

Effect of Whats-App Reminder Messages on Pregnant Women' Knowledge and Behavior regarding Antenatal Health

Nour El Hoda Moustafa Mohammed¹, Mona R. Ahmed², Eman Ezz Elregal Ibrahim Eisa³, Fatma Ahmed Mohammed Sabry⁴

¹ Assistant professor of Obstetric and Gynecological Department, Faculty of Nursing, Sohag University, Egypt.

² Lecturer of Maternity & Newborn Health Nursing, Faculty of Nursing, Assiut University, Egypt.

³ Assistant professor of Family and Community Health Nursing Department, Faculty of Nursing, Damietta University, Egypt.

⁴ Lecturer of Obstetric and Gynecological Department, Faculty of Nursing, Sohag University, Egypt.

Abstract

Background: The provision of health information via whatsapp media can increase knowledge about pregnancy health. Furthermore, good knowledge can lead to awareness, which would eventually cause a pregnant woman to behave in accordance with their knowledge. **Aim:** To evaluate the effect of Whats-App reminder messages on pregnant women' knowledge and behavior regarding antenatal health. **Design:** Quasi experimental research design was used in this study. **Setting:** It was conducted at Antenatal Clinics in Women Health Hospital, Assiut University. **Sample:** purposive sample of 100 pregnant women. **Tools:** Three tools were used in this study (1) structured interviewing questionnaire, (2) knowledge assessment tool, (3) healthy behaviors assessment tool. **Results:** There is highly statistical significance difference between pre & posttest regarding total knowledge about antenatal health and the healthy behaviors of studied women with p-value 0.001. **Conclusion:** There was an improvement in the knowledge regarding antenatal health and adherence to healthy behaviors of pregnant women after health promotion by whatsapp reminder messages. **Recommendations:** Health facilities should start utilizing whatsApp reminder as a policy to promote adherence of pregnant women with the healthy behaviors.

Keywords: Antenatal health, Behavior, Knowledge, Pregnant women, Whats-App Reminder Messages.

Introduction

Pregnancy is a sensitive and critical time in a woman's life, bringing with plenty of physical, physiological, hormonal, and anatomical changes. These changes necessitate lifestyle modifications on the part of pregnant women (Abu-Baker et al.,2021).

Pregnancy healthy behaviors are likely to have an impact on maternal and infant health in the short and long term,

such as drug use, tobacco use, nutrition, physical activity, and dental care (Wilkinson & Miller,2007). Pregnancy has been described as a time when women may be especially willing to change their healthy behaviors (Olander et al.,2018).

Antenatal classes are commonly used to provide health education during pregnancy, but they are not well attended by younger or socially disadvantaged women. There is a clear need for

appropriate widespread delivery of evidence-based information and skill-development strategies to influence pregnancy health behaviors (Wilkinson & Miller, 2007).

There is a need to restructure the health education programs relating to pregnancy delivered through primary health care providers and the social media for better knowledge among women of childbearing age to decrease pregnancy-related problems and improve perinatal outcome) Rasheed et al., 2018).

Social media platforms such as Facebook, Instagram, WhatsApp, Snapchat, and Twitter can be used to provide continuous support and effective communication and overcome barriers associated with face-to-face modalities. Patients consider social media as a resource for disease-specific information, interacting with others quickly and efficiently, and sharing medical information with a community of patients experiencing similar issues (Omar et al., 2020).

The provision of health information via Whatsapp media can increase knowledge about pregnancy health. Furthermore, good knowledge can lead to awareness, which would eventually cause a pregnant woman to behave in accordance with their knowledge) Ardiyanti et al., 2020).

Significance of the study:

While rates of maternal and newborn mortality are declining globally, over 300,000 women and 2.6 million newborns continue to die every year from primarily preventable causes. Empowering and educating women during pregnancy can have important impacts on care-seeking behaviors and

health outcomes (Bauserman et al., 2018). Despite pregnancy guidelines that recommend healthy behaviors, many women continue to make unhealthy behaviors and the ongoing challenge for health professionals is to encourage pregnant women to change their unhealthy behaviors (Dunney & Murphy, 2015)

According to WHO (2003), innovative approaches to improve health behavior are not limited to face-to-face interactions, but the model can also make use of mobile health services. According to the user's needs, smartphones have a variety of applications such as WhatsApp, Instagram, email, short message service (SMS), and others. Health services can use SMS as a cost-effective reminder of patient medication, but SMS and MMS have been replaced by Whatsapp media, which is popular and facilitates communication. (Dewi et al., 2019). Midwives agreed that Whatsapp reminders could potentially be useful to women who were forced to take in a lot of new information on their first clinic visit (Lau et al., 2014).

Aim of the study

The study aimed to

To evaluate the effect of WhatsApp reminder messages on pregnant women' knowledge and behavior regarding antenatal health.

Hypothesis

WhatsApp reminder messages will have positive effect on pregnant Women' knowledge regarding antenatal health and their adherence with healthy behavior during pregnancy.

Subjects and methods:**Research Design:**

Quasi experimental research design with Pre-test and post-test was used in this study.

Setting:

This study was carried out in the antenatal clinic at Women Health Hospital, Assiut University. The Women's Health Hospital serves the entire region of Upper Egypt. It is a building that have a six floor, five for governmental admission and one for private service.

Subjects:**Sample type:**

A purposive sample was used in this study.

Sample size:

The sample size was estimated to be 100 pregnant women.

Sample size calculation:

In this study, The sample was calculated using (Epi-info statistical package, version 7.2, designed by the CDC (Center for Disease Control and Prevention) with 80 percent power, a value of 2.5 is chosen at the acceptable limit of precision (D) at 95 percent confidence level (C1), with expected prevalence 10%, worst acceptable 25%. As a result, the sample size was estimated to be 100 +10%of woman to guard against non-response rate.

Inclusion criteria:

- Pregnant women in their first and second trimesters to receive health promotion and and continue follow up.
- Women who agreed to take part in the research.
- Women who can read and write and have access to the WhatsApp application.

Exclusion criteria

Pregnant women who had any medical conditions during pregnancy, such as gestational diabetes, preeclampsia, hypertension, or coronary heart disease, in order to rule out the effect of other factors on study outcomes.

Tools of the study:**Tool (1): Structured interviewing questionnaire included**

Part I: included Socio-demographic data as: Name, age, residence, educational level, occupation.

Part II: included Data related to medical history as: the history of diabetes, hypertension, renal disease, cardiac disease, hepatic disease, and any other diagnosed medical disease.

Part III: included Data related to obstetric history as: number of gravidity, number of parity, gestational age.

Tool (2): Knowledge assessment tool about antenatal health. questionnaire consisted of 4 parts

Part I: Knowledge assessment of antenatal care , danger signs during pregnancy & signs of labor and health impacts of exposure to passive smoking ,included 11 questions.

Part II: Knowledge assessment of nutrition during pregnancy, included 11 questions.

Part III: Knowledge assessment of physical exercises during pregnancy, included 3 questions.

Part IV: Knowledge assessment of sleep and rest during pregnancy, included 2 questions.

❖ Knowledge scoring system

Each question was scored as (2) for a correct answer and (1) for an incorrect answer. While the total knowledge score was calculated as the following: knowledge was considered inadequate if the percent score was <75% and adequate if percent was 75% and more.

Tool (3) Behaviors assessment tool done by the pregnant women

Questionnaire consisted of 8 items: Following Antenatal care, eating healthy foods and diet (foods rich in iron, calcium and vitamins), taking iron supplements, taking folic acid, reducing caffeine intake during pregnancy, avoiding second hand smoking, avoiding drug intake without doctor order.

A scoring system: For healthy behavior items, Correct behavior received a score of 2 and incorrect behavior received a score of 1. The scores were added up and the total was divided by the number of items, giving a percentage score.

Satisfactory if the percentage score was equal to or greater than 60%

- **Unsatisfactory** if the percentage score was less than 60% (Lau et al.,2014)

Content validity:

The study tools were tested for content validity by just a panel of four experts in the fields of maternity and newborn health nursing, obstetrics, and community health nursing, and modifications were made as needed

Reliability:

Cronbach's Alpha was used to assess reliability, and it revealed that each of the tools consisted of relatively homogenous items as indicated by the moderate to high reliability of each tool, it was (0.93) for knowledge tool, (0.94) for tool of healthy behaviors.

Ethical and legal considerations:

Before starting the research, ethical approval was obtained from the scientific research ethical committee of faculty of nursing. An official permission was obtained from the manager of women health hospital Assiut University. The agreement for participation in the study was taken from subjects after the purpose of the study was explained to them. Before data Collection, the pregnant women were informed about the aim and the Nature of the study which didn't cause any harm Or pain. Also, they were assured that the Information would remain confidential and Used for purpose of research only. The Participants were informed by the researcher that participating in the study is voluntary; they have the right to withdraw from the study at Any time.

Pilot study:

A pilot study was conducted on 10% of the total sample (ten pregnant women) to assess the clarity and applicability of the tools; no changes were made. A total of ten participants were recruited for the pilot study and included in the total sample.

Procedure:

Actual fieldwork was carried out in a period of five months from May to October 2021 involving development, implementation, and evaluation of the educational program.

Preparatory phase:

After reviewing relevant current Arabic and English literature, a program in the form of voice messages, text messages, figures, and videos covering various aspects of antenatal health and healthy behaviors in pregnancy was designed in the Arabic language to address gaps in pregnant women's knowledge and promote healthy behaviors

The implementation phase:**Assessment phase**

The researcher interviewed the women face to face; each interview took about 15-30 minutes before sending Whats-App Reminder Messages., and at the beginning of each interview, the researcher greeted, introduced herself to the woman after that the researcher explained the nature and aim of study, and an oral consent to participate in the study was obtained from each woman. Then, the researcher assessed sociodemographic data&the obstetrical history of the women and Pretest

structured questionnaires were completed face-to- face before sending Whats-App Reminder Messages.

Intervention phase (Whats-App Reminder Messages)

The reminder messages were then sent twice daily for 3 weeks , including voice messages, text messages, figures and videos about antenatal health and healthy behaviors. The content was distributed over the period according to the topics. Additional media were created or adapted by the team, according to the demands of the women.

WhatsApp reminder messages content were about

Importance of antenatal care during pregnancy, health impacts of not following regular antenatal care on pregnant women's and their babies, danger signs during pregnancy, signs of labor, health impacts of exposure to Second hand smoking, benefits of exercises during pregnancy, the best kind of physical exercise for pregnant women, nutrition during pregnancy (sources of iron, sources of calcium, drinks that enhance iron absorption, drinks that inhibit iron absorption, the required vitamins and minerals supplements in pregnancy, Importance of taking folic acid and health impacts of high caffeine intake), sleep and rest during pregnancy (the amount of sleep, rest needed during pregnancy and the most preferable position for sleep during pregnancy) & healthy behaviors that pregnant women should do during pregnancy.

Evaluation phase

Finally, to evaluate the effect of the whats app reminder messages on improving the knowledge and the healthy

behaviors of the pregnant women, a post-test (after one month from the application of the program) was done using the same two tools through telephone.

Statistical analysis

Data were collected, coded, revised and entered to the Statistical Package for Social Science (IBM SPSS) version 20. The data were presented as number and percentages for the qualitative data, mean, standard deviations and ranges for the quantitative data with parametric distribution and median with inter quartile range (IQR) for the quantitative data with non-parametric distribution. Chi-square test was used in the comparison between two groups with qualitative data and Fisher exact test was used instead of the Chi-square test when the expected count in any cell found less than 5

The confidence interval was set to 95% and the margin of error accepted was set to 5%. So, the p-value was considered significant as the following:

$P > 0.05$: Non-significant (NS)

$P < 0.05$: Significant (S)

$P < 0.01$: Highly significant (HS)

Results

Table (1): Shows the distribution of the studied women regarding to their socio-demographic characteristics. According age it was noticed that (60.0%) of the women their age between (25< 30yrs) and the mean age \pm SD of the women was (26.97 \pm 2.76 years). Regarding residence, it was observed that (79.0%) of the women were living in rural areas. As regard mother's education level it was observed that (60.0%) of the women had Secondary educational level.

According to women's occupation it was observed that (75.0%) of the women were housewives.

Table (2): Reveals the distribution of the women regarding to their obstetrical history. According number of gravida, it was noticed that (46.0%) of the women were primigravida. Regarding gestational age of women, it was observed that (57.0%) of the women were in second trimester.

Table (3): Shows knowledge of pregnant women about antenatal care in pre and posttest, and finds that there is highly statistical significance difference between pre & posttest with p-value (0.001)

Table (4): Illustrates knowledge of pregnant women about nutrition during pregnancy in pre and posttest, and displays that there is highly statistical significance difference between pre & posttest with p- value 0.001

Table (5): Shows knowledge of Pregnant women regarding physical exercise during pregnancy in pre-test and posttest, and clarifies that there is highly statistical significance difference between pre & posttest with p- value 0.001.

Table (6): Shows knowledge of Pregnant women regarding rest and sleep during pregnancy in pre-test and posttest, and clarifies that there is highly statistical significance difference between pre & posttest with p- value 0.001.

Figure (1): Shows total knowledge of studied pregnant women regarding antenatal health in pre-test and posttest, and clarifies that there is highly statistical significance difference between pre & posttest p- value 0.001. Where (71%) of the women had inadequate level

of knowledge pre-test, compared to (82%) of the women had adequate level of knowledge post-test.

Table (8): Shows the healthy behaviors of Pregnant women during pregnancy in pre-test and posttest and clarifies that there is highly statistical significance difference between pre & posttest with p- value 0.001.

Figure (2): Shows the healthy behaviors of pregnant women during pregnancy in pre-test and posttest and clarifies that there is highly statistical significance difference between pre & posttest with p- value 0.001. Where (80%) of the women had unsatisfactory healthy behaviors pre-test, compared to (88%) of the women had satisfactory healthy behaviors post-test.

Table (1): Distribution of studied women according to their socio demographic characteristics (n=100).

Socio- demographic characteristics		(N=100)	%
1. Age			
Less than 20 years		10	10.0%
20 < 25 years		15	15.0%
25 < 30		60	60.0%
30-35		10	10.0%
More than 35		5	5.0%
	Mean		± SD
	age		26.97±2.76
2. Residence			
Urban		21	21.0%
Rural		79	79.0%
3. Mother's educational level			
Read and write		14	14%
Secondary		60	60%
University or higher		26	26%
4. Mother's occupation			
House wife		75	75%
Employed		25	25%

Table (2): Distribution of studied women according to their obstetrical history (n=100).

Obstetrical history	(N=100)	%
1- Gravidity		
Primigravida	46	46.0%
2-3	30	30.0%
>3	24	24.0%
2-parity		
Nulliparous	46	46.0%
2-3	41	41.0%
>3	13	13.0%
3- Gestational age		
First trimester	43	43%
Second trimester	57	57%

Table (3): Distribution of studied women according knowledge about antenatal care in pre-test and posttest.

		Pre		Post		Chi square test																																																																																																																																
		No	%	No	%	X ²	P value																																																																																																																															
Is it important to attend clinic in pregnancy	Correct	39	39.0%	91	91.0%	67.395	<0.001																																																																																																																															
	In correct	61	61.0%	9	9.0%			What the care are given	Correct	15	15.0%	92	92.0%	137.43	<0.001	In correct	87	87.0%	8	8.0%	Why do the nurses test the urine and blood pressure every visit	Correct	17	17.0%	96	96.0%	157.167	<0.001	In correct	83	83.0%	4	4.0%	Why do the nurses test the blood?	Correct	13	13.0%	92	92.0%	158.459	<0.001	In correct	87	87.0%	8	8.0%	When mother should get the first visit	Correct	17	17.0%	96	96.0%	169.376	<0.001	In correct	83	83.0%	4	4.0%	How many times mothers should get ANC during their pregnancy	Correct	13	13.0%	92	92.0%	144.313	<0.001	In correct	87	87.0%	8	8.0%	What are the health impacts of not following ANC	Correct	17	17.0%	92	92.0%	143.274	<0.001	In correct	83	83.0%	8	8.0%	Should you seek medical help outside your appointments	Correct	39	39.0%	96	96.0%	103.504	<0.001	In correct	61	61.0%	4	4.0%	What are the danger sign of pregnancy	Correct	17	17.0%	96	96.0%	157.167	<0.001	In correct	83	83.0%	4	4.0%	What are the signs of labor	Correct	13	13.0%	96	96.0%	184.703	<0.001	In correct	87	87.0%	4	4.0%	What are health impacts of smoking on pregnancy	Correct	39	39.0%	96	96.0%	103.504	<0.001	In correct	61
What the care are given	Correct	15	15.0%	92	92.0%	137.43	<0.001																																																																																																																															
	In correct	87	87.0%	8	8.0%			Why do the nurses test the urine and blood pressure every visit	Correct	17	17.0%	96	96.0%	157.167	<0.001	In correct	83	83.0%	4	4.0%	Why do the nurses test the blood?	Correct	13	13.0%	92	92.0%	158.459	<0.001	In correct	87	87.0%	8	8.0%	When mother should get the first visit	Correct	17	17.0%	96	96.0%	169.376	<0.001	In correct	83	83.0%	4	4.0%	How many times mothers should get ANC during their pregnancy	Correct	13	13.0%	92	92.0%	144.313	<0.001	In correct	87	87.0%	8	8.0%	What are the health impacts of not following ANC	Correct	17	17.0%	92	92.0%	143.274	<0.001	In correct	83	83.0%	8	8.0%	Should you seek medical help outside your appointments	Correct	39	39.0%	96	96.0%	103.504	<0.001	In correct	61	61.0%	4	4.0%	What are the danger sign of pregnancy	Correct	17	17.0%	96	96.0%	157.167	<0.001	In correct	83	83.0%	4	4.0%	What are the signs of labor	Correct	13	13.0%	96	96.0%	184.703	<0.001	In correct	87	87.0%	4	4.0%	What are health impacts of smoking on pregnancy	Correct	39	39.0%	96	96.0%	103.504	<0.001	In correct	61	61.0%	4	4.0%										
Why do the nurses test the urine and blood pressure every visit	Correct	17	17.0%	96	96.0%	157.167	<0.001																																																																																																																															
	In correct	83	83.0%	4	4.0%			Why do the nurses test the blood?	Correct	13	13.0%	92	92.0%	158.459	<0.001	In correct	87	87.0%	8	8.0%	When mother should get the first visit	Correct	17	17.0%	96	96.0%	169.376	<0.001	In correct	83	83.0%	4	4.0%	How many times mothers should get ANC during their pregnancy	Correct	13	13.0%	92	92.0%	144.313	<0.001	In correct	87	87.0%	8	8.0%	What are the health impacts of not following ANC	Correct	17	17.0%	92	92.0%	143.274	<0.001	In correct	83	83.0%	8	8.0%	Should you seek medical help outside your appointments	Correct	39	39.0%	96	96.0%	103.504	<0.001	In correct	61	61.0%	4	4.0%	What are the danger sign of pregnancy	Correct	17	17.0%	96	96.0%	157.167	<0.001	In correct	83	83.0%	4	4.0%	What are the signs of labor	Correct	13	13.0%	96	96.0%	184.703	<0.001	In correct	87	87.0%	4	4.0%	What are health impacts of smoking on pregnancy	Correct	39	39.0%	96	96.0%	103.504	<0.001	In correct	61	61.0%	4	4.0%																							
Why do the nurses test the blood?	Correct	13	13.0%	92	92.0%	158.459	<0.001																																																																																																																															
	In correct	87	87.0%	8	8.0%			When mother should get the first visit	Correct	17	17.0%	96	96.0%	169.376	<0.001	In correct	83	83.0%	4	4.0%	How many times mothers should get ANC during their pregnancy	Correct	13	13.0%	92	92.0%	144.313	<0.001	In correct	87	87.0%	8	8.0%	What are the health impacts of not following ANC	Correct	17	17.0%	92	92.0%	143.274	<0.001	In correct	83	83.0%	8	8.0%	Should you seek medical help outside your appointments	Correct	39	39.0%	96	96.0%	103.504	<0.001	In correct	61	61.0%	4	4.0%	What are the danger sign of pregnancy	Correct	17	17.0%	96	96.0%	157.167	<0.001	In correct	83	83.0%	4	4.0%	What are the signs of labor	Correct	13	13.0%	96	96.0%	184.703	<0.001	In correct	87	87.0%	4	4.0%	What are health impacts of smoking on pregnancy	Correct	39	39.0%	96	96.0%	103.504	<0.001	In correct	61	61.0%	4	4.0%																																				
When mother should get the first visit	Correct	17	17.0%	96	96.0%	169.376	<0.001																																																																																																																															
	In correct	83	83.0%	4	4.0%			How many times mothers should get ANC during their pregnancy	Correct	13	13.0%	92	92.0%	144.313	<0.001	In correct	87	87.0%	8	8.0%	What are the health impacts of not following ANC	Correct	17	17.0%	92	92.0%	143.274	<0.001	In correct	83	83.0%	8	8.0%	Should you seek medical help outside your appointments	Correct	39	39.0%	96	96.0%	103.504	<0.001	In correct	61	61.0%	4	4.0%	What are the danger sign of pregnancy	Correct	17	17.0%	96	96.0%	157.167	<0.001	In correct	83	83.0%	4	4.0%	What are the signs of labor	Correct	13	13.0%	96	96.0%	184.703	<0.001	In correct	87	87.0%	4	4.0%	What are health impacts of smoking on pregnancy	Correct	39	39.0%	96	96.0%	103.504	<0.001	In correct	61	61.0%	4	4.0%																																																	
How many times mothers should get ANC during their pregnancy	Correct	13	13.0%	92	92.0%	144.313	<0.001																																																																																																																															
	In correct	87	87.0%	8	8.0%			What are the health impacts of not following ANC	Correct	17	17.0%	92	92.0%	143.274	<0.001	In correct	83	83.0%	8	8.0%	Should you seek medical help outside your appointments	Correct	39	39.0%	96	96.0%	103.504	<0.001	In correct	61	61.0%	4	4.0%	What are the danger sign of pregnancy	Correct	17	17.0%	96	96.0%	157.167	<0.001	In correct	83	83.0%	4	4.0%	What are the signs of labor	Correct	13	13.0%	96	96.0%	184.703	<0.001	In correct	87	87.0%	4	4.0%	What are health impacts of smoking on pregnancy	Correct	39	39.0%	96	96.0%	103.504	<0.001	In correct	61	61.0%	4	4.0%																																																														
What are the health impacts of not following ANC	Correct	17	17.0%	92	92.0%	143.274	<0.001																																																																																																																															
	In correct	83	83.0%	8	8.0%			Should you seek medical help outside your appointments	Correct	39	39.0%	96	96.0%	103.504	<0.001	In correct	61	61.0%	4	4.0%	What are the danger sign of pregnancy	Correct	17	17.0%	96	96.0%	157.167	<0.001	In correct	83	83.0%	4	4.0%	What are the signs of labor	Correct	13	13.0%	96	96.0%	184.703	<0.001	In correct	87	87.0%	4	4.0%	What are health impacts of smoking on pregnancy	Correct	39	39.0%	96	96.0%	103.504	<0.001	In correct	61	61.0%	4	4.0%																																																																											
Should you seek medical help outside your appointments	Correct	39	39.0%	96	96.0%	103.504	<0.001																																																																																																																															
	In correct	61	61.0%	4	4.0%			What are the danger sign of pregnancy	Correct	17	17.0%	96	96.0%	157.167	<0.001	In correct	83	83.0%	4	4.0%	What are the signs of labor	Correct	13	13.0%	96	96.0%	184.703	<0.001	In correct	87	87.0%	4	4.0%	What are health impacts of smoking on pregnancy	Correct	39	39.0%	96	96.0%	103.504	<0.001	In correct	61	61.0%	4	4.0%																																																																																								
What are the danger sign of pregnancy	Correct	17	17.0%	96	96.0%	157.167	<0.001																																																																																																																															
	In correct	83	83.0%	4	4.0%			What are the signs of labor	Correct	13	13.0%	96	96.0%	184.703	<0.001	In correct	87	87.0%	4	4.0%	What are health impacts of smoking on pregnancy	Correct	39	39.0%	96	96.0%	103.504	<0.001	In correct	61	61.0%	4	4.0%																																																																																																					
What are the signs of labor	Correct	13	13.0%	96	96.0%	184.703	<0.001																																																																																																																															
	In correct	87	87.0%	4	4.0%			What are health impacts of smoking on pregnancy	Correct	39	39.0%	96	96.0%	103.504	<0.001	In correct	61	61.0%	4	4.0%																																																																																																																		
What are health impacts of smoking on pregnancy	Correct	39	39.0%	96	96.0%	103.504	<0.001																																																																																																																															
	In correct	61	61.0%	4	4.0%																																																																																																																																	

Table (4): Distribution of studied women according knowledge about nutrition in pregnancy in pre-test and post test.

		Pre		Post		Chi square test	
		N	%	N	%	X ²	P value
Women's diet during pregnancy is different from others	Correct	13	13.0%	96	96.0%	158.293	<0.001
	In correct	87	87.0%	4	4.0%		
What vitamins and minerals do pregnant women need during pregnancy	Correct	17	17.0%	96	96.0%	169.376	<0.001
	In correct	83	83.0%	4	4.0%		
Why should you take folic acid during your pregnancy	Correct	13	13.0%	92	92.0%	170.695	<0.001
	In correct	87	87.0%	8	8.0%		
What kind of foods should pregnant women avoid during pregnancy	Correct	17	17.0%	96	96.0%	169.376	<0.001
	In correct	83	83.0%	4	4.0%		
Should pregnant woman reduce intake of caffeine during pregnancy	Correct	13	13.0%	96	96.0%	169.343	<0.001
	In correct	87	87.0%	4	4.0%		
What are sources of Caffeine	Correct	17	17.0%	96	96.0%	169.343	<0.001
	In correct	83	83.0%	4	4.0%		
What are Harmful effects of high intake of caffeine	Correct	39	39.0%	92	92.0%	90.803	<0.001
	In correct	61	61.0%	8	8.0%		
When a diet for pregnant women lacks iron, health Risks can occur, including	Correct	17	17.0%	91	91.0%	139.99	<0.001
	In correct	83	83.0%	9	9.0%		
What are examples of food which enhance iron absorption when taken with meals	Correct	13	13.0%	91	91.0%	167.375	<0.001
	In correct	87	87.0%	9	9.0%		
What are examples of drinks that inhibit iron absorption when taken with meals	Correct	38	38.0%	92	92.0%	64.088	<0.001
	In correct	62	62.0%	8	8.0%		
What is source of calcium	Correct	14	14.0%	96	96.0%	135.838	<0.001
	In correct	86	86.0%	4	4.0%		

Table (5): Distribution of studied women according knowledge about exercises in pre-test and post test.

		Pre		Post		Chi square test	
		No	%	No	%	X ²	P value
Benefits of exercise during pregnancy include	Correct	24	24.0%	95	95.0%	104.596	<0.001
	In correct	76	76.0%	5	5.0%		
Times of exercise per week during pregnancy are	Correct	13	13.0%	0	0.0%	181.087	<0.001
	In correct	87	87.0%	95	95.0%		
What kind of exercises would be best for pregnant woman	Correct	13	13.0%	5	5.0%	184.703	<0.001
	In correct	87	87.0%	0	0.0%		

Table (6): Distribution of studied women according knowledge about sleep and rest in pre-test and post test.

		Pre		Post		Chi square test	
		No	%	No	%	X ²	P value
What is amount of sleep or rest should pregnant woman get	Correct	38	38.0%	91	91.0%	61.339	<0.001
	In correct	62	62.0%	9	9.0%		
What is the preferable position for sleep	Correct	14	14.0%	91	91.0%	118.877	<0.001
	In correct	86	86.0%	9	9.0%		

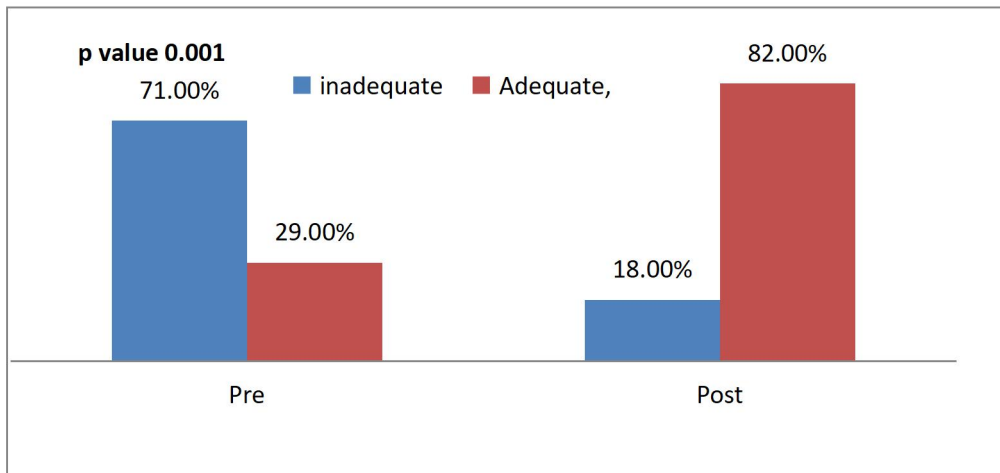


Figure (1): Distribution of studied women according to total knowledge in pre-test and post test.

Table (7): Distribution of studied women according their healthy behaviors in pre-test and post test.

		Pre		Post		Chi square test	
		No	%	No	%	X ²	P value
Do you attend antenatal care visits regularly	Done	31	31.0%	96	96.0%	91.144	<0.001
	Not done	69	69.0%	4	4.0%		
Do you take folic acid and iron	Done	13	13.0%	92	92.0%	125.133	<0.001
	Not done	87	87.0%	8	8.0%		
Do you avoid second hand smoking	Done	22	22.0%	96	96.0%	113.187	<0.001
	Not done	78	78.0%	4	4.0%		
Do you reduce caffeine intake	Done	27	27.0%	96	96.0%	100.538	<0.001
	Not done	73	73.0%	4	4.0%		
Do you eat healthy foods	Done	13	13.0%	96	96.0%	138.905	<0.001
	Not done	87	87.0%	4	4.0%		
Do you following exercise	Done	22	22.0%	96	96.0%	113.187	<0.001
	Not done	78	78.0%	4	4.0%		
Do you avoid taking drugs without doctor order	Done	68	68.0%	96	96.0%	26.558	<0.001
	Not done	32	32.0%	4	4.0%		

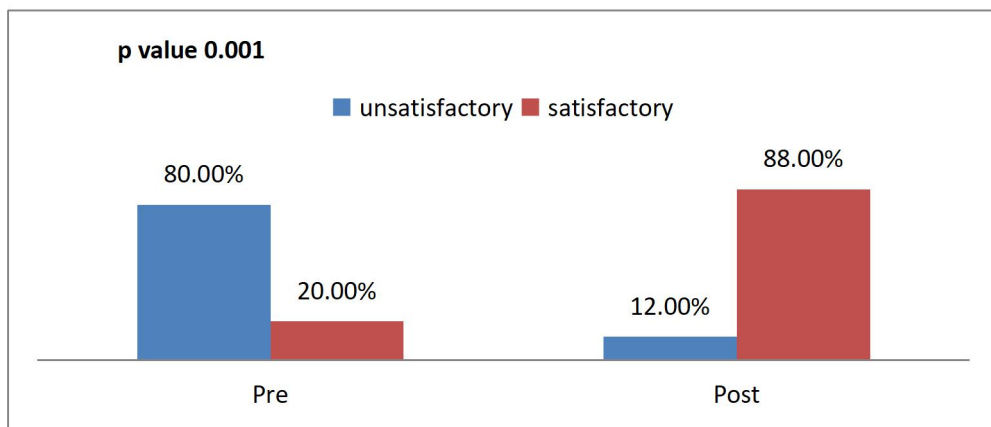


Figure (2): Distribution of studied women according to healthy behaviors in pre-test and post test.

Discussion

The provision of health information via Whatsapp media can increase knowledge about pregnancy health. Furthermore, good knowledge would lead to awareness, which would

eventually cause a pregnant woman to behave in accordance with their

knowledge. (Ardiyanti1 et al.,2020) thus this study aimed to evaluate effect of health promotion through whatsapp

reminders messages on improving the knowledge about antenatal health and the healthy behaviors among the pregnant women.

Regarding pregnant women's knowledge about antenatal health and the healthy behaviors before the health promotion through whatsapp reminders, the knowledge was inadequate and the healthy behaviors were unsatisfactory in the majority of the studied women. This was similar to (**Sabry et al.,2021**) who conducted their study in Egypt, Sohag city to evaluate the effect of whatsapp educational program reminder on pregnant women's knowledge, attitude and practice regarding COVID -19 pandemic and reported the majority of the pregnant women had a poor level of knowledge about covid-19 preeducational program

Also with (**Janakiraman et al.,2021**) who conducted their study in Ethiopia to evaluate the knowledge, attitude, and practice of antenatal exercises among Ethiopian women during pregnancy and reported low knowledge concerning antenatal exercise.

Also with(**Zerfu&Biadgilign,2018**) who conducted their study in Ethiopia to examine the level of knowledge and attitude towards maternal nutrition and dietary diversity practices among pregnant women and reported that pregnant women had limited knowledge and poor dietary diversity practices.

This was different with (**Rasheed et al.,2018**)who conducted their study in Saudi Arabia to find out the level of health awareness related to pregnancy in pregnant women and reported that a large proportion of the women were well

informed about certain health issues of pregnancy such as dietary intake of essential foods like protein-rich, foods dairy products and fruits, the need for exercise, the hours of daily rest necessary, the importance and timing of antenatal visits, the risk of smoking in pregnancy.

This difference may because the majority of women participated in (**Rasheed et al.,2018**) study had high educational level and the majority of women in this study had secondary school where level of education closely related to knowledge.

Concerning, total knowledge of studied pregnant women regarding antenatal health in pre-test and posttest, the current study clarifies that there is highly statistical significance difference between pre &posttest p-value 0.001.This was in line with (**Dafroyati &Widyastuti,2021**) who conducted their study in Southeast Indonesia to determine the effectiveness of health education about healthy pregnancy through WhatsApp group towards the knowledge of pregnant women and reported there was a significant difference in the knowledge of pregnant women before and after providing health education about healthy pregnancy through WhatsApp group

This was different with (**Lau et al.,2014**) who achieved their study in South Africa to evaluate whether antenatal health information disseminated via SMS reminder messages would increase health knowledge in pregnant women and improve adherence with healthy behaviors and reported the SMS

reminder messages did not show evidence of improving antenatal health knowledge.

This difference may be due to different methods used for delivering the information while WhatsApp reminder messages are more effective in delivering information in many forms as text messages, figures, videos, and voice messages than SMS reminder messages that depend mainly on text messages.

Concerning healthy behaviors of studied pregnant women in pre-test and post-test, the current study clarifies that there is a highly statistically significant difference between pre- and post-test p-value 0.001 with more adherence to healthy behaviors in post-test. This was in line with previous (Lau et al., 2014) who reported that SMS reminder messages promoted adherence to healthy behaviors during pregnancy.

This finding may be due to constantly repeating and remembering messages for pregnant women through photos and videos.

Conclusion

There was an improvement in the knowledge of pregnant women regarding antenatal health evidenced by the pre-test and post-test knowledge scores. Also, WhatsApp reminder is an effective way for promoting adherence to healthy behaviors through repeating and remembering messages for pregnant women through photos and videos to enhance their knowledge and encourage healthy behaviors.

Recommendations

- Health facilities should start utilizing WhatsApp reminder as a policy to

promote adherence of pregnant women with healthy behaviors because it is a good medium for conveying health promotion messages for individuals or groups.

- Similar studies with longer duration should be conducted in pregnant women, so that complications during pregnancy and childbirth can be assessed in an effort to evaluate if improving knowledge and adherence to healthy behaviors via WhatsApp reminder will improve the pregnancy outcome.

References

- Abu-Baker, N., Abusbaitan, H., Al-Ashram, S., & Alshraifeen, A. (2021).** The Effect of Health Education on Dietary Knowledge and Practices of Pregnant Women in Jordan: A Quasi-Experimental Study. *Int J Womens Health*, 13, 433-443. 10.2147/IJWH.S303568
- Ardiyanti S, Wiwik K, Winny N. (2020).** WhatsApp Group Increase Antenatal Visit. *International Journal of Health Science and Technology*, 2 (1).
- Bauserman M., Thorsten, V.R., Nolen, T.L. et al. (2020).** Maternal mortality in six low and lower-middle income countries from 2010 to 2018: risk factors and trends. *Reprod Health* 17, 173. <https://doi.org/10.1186/s12978-020-00990-z>
- Dafroyati Y & Widyastuti R. (2019).** The Effectiveness of Health Education about Healthy Pregnancy through WhatsApp Group towards the Knowledge of Pregnant Women at Bakunase

- Health Center Kupang City. *Aloha International Journal of Health Advancement* (AIJHA),7(3),8224,<http://dx.doi.org/10.33846/aijha30703>
- Dewi K, Kusumawati W, Ismarwati B.(2019).**Effect of health promotion and Whatsapp reminder to self efficacy of the consumption of Fe tablets adherence among pregnant women. *Journal of Health Technology Assessment in Midwifery*,2(1),23-32. DOI: 10.12968/bjom.2015.23.2.126
- Dunney C., Murphy J .(2015):Alcohol consumption in pregnancy and its implications for breastfeeding. *British Journal of Midwifery* 23(2):126-134,
- Janakiraman B, Gebreyesus T, Yihunie M, Genet MG (2021)** Knowledge, attitude, and practice of antenatal exercises among pregnant women in Ethiopia: A cross-sectional study. *PLoS ONE* 16(2): e0247533. doi:10.1371/journal.pone.0247533
- Lau Y, Cassidy T, Hacking D, Brittain K, Haricharan H and Heap M.(2015).**Antenatal health promotion via short message service at a Midwife Obstetrics Unit in South Africa: a mixed methods study. *BMC Pregnancy and Childbirth*,14:284, <http://www.biomedcentral.com/1471-2393/14/284>
- Olander E, Smith D& Darwin Z.(2018).** Health behaviour and pregnancy: a time for change, *Journal of Reproductive and Infant Psychology*, 36:1, 1-3, DOI: 10.1080/02646838.2018.1408965
- Omar M, Hasan S, Palaian S, Mahameed S. (2020).**The impact of a self-management educational program coordinated through WhatsApp on diabetes control.*Australian and New Zealand Journal*;18(2):1841. <https://doi.org/10.18549/PharmPract.2020.2.1841>
- Rasheed, P., & Al-Sowielem, L. S. (2018).** Health education needs for pregnancy: a study among women attending primary health centers. *Journal of family & community medicine*, 10(1), 31–38.
- Sabry F, Mohamed A, Ghanem A, Ahmed N, Mohamed N .(2021).** Effect of What Sapp Educational Program Reminder on Pregnant Women’s Knowledge , Attitude and Practice Regarding COVID -19 pandemic . *Egyptian Journal of Health Care, EJH* , 3(12).
- Wilkinson SA, Miller YD. (2007).** Improving health behaviours during pregnancy: a new direction for the pregnancy handheld record. *Australian and New Zealand Journal* , 47, 464-467.
- Zerfu, T.A., Biadgilign, S. (2018).** Pregnant mothers have limited knowledge and poor dietary diversity practices, but favorable attitude towards nutritional recommendations in rural Ethiopia: evidence from community-based study. *BMC Nutr* 4, 43, <https://doi.org/10.1186/s40795-018-0251-x>