
▪ **Basic Research**

Effect Of an Educational Intervention Based on Health Beliefs Model Adoption on Pregnant Women's Knowledge and Preventive Health Behaviours in Relation to COVID-19

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Abstract

Introduction: COVID-19 may put pregnant women at greater risk of serious conditions and poor outcomes for new-borns. **Aim:** The study aimed to evaluate the effect of an educational intervention based on health beliefs model adoption on pregnant women's knowledge and preventive health behaviours in relation to COVID-19. **Subjects & Method:** A quasi-experimental design was performed on 100 pregnant women in the antenatal clinic of Zagazig University Hospital using purposive sampling. Data were collected using three tools: a structured interview questionnaire, the health beliefs model and preventive health behaviours of pregnant women in relation to COVID-19. **Results:** Mean and standard deviation of knowledge and preventive behaviours about covid-19 were greatly improved from 21.1 ± 5.67 and 26.88 ± 2.49 before applying the Health Belief Model to 27.84 ± 1.67 and 31.92 ± 3.61 after applying the health belief model. **Conclusion:** The study concluded that an educational intervention based on the adoption of the health belief model enhanced pregnant women's knowledge and preventive health behaviors in relation to COVID-19. **Recommendations:** The study suggests that health education interventions should specifically target pregnant women at different antenatal clinics at Zagazig city.

Keywords: COVID19, Health Beliefs Model, Pregnant women, Preventive Behavior.

Introduction

Coronavirus (COVID-19) is now a spreading pandemic and a deadly health crisis, particularly in vulnerable communities and those where health systems are not sufficiently prepared to manage infection. It is important for pregnant women and those around them to take precautions to protect themselves from COVID-19 (Yassa et al., 2020) ⁽¹⁾.

Pregnant women are at high risk during infectious disease outbreaks (**Dashraath et al., 2020**)⁽²⁾. Middle East respiratory syndrome- COVID (MERS-CoV) infection in the third trimester of pregnancy appears to increase the risk of premature rupture of membranes, preterm delivery, fetal tachycardia, and fetal distress. Thus, it is important that pregnant women and their families, as well as health care providers, receive as much accurate information as possible. During the outbreak of the Corona, pregnant women are advised to pay attention to personal and social hygiene and to avoid unnecessary trips, crowded places, public transportation, and communication with patients (**Wang et al., 2020**)⁽³⁾.

In fact, no definitive cure for COVID-19 has been found, so the behaviors of a pregnant woman are very important to prevent and control infection. Thus, educational intervention is the most important strategy for preventing COVID-19 infection. Furthermore, it is necessary to assess pregnant women's beliefs about COVID-19 prevention and the motivation for following preventive measures, such as personal hygiene, use of personal protective supplies, maintaining social distance, and isolation. Thus, people's psychological and behavioral responses are very important to the prevention and control of COVID-19 outbreaks (**Mirzaei et al., 2021**)⁽⁴⁾.

The health belief model (HBM) is a tool designed to illustrate patient behavior in the face of infection risk and to show positive factors that improve health behaviors and reduce or prevent negative factors. Therefore, in order to establish a health care behavior that prevents the risk of infection, a woman must know is vulnerable to infection and that this infection will negatively affect the life even slightly, and **woman** must follow certain behaviours to reduce exposure to infection (**Rasmussen et al., 2020**)⁽⁵⁾.

The health belief model has six main constructs including the perceived susceptibility where a woman should perceive that pregnant woman is at risk for health (e.g., COVID-19), the perceived severity whereby women should perceive the risks and complications of health risks, and the perceived advantages that they should understand the value and benefit of women adopting new behaviours in terms of reducing the risk of infection and being able to adopt new behaviours based on their perception of their benefits in reducing risk. Perceived barriers include attempting to reduce barriers to preventive action, while perceived self-efficacy includes women's confidence in successfully performing the behavior. Finally, cues to actions are the symptoms, strategies, or sources of information that facilitate the execution of the behaviour (**Carico et al., 2020**)⁽⁶⁾.

Health care providers should pay more attention to pregnant women who have health concerns regarding themselves and their fetuses at the same time. Nurses play an important role as a primary health care provider through providing health education regarding COVID-19 information, understanding to enable hopeful states of mind and maintain safe practices (Mohamed et al., 2020) ⁽⁷⁾.

Significance of the Study

Pregnancy is an important period, but for pregnant women who are at risk of contracting COVID-19 and fear are the barriers to this enjoyable period. Dealing with the outbreak of COVID-19 among pregnant women, there is a need to take measures to educate and guide pregnant women to adopt healthy preventive behaviors in relation to COVID-19 during this period (Malapuram and Kamel 2020) ⁽⁸⁾. Covid-19 infection can cause serious complications during pregnancy and the mortality rate for MERS-CoV among pregnant women is up to 25% (Poon et al., 2020) ⁽⁹⁾.

Aim of the study

The study aimed to evaluate the effect of an educational intervention based on health beliefs model adoption on pregnant women's knowledge and preventive health behaviors in relation to COVID-19.

Research hypothesis

An educational intervention based on the adoption of the health belief model can improve knowledge and preventive health behaviors of pregnant women in relation to COVID-19.

Subjects & Method:

Research design

A quasi-experimental design was used to achieve the aim of the study (pre/posttest design).

Research setting

The study was conducted in the antenatal clinic for obstetrics and gynecology at Zagazig University Hospital, which is the main hospital that serves the community of Sharkia Governorate and the surrounding areas and provides routine care for pregnant women.

Study sample size

The study was conducted on a quarter of all pregnant women who attended the clinic for 6 months and were enrolled for the study. The sample size was 100 pregnant women.

Sampling technique

A purposive sampling of pregnant women was recruited.

Study subjects' criteria

Pregnant women who agreed to participate in the study, and who were able to read and write were included in the study. Women with pregnancy complications or any medical disorders were excluded from the study.

Data collection tools

Tool (I): A structured interview questionnaire:

It was developed by the researchers in Arabic language after looking into the related writing. (Mohamed, et al., 2020) ⁽⁷⁾. It comprised of two parts:

Part (1): Demographic characteristics and obstetric history of pregnant women. It included age/ years, place of residence, educational level, and occupation. Also, gestational age /weeks, number of pregnancy and delivery.

Part (2): Sources of information and knowledge of pregnant women about COVID-19. It included 15 questions about COVID 19 such as mode of transmission, signs and symptoms, causes, high-risk groups, diagnosis, complications, management and prevention measures of COVID-19.

Knowledge Score & level

The correct answer received a score of one, while the incorrect answer received a score of zero. The total knowledge scores for pregnant women were categorized as follows:

- Adequate knowledge: $\geq 60\%$.
- Inadequate knowledge: $< 60\%$.

Tool (II): Health Beliefs model:

The health beliefs model was adapted from Khoramabadi et al. (2020) ⁽¹⁰⁾ with modification. It consists of 29 questions divided into six parts:

Part (1): Perceived susceptibility of COVID 19 (four items) as pregnant women are more susceptible to infection with corona, they do not care about this infection and carry out daily activities as usual, --- etc.

Part (2): Perceived benefits of COVID 19 prevention (six items) as COVID can be easily prevented by cleaning hands regularly with soap and water and it is easily prevented by personal shielding supplies such as masks and disposable gloves, --- etc.

Part (3): Perceived severity of COVID 19 (six items) as Coronavirus has a high mortality rate, is very dangerous, and has high transmission ability, --- etc.

Part (4): Perceived barriers of COVID 19 (eight items) as prevention instructions are difficult to follow, do not be impatient to follow preventive instructions, it is difficult to clean hands regularly with soap and water, a mask is expensive, --- etc.

Part (5). Cues of action consisted of 5 items as TV and radio news related to COVID-19 have been valuable, encourages local government to follow prevention measures, and family members to follow preventive behaviors, ----- etc.

Part (6): Self-efficacy. It consisted of 5 items for the ability to follow all preventive instructions against COVID 19, ---etc.

Scoring System for the Health Beliefs Model

Five-level Likert scale (0 to 4), each item was assigned as follows: “completely agree” 4 points, “agree” 3 points, “no idea” 2 points, and “disagree” 1 point, and “absolutely disagree” with 0 point. The Total Health Beliefs model level is categorized as follows:

- High health beliefs $\geq 60\%$
- Moderate health beliefs 50- <60%
- Low health beliefs <50%

Tool (III): Preventive measures of pregnant women against COVID-19.

It was developed by researchers to assess preventive measures of pregnant women against COVID-19 and consisted of eight items as; Put a tissue or bend the elbow in front of the mouth and nose when coughing or sneezing, stay at least 1 meter away from others, do not shake hands or kiss others, wash hands with soap and water, do not touch anything after entering the house - and so on.

Likert scoring system for preventive behaviors

It was rated (0 to 4) as follows: “Exactly Agree” with 4 points, “Agree” with 3 points, “No idea” 2 points, “disagree” 1 point, and “Exactly disagree” 0 points. It classified as: High (60%), Moderate (50- <60%), Low (<50%).

Content Validity

Data collection tools were reviewed by a panel of five professors' expertise in obstetrics and gynecology nursing to ensure tools were clear, appropriate, comprehensive, applicable, and validated for content.

Reliability

Reliability was performed by Cronbach's alpha coefficient test to ensure that data collection tools consisted of fairly homogeneous items (knowledge reliability was 0.971, health beliefs model was 0.874, and preventive measures was 0.91).

Pilot study

The pilot study included 10% (10 pregnant women) of the included study sample to assess the tool's feasibility, clarity, applicability, and time to fill out the questionnaire. No adjustments were made, so the pilot study sample was included in the total sample size.

Ethical Considerations

For study data collection, approval was obtained from hospital authorities. Consent of the pregnant woman was also obtained prior to data collection after clarifying the purpose of the study. The questionnaire was given a code number, to ensure anonymity. The women were advised that the questionnaire would be used only for the purpose of the study with no negative consequences for them. They also have the right to withdraw at any time without giving reasons.

Field work:

Dean of the Faculty of Nursing, Zagazig University gave an official agreement and forwarded it to the Director of Zagazig University Hospital and to the Director of Obstetrics

and Gynecology Outpatient Clinic After clarifying the study's aim. The study was accomplished in four stages: the assessment phase, the planning phase, the implementation phase, and the evaluation phase. These phases lasted six months, from January 2021 to June 2021. The researchers attended the above-mentioned place three times per week (Saturdays, Tuesdays, and Thursdays) from 9.00 a.m. to 12.00 p.m.

2- Assessment phase

This phase involved interviewing pregnant women to obtain demographic characteristics, knowledge, beliefs, and preventive actions regarding COVID-19. The researchers greeted the women, introduced themselves, explained the purpose of the study, and gave the woman all information about the study such as duration, activities, and taking oral consent. The average time per woman was 15-25 minutes and the number of women previously interviewed was counted by study participants.

3- Planning phase:

Based on the outcomes from the assessment phase, the educational intervention based on the health beliefs model was designed, and the session number, its contents, different education methods, and educational media were assigned.

4- Implementation phase:

Pregnant women were divided into small groups and the researchers asked the women to follow the preventive actions during the sessions of wearing masks and gloves, using alcohol, and maintaining a social distance. Then the educational program was carried out through two sessions for each group, one theoretical session took about thirty minutes, and one practical session took about twenty minutes. Various methods of teaching have been used such as lecture, discussion, illustration, and replay. Educational media such as videos with all educational contents and educational brochures on infection with COVID-19 were distributed to each woman. At the end of each session, the women were encouraged to ask questions to correct any misunderstandings.

5- Evaluation phase:

The effect of an educational intervention based on the health beliefs model was assessed by the same form of tools that used the pre-education application immediately after educational implementation to assess the pregnant woman's knowledge, beliefs, and preventive actions regarding COVID-19

Data Analysis

Prior to data entry, data was checked, then categorized, coded, computerized, and tabulated using IBM SPSS-22. (20). Numbers and percent were used to describe qualitative data, the mean, and standard deviation for quantitative data. The t-test and X² test were used to examine the differences between quantitative and qualitative data, respectively. The Pearson correlation coefficient (r) was also utilized to assess the correlation between different variables under investigation. The p-value is considered a significant level at less than 0.05.

Results

Table 1 reveals that over a third (36.0%) of women aged 19-25 years had a mean of 29.44 years. More than half (56.0% and 58.0%) live in rural areas and have a university education, respectively. regarding occupation, nearly two-thirds (60.0%) were housewife.

Table 2 shows that more than half of the women (54.0%) had gestational age between 36 and 37 weeks with a mean of 35.22 weeks. Most of them (86.0% and 60.0%) had three or more pregnancies and deliveries, respectively.

Table 3 shows that the mean knowledge score of women regarding COVID-19 was 21.1 ± 5.67 and 27.84 ± 1.67 before and after the adoption of the health beliefs model, respectively with a highly statistically significant difference ($P < 0.001$). Additionally, there is a highly statistically significant difference with respect to mean women's perceived susceptibility, perceived severity, perceived barriers, action cues, and self-efficacy scores on COVID-19 before and after adopting the health beliefs model ($P < 0.001$). While there is no statistically significant difference with regard to perceived benefits before and after the adoption of the health beliefs model ($P > 0.05$). Also the mean score of preventive behaviors of women regarding COVID-19 was 26.88 ± 2.49 and 31.92 ± 3.61 before and after the adoption of the health Beliefs model with a highly statistically significant difference ($P < 0.001$).

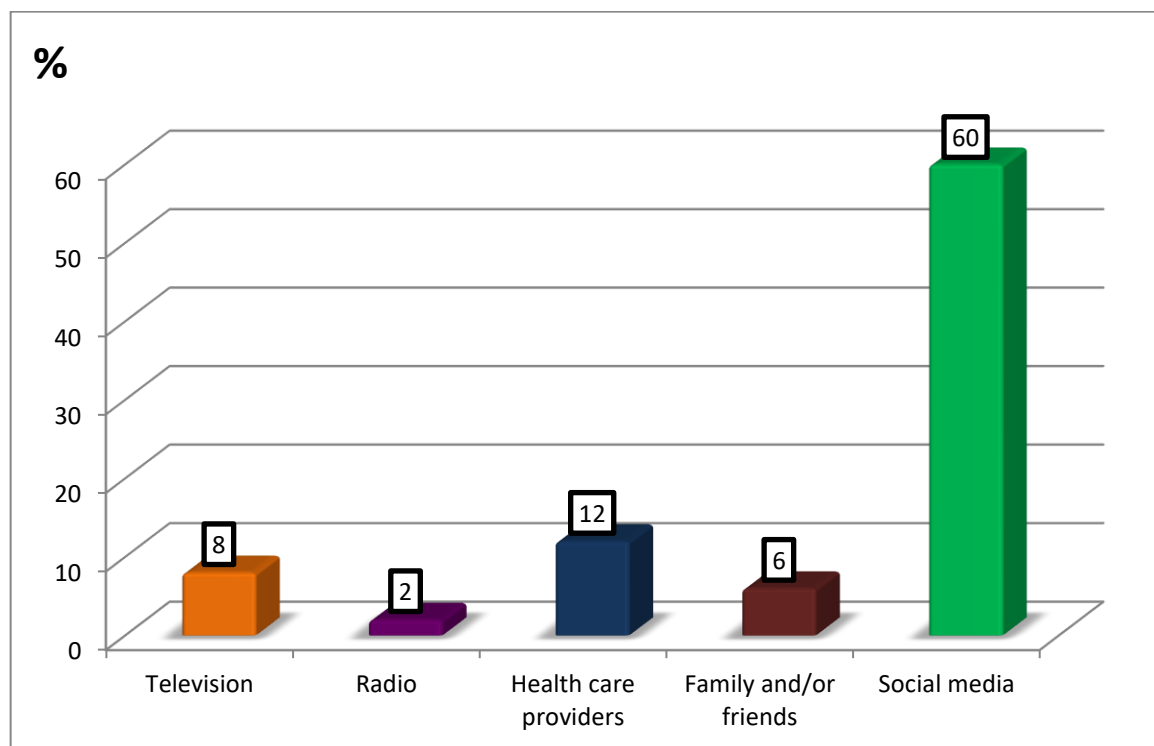
Table 4 shows that there is a highly positive significant correlation between preventive behaviors and adopting the health beliefs model ($P < 0.000$).

Table (1): Distribution of women regarding demographic characteristics (N= 100)

Demographic characteristics	No.	%
Age		
19-25 years	36	36.0
26-32 years	32	32.0
33-38 years	32	32.0
Mean \pm SD	29.44 \pm 5.2	
Place of residence		
Rural	56	56.0
Urban	44	44.0
Educational level		
Primary school	4	4.0
Secondary school	38	38.0
University education	58	58.0
Occupation		
Housewife	60	60.0
Employee	40	40.0

Table (2): Distribution of women regarding obstetrics history (N= 100)

Obstetrics History	No.	%
Gestational Age /weeks		
25-27 weeks	18	18.0
36-37 weeks	54	54.0
38-39 weeks	28	28.0
Mean \pm SD	35.22 \pm 4.53	
Number of pregnancy		
One	0	0.0
Two	14	14.0
Three or more	86	86.0
Number of delivery		
One	24	24.0
Two	16	16.0
Three or more	60	60.0

**Figure 1.** Sources of information of women regarding COVID-19

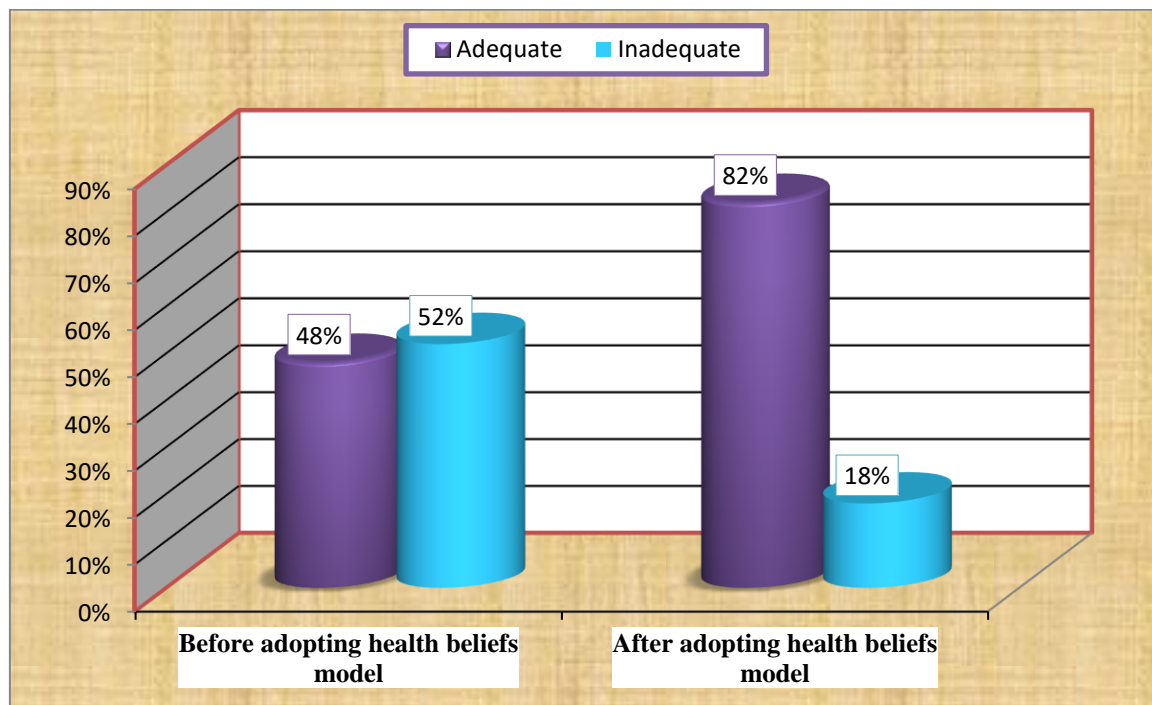


Figure (2): Level of women knowledge before and after adopting health beliefs model

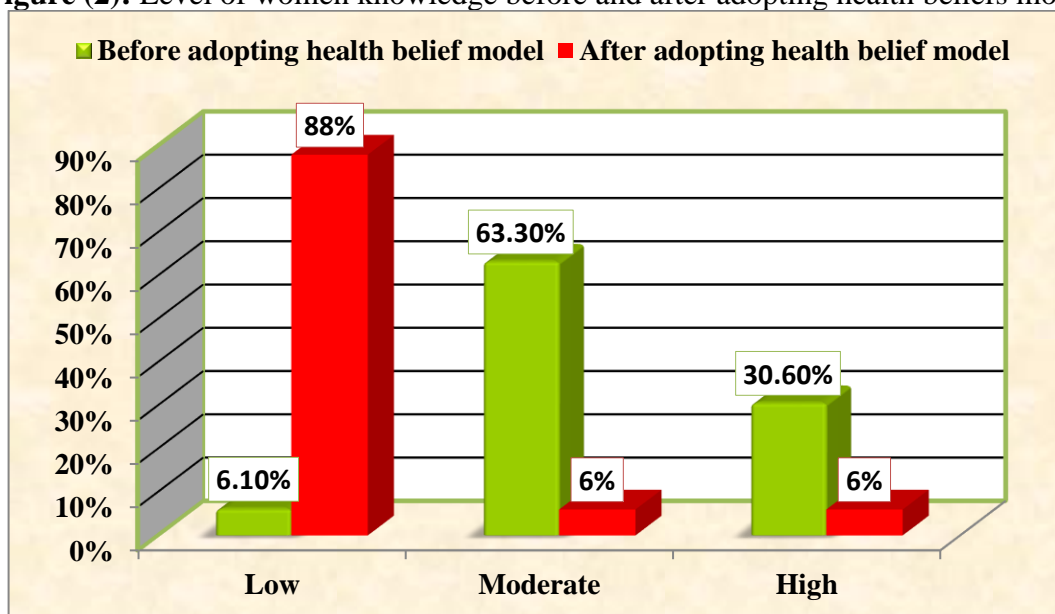


Figure (3): Level of the health beliefs model before and after its adoption

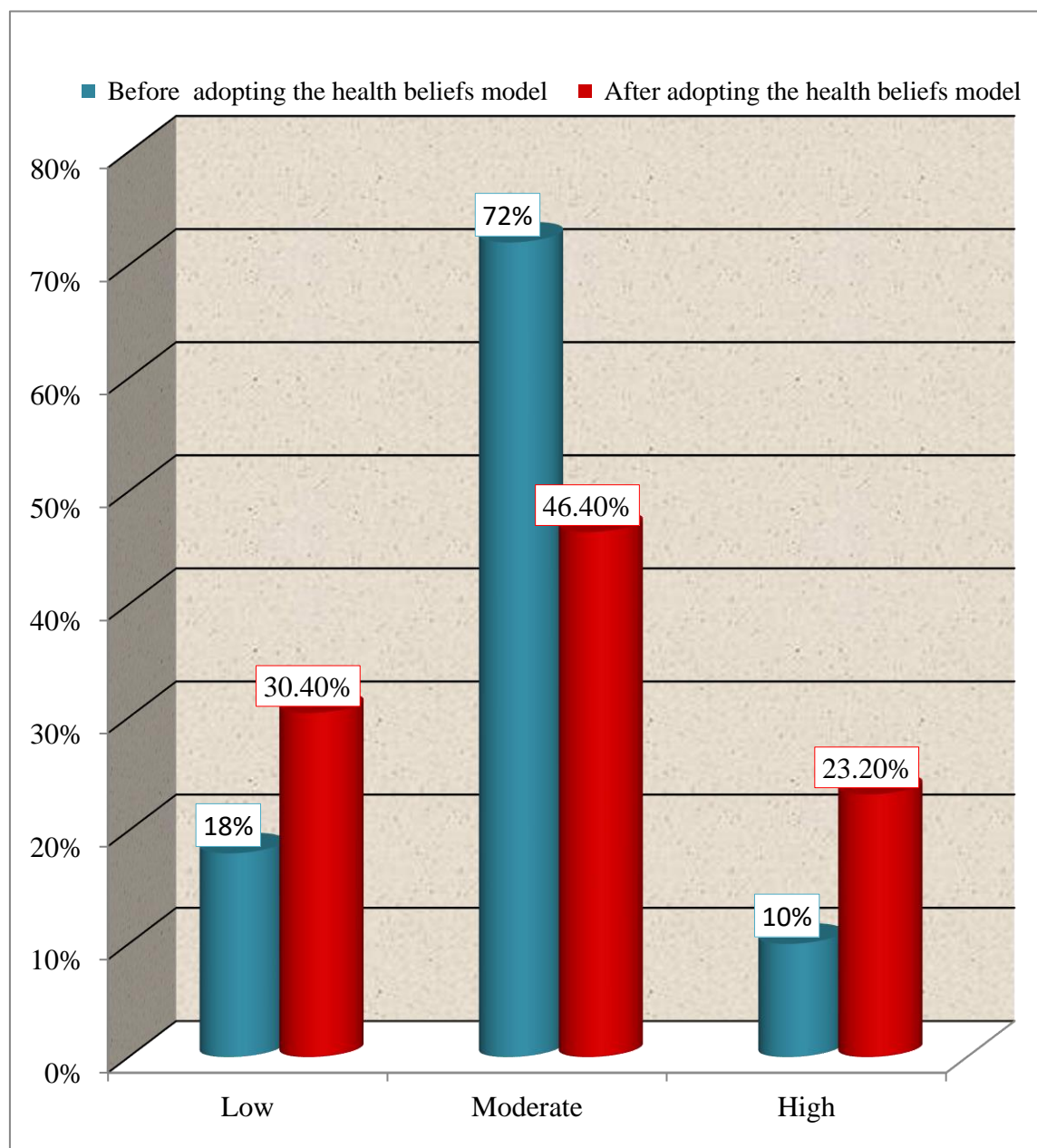


Figure (4): Level of women's preventive behavior about COVID-19 before and after adopting the health beliefs model.

Table (3): Mean scores of knowledges and health beliefs model and preventive behaviors for women's about COVID-19 (N= 100)

Items	Mean \pm SD		t-test	P-Value
	Before adopting health beliefs model	After adopting health Beliefs model		
Knowledge	21.1 \pm 5.67	27.84 \pm 1.67	-8.274	<0.000
Perceived susceptibility	11.16 \pm 2.31	19.56 \pm 13.18	-4.506	.000
Perceived benefits	16.0 \pm 2.72	19.56 \pm 13.18	-1.827	.074
Perceived severity	17.3 \pm 2.65	27.04 \pm 1.89	-23.763	.000
Perceived barriers	23.2 \pm 3.17	30.18 \pm 9.38	-5.019	.000
Cues of action	6.54 \pm 1.07	21.1 \pm 1.7	-54.901	.000
Self-efficacy	6.12 \pm 1.02	24.72 \pm 9.74	-13.854	.000
Preventive behaviours	26.88 \pm 2.49	31.92 \pm 3.61	-14.753	.000

* SD=Standard deviation

Table (4): Correlation between women's preventive behaviours and the adoption of the health beliefs model (N= 100)

Preventive behaviors regarding COVID 19	After adopting health beliefs model	
	r	P- Value
Before adopting health beliefs model	.733**	<0.000

** . Correlation is significant at the 0.01 level.

Discussion

Pregnant women are primarily vulnerable to infectious diseases such as COVID-19 compared to the non-pregnant counterparts as it causes unfavorable outcomes for the mother and fetus. During pregnancy, women undergo a series of immune transformations that allow the immune system to bear and support the growth of the fetus while maintaining the antimicrobial defense (**Bouaziz et al., 2020**)⁽¹¹⁾.

The results of the current study showed that more than half of the women were living in the rural areas, had a university education, and were housewives. Similarly, **Mohamed et al. (2020)**⁽⁷⁾. studied "Pregnant woman's knowledge, attitude, and practice of self-protection

measures in relation to the prevention of coronavirus: a health education intervention” and they reported that most pregnant women were living in rural areas and were not working. In contrast, **Nwafor et al. (2020)**⁽¹²⁾. investigated “Knowledge and preventive measures against COVID-19 among pregnant women in a low-resource African setting.” They noted that the study participants had secondary education and resided in urban areas. The differences in culture and society among women may be the reasons for this discrepancy. Moreover, a high percentage of women's had the gestational age from 36 to 37 weeks with the mean being 35.22, and had three or more times pregnant. These findings are in the same line with **Yassa, et al., (2020)**⁽⁴⁾. who investigated the pregnant women’s attitude toward, concern, and knowledge about the COVID-19 pandemic in Turkey, mean gestational age of the women were 35 ± 11 weeks. This result disagrees with **Mohamed, et al., (2020)**⁽⁷⁾. who reported that nearly half of studied subjects were primigravida, and had the gestational age from 20 to less than 30 weeks.

The present results demonstrated that the majority of women had information regarding COVID-19 from social media, which is in agree with **Kamate, et al., (2020)**⁽¹³⁾ who “assessing knowledge, attitudes and practices regarding the COVID-19 pandemic” in India, they reported that the main source of information was mass media. Similarly, **Olapegba et al., (2020)**⁽¹⁴⁾ who conducted a pilot assessment on knowledge and perceptions of novel coronavirus (COVID-19)”, and found main source of information was mass media in Nigeria. Also **Mirzaei et al., (2020)**⁽⁴⁾ studied application of health Beliefs model to predict COVID-19-preventive behaviours in Iranian and reported that internet, virtual social networks and healthcare professionals were the main sources of people’s information related to COVID-19, respectively. In the researcher’s point of view, social media plays a major role in providing up-to date information for the population.

The results of the current study indicated an improvement in the knowledge scores of women about COVID-19 after adopting the health Beliefs model, with high statistical significance ($P < 0.001$). In the same line **Alsulaiman & Rentner (2018)**⁽¹⁵⁾ who carried out the study about the health Beliefs model and preventive measures: a study of the ministry of health campaign on coronavirus in Saudi Arabia found that students' awareness about coronaviruses significantly improved after the HBM educational program. Additionally **Barakat & Kasemy (2020)**⁽¹⁶⁾ who studied “Preventive health behaviors during coronavirus disease 2019 pandemic based on health Beliefs model among Egyptians” and reported that information score was lower at the begin, a surge happened within the another meet taken after by a slight drop within the 3rd meet.

Also, **Aboma & Gurm (2021)**⁽¹⁷⁾ assess “level of knowledge and preventive practices against COVID-19 pandemic infection among pregnant women, Jimma town southwest Ethiopia” and stated that the status of information and desirable practices were not adequate sufficient to struggle with the spreading of the virus. Risk communication and public education efforts should focus on building a suitable level of information. The finding of

the current study was similar to the study conducted in Nigeria knowledge of pregnant women regarding the preventive measures about COVID-19 was 60.9% (**Nwafor et al. 2020**)⁽¹²⁾.

The results of the current study showed that there was a significant improved with respect to women's perceived susceptibility, perceived severity, perceived barriers, action cues, and self-efficacy scores on COVID-19 after adopting the health Beliefs model ($P < 0.001$). In the researcher's point of view, this might be due to that adopting health Beliefs model help to improve pregnant women practices including wearing mask ,and recognizing the importance of self-protection and recognizing that COVID 19 may be avoided by demonstrating protective measures as educated. This finding agrees with **Carico et al., (2020)**⁽⁶⁾ who applying the health Beliefs model" and expressed that HBM constructs could be right away to assist reinforce COVID-19 prohibitive practices and encourage emphasized the significance of contamination control measures in open places.

The present results showed that the adoption of the health Beliefs model led to a significant improvement in the preventive behaviors of women about COVID-19 ($P < 0.001$). This may be due to that it is supportive to design educational models to take advantage of the significant effects of the mentioned constructs on adopting COVID-19 preventive behaviours. Similarly, **Miller (2020)**⁽¹⁸⁾ recommended that health education about COVID-19 has improved subjects' attitudes and practices toward COVID-19. Moreover, **Barakat & Kasemy (2020)**⁽¹⁶⁾ studied preventive health behaviors during the coronavirus 2019 pandemic among Egyptians based on the health Beliefs model and reported that protective behaviors were significantly higher in the third interview than the second interview of the health Beliefs model. Thus, awareness of pregnant women about the dangers of COVID-19 should be the focus of educational programs at present.

Additionally, the current findings revealed a highly positive significant correlation between preventive behaviours before and after adopting the health Beliefs model. This finding is consistent with **Guidry et al., (2019)**⁽¹⁹⁾ who concluded that without enough information to increase the perception of sensitivity and severity, no one would ever initiate or engage in any preventative or defensive activity. Furthermore, **Alsulaiman & Rentner (2018)**⁽¹⁵⁾ stated that increasing awareness will aid in extending openly observed defencelessness and seriousness from getting infected with a harmful infection. It will also assist in increasing the capacity.

The findings revealed that a health education intervention based on HBM was significant in improving information and preventive behaviour. This could be because pregnant women became to have a better understanding of the dangers or health issues that may arise, so they consider potential health warnings and take action to avoid health issues or dangers, resulting in changes in their attitudes and behaviours.

Conclusion

The study concluded that an educational intervention based on the adoption of the health belief model enhanced pregnant women's knowledge and their preventive health behaviors in relation to COVID-19. Thus, the results of the current study sustain the study hypothesis.

Recommendations

The study suggests that health education interventions should specifically target pregnant women at different antenatal clinics at Zagazig city. Knowledge and control of COVID-19 may increase dramatically if health education programs based on the adoption of health theories are implemented.

Study Strengths

This study addresses an important issue relating to COVID-19. Data generated from this study may help decision-makers to build their educational intervention about COVID-19 based on HBM. Therefore, it needs to be applied by nursing educators to change women' health beliefs regarding essential topics like infection control and safety measures of COVID-19

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الملخص العربي

تأثير التدخل التعليمي القائم على تبني نموذج المعتقدات الصحية على معرفة السيدات الحوامل والسلوكيات

الصحة الوقائية فيما يتعلق بكوفيد 19

المقدمة: قد يعرض كوفيد19 السيدات الحوامل لخطر أكبر للإصابة بحالات خطيرة ونتائج سيئة للمواليد الجدد.

الهدف من الدراسة: هدفت الدراسة إلى تقييم تأثير التدخل التعليمي القائم على تبني نموذج المعتقدات الصحية على

معرفة السيدات الحوامل والسلوكيات الصحية الوقائية فيما يتعلق بكوفيد 19

فرضية البحث: يمكن للتدخل التعليمي القائم على نموذج المعتقدات الصحية أن يحسن المعرفة والسلوكيات الصحية

الوقائية للسيدات الحوامل فيما يتعلق بكوفيد 19.

تصميم البحث: تصميم شبه تجريبي.

منهجية البحث: أجريت الدراسة في عيادة ما قبل الولادة بمستشفى جامعة الزقازيق على 100 امرأة حامل باستخدام

عينة هادفة. أدوات جمع البيانات: استبيان المقابلة الشخصية ونموذج المعتقدات الصحية وسلوكيات الصحة الوقائية

للسيدات الحوامل فيما يتعلق بكوفيد19

النتائج: لقد أسفرت نتائج البحث عن الآتي: تم تحسين متوسط معرفة السيدات الحوامل والسلوكيات الوقائية حول

كوفيد19 بشكل كبير من 21.1 ± 5.67 و 26.88 ± 2.49 قبل تطبيق نموذج المعتقدات الصحية إلى 31.92 ± 3.61 و 27.84 ± 1.67

بعد تطبيق نموذج المعتقدات الصحية.

الخلاصة: التدخل التعليمي القائم على تبني نموذج المعتقدات الصحية عزز معرفة السيدات الحوامل والسلوكيات

الصحية الوقائية فيما يتعلق بكوفيد 19

التوصيات: افضت نتائج هذه الدراسة الى أن تدخل التنقيف الصحي يجب أن تستهدف على وجه التحديد السيدات

الحوامل اللاتي قد يتعرضن لخطر متزايد للإصابة بكوفيد19.