information between both groups. Average time for the completion of each women interview was around (10-15 minutes). A number of interviewed women / week ranged from 3-5 women).

planning phase

Based on the needs that obtained from pretest assessment phase and review of related literatures, the researchers developed health belief model constructs about hepatitis B with simple Arabic language to suit females' level of understanding, which aimed to improve females' knowledge, modify their health beliefs, and empower them to take health decisions for hepatitis B screening practice and prevention. It emphasized the areas of major

deficiency in female's knowledge about important regarding hepatitis B (meaning, causes, risk factors, signs and symptoms, diagnosis, methods of treatment, prevention, benefits of prevention vaccination (benefits, safety, and availability and early treatment. The health educational program involved two sessions which conducted to a small group (10) of the intervention group. The program was implemented according to pregnant women' physical and mental readiness. The duration of each session lasted from forty five minutes to one hour including periods of discussion according to their achievement, progress and feedback. Different methods of teaching were used such as lecture and group discussion.

Implementation phase

A. Women were divided into two groups (intervention & control) each woman in both groups was asked to read and sign the informed consent form. The participants also were assured that their information will remain confidential to the researchers, and it is released unnamed and in general.

B. The pre-test was performed by administering the coded anonymous questionnaire on the participants in the intervention and control groups, and some explanations were given on how to fill out the questionnaire. To avoid cross contamination of data between both groups, control group was assessed first. Average time for the completion of each woman interview was around (10-15 minutes).

C. Pregnant women in the control group only received routine prenatal care in health care centers, while women in the intervention group participated in sessions, in addition to the routine prenatal care provided by the health care centers.

D. Teaching the intervention group members was performed using the methods of lecture, group discussion, question and answer, and pamphlets provided by the researchers, in groups of 10 members for 45-60 minutes sessions over five weeks in the target centers.

E. The educational content in the first session included general information about hepatitis B, positive change in behaviors. In order to increase women motivation. Each session lasted from 45-60 minutes.

F. In the second session, to raise knowledge, the participant were provided by knowledge regarding Hepatitis B infection can be fatal lead to complication and death of mother and child (perceived severity), and increase risk of hepatitis B in pregnant women (perceived susceptibility), emphasizing the benefits and the significance of preventive behaviors of hepatitis B(perceived

benefits). Also, group discussions were conducted to overcome the barriers (perceived barriers) to healthy behaviors and (self efficacy). At the end of each session; 10 minutes were devoted to questions and answers.

G. Two month after the last educational session, all participants in both intervention and control groups were invited through telephone number to complete the post test questionnaire. Also, according to the principles of ethics in research, the members of the control group were provided by the educational pamphlet prepared by the researchers.

Evaluation phase

After education based HBM; the effect of the program was evaluated by using the same format of pre test. Post-test was conducted for control group first then intervention group; this was done after two months of program implementation.

Statistical analysis

Data were verified prior to computerized entry. The Statistical Package for Social Sciences (SPSS version 20.0) was used for that purpose, followed by data analysis and tabulation. Descriptive statistics were applied (e.g., frequency and percentages).Test of significance (chi-square) was used to test the homogeneity of the outcome variables between the groups and to test the study hypothesis. Pearson correlation coefficients were used. A statistically significant difference was considered at p-value p≤0.05, and a highly a statistically significant difference was considered at p-value p ≤ 0.001.

Results

Table (1): Distribution of studied groups regarding socio-demographic characteristics (n=100).

socio-demographic characteristics	Study group n=50		Control group n=50		X2	p-value
	no.	%	no.	%		
Age (years)						
<20	7	14.0	9	18.0		
20-<30	35	70.0	34	68.0	0.33	< 0.05
30+	8	16.0	7	14.0		
Mean ±SD	**29.4±0.98**		**29.2±1.04**			
Educational level						
Basic education	7	14.0	9	18.0		
Secondary Education	35	70.0	34	68.0	0.33	< 0.05
University	8	16.0	7	14.0		
Occupation						
working	20	40.0	15	30.0	1.09	< 0.05
Not working	30	60.0	35	70.0		
Income						
Not enough	29	58.0	28	56.0	1.96	< 0.05
Enough	21	42.0	22	44.0		
Residence						
Rural	35	70.0	26	52.0	3.40	< 0.05
Urban	15	30.0	24	48.0		

Table (2): Mean differences between study and control group knowledge before and two months after program implementation (n=100).

Total Knowledge	Pre intervention		t test	p-value	Post intervention		t test	p-value
	Mean	±SD			Mean	±SD		
Control group	26.6400	3.52692			28.6400	3.59001		
Study group	28.0200	4.38220	1.73	>0.05	33.2000	3.63093	6.315	0.001

The test used independent t test between study and control group.
**A highly statistical significant difference (P ≤ 0.001)
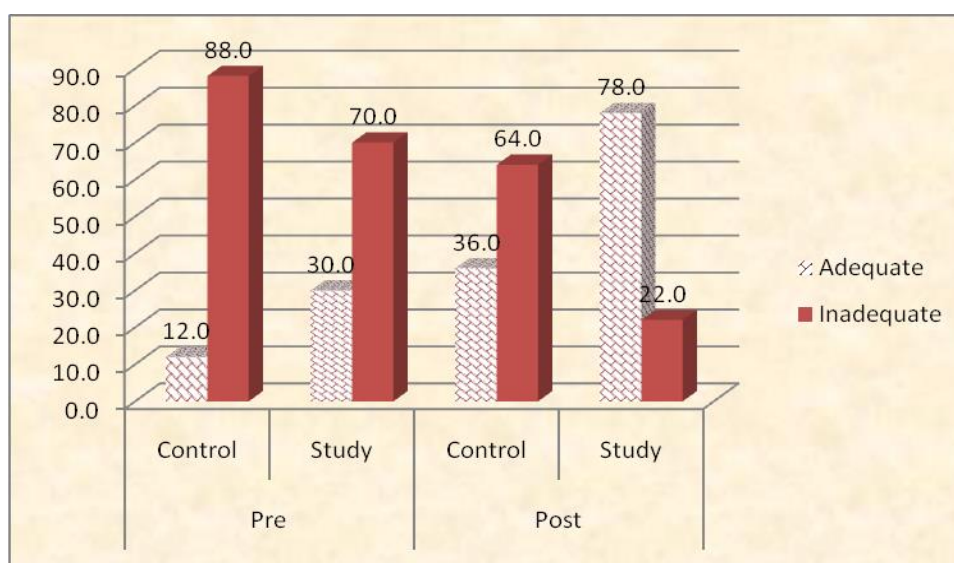

Figure (1): Distribution of studied groups regarding total knowledge score pre and post program implementation.

Table (3): Mean differences between study and control group regarding HBM main constructs before and two months after program implementation. (n=100).

Health belief model	Pre intervention		t test	p-value	Post intervention		t test	p-value
	Mean	±SD			Mean	±SD		
Total perceived susceptibility								
Control	15.2400	2.24572	1.427	>0.05	16.5800	2.81461	13.840-	0.001
study	13.6000	2.53144			24.4000	2.83563		
Total perceived severity								
Control	10.1000	2.17828	1.019	>0.05	10.9600	2.10887	12.880	0.001
study	10.5600	2.33133			16.2800	2.02071		
Total perceived barriers								
Control	16.7800	3.06588	1.087	>0.05	17.2000	2.96235	11.752	0.001
study	16.1000	3.18959			23.7200	2.57175		
Total perceived benefits								
Control	16.8000	2.37332	3.498	>0.05	17.5000	2.71241	11.080	0.001
study	15.1200	2.42975			23.4600	2.66657		
Total self efficacy								
Control	14.4600	2.01231	1.60	>0.05	14.2400	2.36953	13.931	0.001
study	16.3200	2.02474			19.9600	1.67770		

The test used independent t test between study and control group.
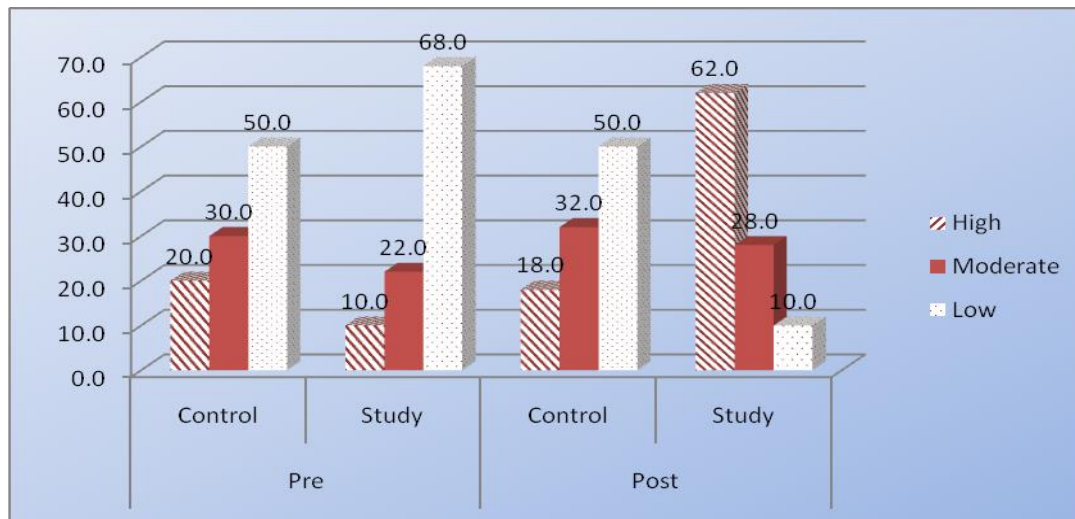***A highly statistical significant difference (P ≤ 0.001)*

Figure (2): Distribution of studied groups regarding total health belief model pre and post program implementation.

Table (4): Mean differences between study and control group regarding total preventive behaviors regarding hepatitis B pre and post program implementation. (n=100).

Total preventive behaviours	Pre intervention		t test	p-value	Post intervention		t test	p-value
	Mean	±SD			Mean	±SD		
Control group	9.2600	1.22574	0.167	>0.05	9.3800	1.29189	9.11	≤ 0.001
Study group	9.3000	1.16496			11.7600	1.31801		

The test used independent t test between study and control group.
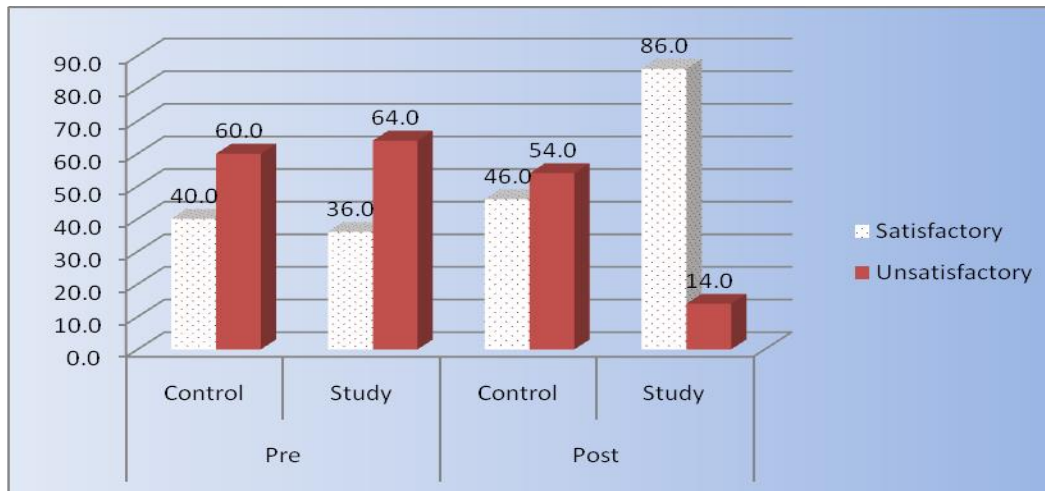***A highly statistical significant difference (P ≤ 0.001)*

Figure (3): Distribution of studied group's preventive behaviors regarding hepatitis B pre and post program.

Table (5): correlation between total knowledge and total preventive behaviors pre and post program for study and control group.

Total preventive behaviors	Total knowledge				
	Pre intervention			Post intervention	
		r	p-value	r	p-value
	Control group	0.26	0.82	0.42	>0.05
	Study group	0.41	0.32	0.63	<0.001

Table (6): correlation between total health belief model and total preventive behaviors pre and post program for study and control groups.

Total preventive behaviors	Health belief model				
	Control group	Pre		Post	
		r	p-value	r	p-value
		0.32	**0.32**	**0.51**	**>0.05**
	Study group	0.38	0.21	0.81	<0.001

Table (1): Reveals that there was no statistically significant difference between study and control group regarding their socio demographic characteristics.

Table (2): Demonstrates that, there was no statistically significant difference between both control and a study group means knowledge score before program implementation. Meanwhile, there was a highly statistically significant difference (p-values < 0.001) was observed between the two groups two months after program implementation.

Figure (1): Represents that total knowledge score regarding hepatitis B during pregnancy were greatly improved after intervention than pre intervention among study group while there were minimal improvement after intervention than pre intervention among control group.

Table (3) Shows that, there was no statistical significant difference was observed between the study and control group in the main HBM constructs

(perceived susceptibility, perceived severity, perceived barriers and perceived benefits, self efficacy) before program implementation. However, two months after program implementation, there was a highly statistically significant difference (p-values < 0.001) was observed in HBM constructs.

Figure (2): Clarifies that health belief model regarding hepatitis B during pregnancy were greatly improved after intervention than pre intervention among study group while there was minimal improvement after intervention than pre intervention among control group.

Table (4): Illustrated that, there was no statistically significant difference between study and control groups before program implementation regarding health behavior to prevent hepatitis B during pregnancy. Meanwhile, a highly statistically significant difference (p-values < 0.001) was observed two months after program implementation between two groups.

Figure (3): Represents that total preventive behavior regarding hepatitis B during pregnancy were greatly improved after intervention than pre intervention among study group while there was minimal improvement after intervention than pre intervention among control group.

Table (5): Clarifies that, clarifies that, there was a positive highly statistically significant correlation between total knowledge and total preventive behaviors score in both study and control groups before and after program implementation.

Table (6): Illustrates that, there was a positive highly statistically significant correlation between total preventive behaviour score and total HBM constructs in both study and control groups before and after program implementation.

Discussion

Viral hepatitis B is major health concern endemic in many counties worldwide caused by HBV and it causes devastating life-threatening acute hepatitis and chronic liver diseases such as cirrhosis and hepatocellular carcinoma. Hepatitis B virus (HBV) infection is a very source of mortality and morbidity **Anka et al., (2016)** The purpose of the present study was to investigate the effect of health belief model based education on preventive behaviors of hepatitis B among pregnant women.

The findings of the current study illustrated that there was no statistically vbsignificant differences were found between the study and control groups in terms of age, educational level, occupation, residence and monthly income. These results mean that the two groups under study are homogenous. These results were similar to **(Khoramabadi et al., 2016 & Shahnazi et al., 2015)** .They had studied the effects of education based HBM on different health behavior among pregnant women. They pointed out that, there was no significant difference between the intervention and the control groups regarding their age, educational level, monthly income and occupation.

Concerning women's knowledge regarding hepatitis B, the present study revealed that there was a highly significant improvement in the study group knowledge two months after program implementation compared to the control group. This might be related to the effect of the nursing educational program on knowledge. These findings were in agreement with study conducted by **Anka et al., (2016)** in the study of the effectiveness of education intervention program for improving knowledge, attitude and practice related to hepatitis-B infection among non-medical and non-veterinary undergraduate university student in northern Nigeria, a randomized control community trial**.** Study showed that there was

significance increase in sound HBV knowledge among respondents in the intervention group immediately post intervention. This increase was sustained at three months post-intervention follow-up. Additionally **Han et al., (2015)** they revealed at the study of knowledge of and attitudes towards hepatitis B and its transmission from mother to child among pregnant women in Guangdong Province, China found that pregnant women had insufficient knowledge regarding HBV infection. Despite most respondents being aware of the importance of antenatal screening, neonatal vaccination and postnatal follow-up of HBV Additional efforts to enhance HBV public health education programs in understandable language are needed to achieve the goal of eliminating MTCT of HBV. Future studies could be aimed towards determining the impact of such education programs. On other hand this result came in contrast with **Setia et al., (2013)** in the study of Hepatitis B and Hepatitis C amongst health care workers of a tertiary hospital in India. Showed that majority of the respondents were aware of hepatitis B infection. This difference may be due to that sample were health workers and may have knowledge about hepatitis B infection.

The current study results showed that total knowledge score of pregnant women regarding hepatitis B were greatly improved after intervention than pre intervention among study group while there were minimal improvement after intervention than pre intervention among control group. This may be due to the reason that routine follow up of pregnancy and health education given during antenatal visits cause minimal improvement in the knowledge of control group while the educational intervention based on HBM cause great improvement in the knowledge of intervention group this will ensure the importance of health education based on HBM.

Regarding the main HBM constructs, the current study results showed a significant increase in the mean scores of perceived susceptibility in the intervention group compared to control group after program implementation. Perceived susceptibility is an HBM component, which means the understanding of a person about exposure to a disease. This result was compatible to **Karami, et al., (2016)** who found that the people's susceptibility has increased and suggested that perceived susceptibility must be increased by training before entanglement of disease. Additionally these result was agree with **Abdel-Aziz et al., (2016)** in the study of effect of application of health belief model on pregnant women' knowledge and health beliefs regarding urogenital infections. They documented significant increase in the mean scores of perceived susceptibility in the intervention

group compared to control group two months after program implementation.

Moreover This result is similar to at least two studies (**Bonar & Rosenberg's study 2015** & **Lin et al., 2015**) .They had studied the effects of education based HBM on different health behavior among pregnant women. They documented that a significant increase in the mean scores of perceived susceptibility in the intervention group compared to control after the intervention. On the other hand (**Bakhtari et al., 2012**) had studied the effect of HBM based education on screening behaviours of breast cancer among women. He showed no significant difference between intervention and control group in the perceived susceptibility after the education.

The present study findings indicated that the mean scores of perceived severity to hepatitis B increased in intervention group two months after program implementation with highly statistically significant difference observed between intervention and control group. Perceived severity, which refers to the understanding of a person about the severity of a disease and its potential consequences. The results indicated that HBM-based training increased the score of perceived severity. This is consistent with **Khodaveisi et al., (2016)**. He stated that the score of the perceived severity in the intervention group was meaningfully increased, compared to the control group, after the program. on other hand this result in contrast with in the study of **Tavakoli et al., (2016)**. HBM-based training did not lead to a significant increase in the score of perceived severity, the reasons of which may be test error, research limitations, lack of training methods in line with the objectives of the research, and an inappropriate environment.

In the present study, the current findings also reported a significant increase in the mean scores of perceived benefits on the intervention group compared to control group two months after program implementation. Perceived benefits, which means individual understanding of the positive results of an accepted behavior. This result is similar to at least two studies (**Khoramabadi et al., 2016** & **Shirzadi et al., 2015**). They had studied the effects of education based HBM on different health behavior among pregnant women. They documented that a significant increase in the mean scores of perceived barriers on the intervention group compared to control after the intervention. This result disagrees with study of **O'Rourke et al., (2016)** they had shown that HBM-based training has effect no effect on the score of perceived benefits of hepatitis B prevention.

Additionally, the current findings also reported a significant increase in the mean scores of perceived barriers on the intervention group compared to control group two months after program implementation. Perceived barriers which refer to the individual's evaluation of the inhibiting effects of an encouraging behavior .This result is similar to **Shirzadi et al., (2015)** they reported in study that training could significantly increase the score of perceived barriers in puberty health among female adolescents. Also in the study of (**Bonar & Rosenberg 2015**) the score of perceived barriers of high risk behaviors was also significantly increased**.**

Additionally the results also indicated a significant difference in mean score of self-efficiency between the intervention and control groups two months after program implementation. Self-efficiency as means of individuals' confidence about the ability to perform an action, which plays an important role in increasing preventive behaviors and reducing risky behaviors .

In accordance with the results of the present study, the results of **Khorsandi et al., study (2014)** indicated that HBM-based training could significantly increase the self-efficiency of the adoption of hypertension-controlling behaviors. Also, it has been shown in the study of **Tanaka et al., (2016)** that HBM-based training could significantly increase the self-efficiency of hepatitis B prevention. Also **Mirzaei et al., (2016)** stated that the mean scores of perceived susceptibility, severity, benefits, barriers, perceived self-efficacy, practice guidance and health performance were significantly different between two groups ($p < 0.001$).

The current study clarified that there was a highly significant improvement in the health behavior to prevent hepatitis B in the intervention group compared to the control group two months after program implementation. Also, significant improvement was observed within the study group health behavior before and two months after program implementation. This result is in agreement with the studies of (**Tehrani et al., 2014, Taghdisi & Sadeghi, 2012** & **Jahanbin et al., 2015**) they stated that education based on HBM can promote preventive behaviors and reduce the risk of the disease among pregnant women.

The results showed that there was a positive highly statistically significant correlation between total knowledge and total health behavior score in both study and control groups before and after program implementation. as well as there was a positive highly statistically significant correlation between total health behavior score and total HBM main constructs in both study and control groups before and two months after program implementation

These findings are in congruence with **Rahimi et al., (2016)** they showed a significant correlation between knowledge and all HBM constructs with health behavors**.** Also this result agree with **Mohamady et al., (2017)** in the study of effect of application of health belief model on females' knowledge and practice regarding the premarital counselling showed that there was a positive statistically significant correlation between knowledge and health beliefs in both intervention and control group before and two months after program implementation. Moreover these findings are in congruence with **Yossif & EL Sayed, (2014)** they clarified that, there was a positive highly statistically significant correlation between total knowledge and total health beliefs scores as well as between total knowledge and total intention to practice health behavior in both intervention and control groups before and two months. From researcher view point this may be attributed to the fact that changing the belief is the milestone for behavior change. All these studies based on HBM which play on changing the belief.

Conclusion
Based on the results, there was no statistical significant difference regarding the main HBM constructs (perceived susceptibility, perceived benefits, perceived severity and perceived barriers and self efficacy) and preventive behavior before and after program implementation among the control group. However, a highly statistically significant difference (p-values < 0.001) was observed regarding the main HBM constructs before and after program implementation among the study group. Therefore educational interventions. In general, the results of the present study showed HBM was effective in improving knowledge and preventive behaviours of hepatitis B in pregnant women. These study findings were supported the study hypothesis.

Recommendations
Based on results of the present study, the following recommendations can be suggested:
- Increase pregnant women awareness about hepatitis B through regular educational program based on HBM.
- Provide pregnant women with instructional booklets about hepatitis B based on HBM to improve their knowledge and health beliefs.
- Routine and universal antenatal hepatitis B virus screening program need to be implemented.
- Replication of the study on large representative probability sample in different maternity hospital to achieve more generalization of results.

Further research
Further studies should be conducted to assess knowledge and behaviours of health care providers as the study only depended on pregnant women.

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