

Effect of an Orientation Program Regarding Utilization of Tele-Maternity Care on Pregnant Women's Awareness, Attitude and Willingness during COVID-19 Pandemic

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Abstract

Background: Tele-maternity represents one approach to optimize care and mitigating risk for exposure for prenatal women in the setting of the COVID-19 and has become crucial to confirm the safety and effective delivery. **Aim:** This study aimed to evaluate the effect of an orientation program about utilization of tele-maternity care on pregnant women' awareness, attitude and willingness during COVID-19 Pandemic. **Design:** A quasi-experimental pre and post-test one-group only design was utilized for this study. **Setting:** This study was carried out at Al-hadeka maternity and child health Centre (MCH) in Al-Fayoum governorate, Egypt. **Sample:** A convenient sample of 300 pregnant women was enrolled during the study period from March 2021 to the end of August 2021. **Tool of data collection:** A structured interviewing questionnaire composed of six parts to collect the following data: socio-demographic data, obstetrics & technology profile data, women's awareness, attitude, and willingness regarding tele-maternity care. **Results:** Findings of this study revealed that there were highly statistically significant differences with an improvement in total score of pregnant women's awareness, attitude, and willingness towards tele-maternity care post-intervention as compared with pre-intervention (P-value < 0.0001), in addition, there was a positive correlation between the studied women's level of awareness with their attitude and willingness towards tel-maternity care. **Conclusion:** The tele-maternity orientation program was effective in raising and significantly improving pregnant women's level of awareness, attitude, and willingness towards tele-maternity care. **Recommendations:** Extra continuing training programs on all updated tele-maternity services should be implemented, as well as additional researches be conducted on a large sample of women during their perinatal period at diverse health care settings.

Key words: Awareness, Attitude, Orientation program, pregnant women, Tele-maternity, Willingness, COVID-19.

Introduction

COVID-19 pandemic is caused by the new virus labeled SARS-CoV-2 the health care systems, especially perinatal service and support providers have been compelled to rely on tele-health, which promotes remote provision of treatment using telecommunications technology, to reach their customers. This has resulted in extraordinary innovation, fast reimbursement modifications, and significant experiences that can shape the role of tele-health in maternity and postpartum care in the future (Jakubowski et al. 2021, and Locsin, et al 2021).

The World Health Organization (WHO, 2020) defines tele-health often known as e-health as 'the delivery of healthcare services, where distance is a critical factor, by all healthcare professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation, and for the continuing education of healthcare providers, all in the interests of advancing the health of individuals and their communities to offer health-related care to clients throughout a long distance. Tele-nursing, a subset of tele-health is a technology-based nursing service created to make health-care services more accessible to people.

Tele-maternity care, is a subcategory of tele-nursing, by which maternity health professionals used telecommunications technology to give care to mothers during the perinatal period, which included preconception, pregnancy, labor, and postpartum, such as (SMS messages, virtual meetings via smartphones, and various apps). Additionally, portable instruments such as sphygmomanometers, glucometers, pulse Oximeter, and mobile CTG devices have been used to assess patient well-being. Also, represents one approach to optimizing care and mitigating risk for exposure for prenatal women in the setting of the COVID-19 and has become crucial to confirm the safety and effective delivery of obstetric care (Fryer, et al 2020).

Utilizing technology to implement the healthcare remotely is viewed as a crucial strategy for dealing with the ongoing increase in demand for care. Tele-health is gaining popularity as communication technology becomes more widely available. Pregnant women were categorized as high-risk in the early phases of the pandemic and advised to limit social connections to avoid getting the virus. As a result, clinical care has implemented new safeguards to ensure that services for pregnant women can be maintained. According to the CDC analysis, 33 of the 19,600 pregnant women evaluated died, or a 0.2 % death rate (ACOG, 2020).

Furthermore; pregnant women were placed in a difficult situation in which they had to adhere to a rigorous management plan of planned visits with their obstetrician or midwife throughout their pregnancy. Tele-maternity is one strategy to optimizing care and decreasing risk of exposure for expectant women in the context of the COVID-19, and it have become critical to confirm the safety and efficacy of obstetric care delivery (Narang, et al, 2020).

The American College of Obstetricians and Gynaecologists (ACOG, 2020) advocated scheduling some appointments via tele-health to limit the risk of infection during their commute to the clinic or due to contact with medical staff. Also, (WHO, 2020) emphasized the necessity of tele-maternity in preserving the

provision and utilization of vital maternal and new born health services during the COVID-19 pandemic.

The compelling reason to emphasize on tele-maternity in obstetrics and gynecology increasing tele-maternity is being employed in almost every element of women's health care. Also, virtual patient consultation with specialty services, remote observation of ultrasound recordings by maternal-fetal medicine and reproductive endocrinology experts, bladder diary tracking with smartphone apps, postpartum blood pressure monitoring with Wi-Fi-connected devices, remote provision of medication abortion, and fertility tracking with patient generated data are some examples. Second, there were approximately 2,000 obstetric apps alone in 2014 (Farag, et al, 2014).

Women's Health & Pregnancy Apps accounted for 7% of all Health Apps in 2015. These tools directly provide resources to expecting parents via blogs, daily updates that track a baby's progress, forums, and symptom trackers, with the goal of improving prenatal and postnatal health outcomes, with promising of reducing the health concerns (DeNicola et al, 2020). A previous study has also demonstrated that using maternity care helps in patient assessment, improves maternity care, boosts the capacity of rural providers to care patients remotely, saves time apart from support networks, and lowers wasteful retrievals. Consequently, programming expertise in mother and child health is lacking (Futerman, et al., 2021).

Tele health is increasingly being used to enhance healthcare utilization, improve the quality of pre- and post-pregnancy care, and as a means of collecting pregnancy and child health data. On the other hand, Tele-health education is commonly recommended as a technique of removing barriers to tele-health use and increasing adoption. (Brewster et al., 2014 and Van Houwelingen et al., 2015). The efficiency and effectiveness of tele-maternity care approaches can be enhanced and attained by raising public awareness and appreciation of its potential benefits. As a result, empowering patients as partners in healthcare delivery could be a critical component in the evolution and

extension of tele-maternity care services (Samp, 2020).

All previous studies and literature attempted to evaluate the outcome and impact of remote maternity care utilization on women's health, but no one attempted to identify whether clients have sufficient awareness and attitudes toward tele-maternity to implement this approach to their patient care. To fulfill this knowledge gap, the purpose of this study was to first assess pregnant women's baseline awareness, attitudes, and willingness toward tele-maternity care, and then to take the first step toward increasing their awareness, attitude, and willingness toward this novel care approach.

Significance of the study

Pregnant women had a higher incidence of ICU hospitalization and mechanical ventilation than non-pregnant women in a study of 8207 COVID19 cases in the obstetric community (CDC, 2021). The World Health Organization (WHO) declared a COVID-19 pandemic, causing rapid, profound, and previously unnoticed changes in the way maternal care is offered around the world. These changes have impacted many maternity care service users, including women, their partners, and carers. Furthermore, when tele-health technology became more widely available, the healthcare landscape shifted (WHO, 2020).

Although tele-maternity care is still a relatively new concept in Egypt's health-care system, its execution has been less than optimal. However, access and utilization of this new model of care were limited by a variety of human-related component variables such as users' digital illiteracy, lack of awareness, attitude, willingness, and readiness to use (Biruk and Abetu, 2018).

As a result, it is essential to consider increasing users' awareness of the technology and highlighting its capabilities and benefits, because proper information and good attitudes toward the technology are critical components in motivating users to utilize it in the future. The current study attempted to raise pregnant

women's awareness, attitude, and willingness toward tele-maternity care approach.

Aim of Study

To evaluate the effect of an orientation program regarding utilization of a tele-maternity care on pregnant women's awareness, attitude, and willingness during COVID-19 pandemic.

Hypothesis

The pregnant women's awareness, attitude, willingness toward tele-maternity care utilization will be improved after receiving the orientation program.

Operational definition

Tele-maternity care: is the remote delivering of maternity healthcare services by specialist maternity healthcare professionals using information and communication technology to communicate valid and accurate information during the perinatal period, which includes preconception, pregnancy, labor, and postpartum.

Subjects and Methods

Research Design:

A quasi-experimental pre and post-test one-group only design was adopted to carry out this study.

Setting:

The current study was carried out at Al-hadeka Maternity and Child Health Centre (MCH) in Al-Fayoum governorate, Egypt, which is an urban Centre linked with the Ministry of Health and offers a wide range of free services to women and their children such as antenatal care, normal delivery, family planning, and vaccination. It serves around 3000 cases each year, getting health care (Al-Fayoum Health Information System, 2020).

Subjects: Sample type:

A convenient sample of 300 pregnant women were attending the previously mentioned setting and seeking for antenatal care (ANC) services within the period of 6 months beginning from March 2021 to the end of August 2021. The studied sample was selected according to the following

Inclusion criteria of the sample selection:

At any trimester of pregnancy, can read and write, and have technology devices as smart phone, laptop, and or personal computer.

Sample size:

Sample size was 297 increased to 300 pregnant women to achieve a power of 80% and a level of significance of 5% (two sided), assuming the standard deviation of the differences to be 1.23 between pairs and effect size 20%.

$$n = \left(\frac{Z_{1-\alpha/2} + Z_{1-\beta}}{ES} \right)^2$$

$Z\alpha$ = Standard normal deviate for $\alpha = 1.9600$.

$Z\beta$ = Standard normal deviate for $\beta = 0.8416$.

$B = (Z\alpha + Z\beta)^2 = 7.8489$.

$C = (E/S\Delta)^2 = 0.0264$.

$N = B/C = 296.8640$.

$n = \left(\frac{1.96+0.84}{0.0264} \right)^2 = 296.8640. \approx 297$ pregnant women

Tool of data collection:**Data of the current study collected by using a structured interviewing questionnaire:**

It was designed by the researchers after reviewing the related literature, and it included six parts that the researcher filled out.

Part 1: Socio-demographic data: it included questions regarding age, residence, educational level, occupation, family monthly income and telephone number.

Part 2: Obstetrics profile data: it included number of gravidity, parity, history of abortion, weeks of gestation, current obstetrics condition, pattern of current ANC follow-up, and types of obstacles facing women during their follow up.

Part 3: Technology profile data: It included 5 statements regarding women's technology /computer usability and access, such as (1) accessing to tele- maternity care more frequently during the COVID-19 period, 2) ability to access more pregnancy-related information from tele-maternity than face-to-face care providers during COVID-19, 3) using phone/computer to search for information on COVID-19 and its prevention during

pregnancy, 4) using computer/phone to download and use applications on maternal and infant health, care, 5) contacting with health care provider for information/advice than the face-to-face care during COVID-19'. Each participant woman being asked to rate each statement on a three-point scales ranging from 0-2 (0) rarely, (1) sometimes (2) often times.

Part 4: Women's awareness regarding tele-maternity care: It was designed and adapted by the researchers after examining relevant national and international literature (Biruk, and Abetu (2018) & Ebrahim, & El sayed, 2018), This part was used twice: before and after the program implementation. It consisted of 9 questions asking for general information about tele-maternity care, such as its definition, importance, advantages, drawbacks, resources, principles of application, role of users, prior tele-maternity information and its sources, and if there are any obstacles of receiving care during COVID-19. In addition to 7 specific questions regarding most popular tele-maternity services such as (tele-antenatal care, tele-lactation, tele-fetal monitoring, virtual psychological support,...etc.) and 9 questions about tele-maternity apps such as (Ovulation & menstruation calculator apps, pregnancy follow-up apps, antenatal and postpartum nutrition& exercise app, Weight, B.p and sugar tracking app, Baby care apps, and fetal development follow-up app). Each participant woman was asked to rate her current awareness level for each question on a three -point scale ranging from 0 to 2, (0) definitely no, (1) some extent, (2) definitely yes.

❖ Scoring system:

These scores were converted into a percent score .The total awareness score (50 degrees (100 %) that were calculated as: satisfactory level of awareness, if the total awareness scores were ≥ 50 % (≥ 25 degree), and unsatisfactory if it was < 50 % (< 25 degree).

Part 5: Women's attitudes towards tele-maternity care:

It was designed and modified by the researchers after reviewing the related literature, **Guinart et al., (2020)**, this part was utilized on two occasions: before and after the program's implementation. It composed of 18 statements in which each participant asked to score her response toward tele-maternity attitude using 3 levels (disagree, somewhat agree, and agree).

❖ Scoring system:

The score ranged from 0 to 2, (0) for disagree, (1) for somewhat, (2) for agree. The total attitude score (36 (100 % degree) was calculated as $\geq 60\%$ (≥ 24 score) it indicated positive attitude, and $< 60\%$ (< 24 score) indicated negative attitude.

Part 6: Women's willingness and readiness to utilize tele- maternity care services:

It was designed and modified by the researchers based on (**Perry, 2019**), this part was utilized on two occasions: before and after the program's implementation. It included 10 statements in which each participant asked to rate her willingness and feeling of readiness to use the tele- maternity care on a three-point Likert scale ranging from 0 to 2, (0) disagree, (1) uncertain, and (2) agree.

❖ Scoring system:

The total score (20 degree (100%)) was calculated as $\geq 50\%$ (≥ 10 score) indicated high willingness, and $< 50\%$ (< 10 score) indicated low willingness.

Content validity and reliability:

A panel of three specialists in the fields of maternity and neonatal health nursing evaluated the data collection tool for content validity, clarity, phrasing, and formatting. The content validity index (CVI) resulted in the identification of highly accepted instruments, which it measured (0.89). Furthermore, the panel of experts assessed the substance of the educational guidelines, and the contents of the guidelines were critically reviewed and validated.

Reliability

A cronbach's Alpha test found that the study's data collection tool contained

reasonably homogeneous items, as indicated by high reliability of it, which was (0.92) .

Ethical consideration

The dean of college, as well as the directors of the Al-hadekah Maternal and Child Health Care (MCH) Centre, provided official permission to enable data gathering. After being told about the nature and aim of the study, women granted oral informed consent prior to data collection. To ensure anonymity, the completed tool was allocated a code number. The researchers informed the women that the information they had gathered would be kept private, each woman was had a right to withdraw at any time without giving a reason. And who were willing to participate and complete the study. In addition; women will not be harmed as a result of the research intervention.

Pilot study:

A pilot research was conducted on 30 pregnant women (10% of the overall study sample), to assess the relevance and content validity of the tool, and testing their simplicity, clarity, and application. Based on the findings of the pilot research, a few changes were made. Women from the pilot study were omitted from the study in order to avoid contamination of the main study population.

Fieldwork:

The current study's data were collected over a 6 months period beginning in March 2021 and to the end of August 2021. The researchers went to the previously mentioned setting three times a week, from 9.00 a.m. to 12.00 p.m. The following phases were used to accomplish the aim of the study: preparatory phase, interviewing & assessment phase, intervention, and evaluation phase.

1-Preparatory phase:

After obtaining official permission from all authorities, the researchers began reviewing relevant literature in order to design the study tool and program materials and teaching methods.

2-Interviewing and assessment phase:

In which researchers interviewed and welcomed each participant in the waiting area

to explain the purpose of the study and familiarize them with the nature and duration of the study before obtaining their approval to participate in the study. This phase lasted 5 minutes. Then the researchers assess the baseline socio-demographic, obstetrics, and information technology profile data of the study participants' women and to fulfill the pre-intervention assessment of women's awareness, attitude, and willingness towards tele-maternity care.

3-Intervention phase:

Following the collection of pre-test data, the researchers began implementing the pre-designed awareness program

Program time: the program implemented on two sessions, one theoretical and one practical. These sessions attended by nearly 15-20 participant women. Total educational intervention time reached 96 hours / 16 weeks, with (6 hours /week-2 hours /daily) for all women while they were in waiting room of El-hadeka MCH Centre.

Program objectives: this program implementing to equip and familiarize pregnant women with the essential information regarding utilization of tele-maternity care.

Program materials: the content of the program covering the following topics: Tele-maternity basic information such as definition, importance, benefits, drawbacks, resources, guidelines, and user role, most popular tele-maternity services such as (tele-antenatal care, tele-lactation, tele-fetal monitoring, virtual psychological support,...etc.) and tele-maternity apps such as (Ovulation & menstruation calculator apps, pregnancy follow-up apps, antenatal and postpartum nutrition& exercise app, weight, B.p and sugar tracking app, baby care apps, and fetal development follow-up app).

That covered in a theoretical session using instructional media, figures and data show. Subsequently a practical session in the form of a role play demonstrating the most popular types and applications of tele-maternity care services, as well as how users practice and use the tele-maternity application and benefit from it. At the end of each session, women' questions were discussed to correct

any misunderstanding. Before the women left the clinic, they were told of the scheduling of the evaluation phase and received a basic Arabic coloured booklet comprising all of the tele-maternity care information.

4-Evaluation phase:

After two months of program implementation, the researchers call each participant either in the clinic or remotely via phone, using the same pre-test study's tool part 4, 5, 6 to complete the post intervention test that evaluates the program's effectiveness.

Statistical Analysis:

All data were collected, tabulated and statistically analyzed using the IBM SPSS (Statistical Package for the social sciences) statistics for windows, version 23. IBM Corp., Armonk, NY: USA. Quantitative data were expressed as the mean \pm SD and qualitative data were expressed as absolute frequencies (number) & relative frequencies (percentage). Wilcoxon Signed Ranks Test. Spearman correlation coefficient was calculated. All tests were two sided. P-value $<$ 0.05 was considered statistically significant p-value $<$ 0.001 was considered statistically highly significant and p-value \geq 0.05 was considered statistically insignificant.

Results:

Table (1): Shows that nearly half 47.7% of studied pregnant women were within the age ranged 26-30 years with the mean age 28.68 ± 4.68 years and more than half 60.7% of them were living in rural areas. Also, 39.3% of them had secondary education and 76.0% were housewives. Concerning family monthly income 57.0% of the studied pregnant women had just enough income.

Table (2): Indicates that more than two thirds 69.0% of studied women were multigravida. In relation to number of parity more than half 57.5% of them had 1-2 times. On other hand 61.9 % had $<$ 2 number of abortion. Also, more than three quarters 74.3% had $<$ 20 weeks of gestational age. Concerning the state of current pregnancy, the majority of studied women 85.3% and 93.0% had regular antenatal care and had normal pregnancy.

Meanwhile, the rest of them had higher risk and irregular antenatal care pattern with fewer percentages.

Figure (1): Illustrate that the most common sources of tele-maternity information among participants who have previous information (n.105), were social media 85.7%, and followed by health care providers 57.1% and friends 42.8%. Among participants who previously heard on tele-maternity care.

Figure (2): Displays that fear from infection and the distant of maternity health care center (75.0% & 50.0%, respectively) were the most common obstacles facing participant women while they receiving care during COVID-19 pandemic. Only 20% of them were in ability to go to health care center's'.

Table (3): Reveals that the majority 81 % of studied pregnant women's were accessing to tele-maternity care more frequently during the COVID-19 period often time & 83.7% of them able to access more pregnancy-related information from tele-maternity than face-to-face care providers during COVID-19. Also, high proportion of the studied pregnant women 84.3 & 86.7%,

respectively were use computer/phone to download ,and use applications on maternal and child health, Moreover; the majority 93.7% were often time easier to contact with health care provider for information/advice than my face-to-face provider during COVID-19.

Table (4): clears up that the mean \pm SD total score of studied pregnant women's awareness regarding tele-maternity information, type of services, and its applications were significantly increased with high percentage of improvement post intervention than pre intervention program (P.<0.0001). Likewise; their attitude and willingness & readiness to use and benefit from the tele-maternity care were, also significantly increased with considerable percentage of improvement in post program intervention (P.<0.0001).

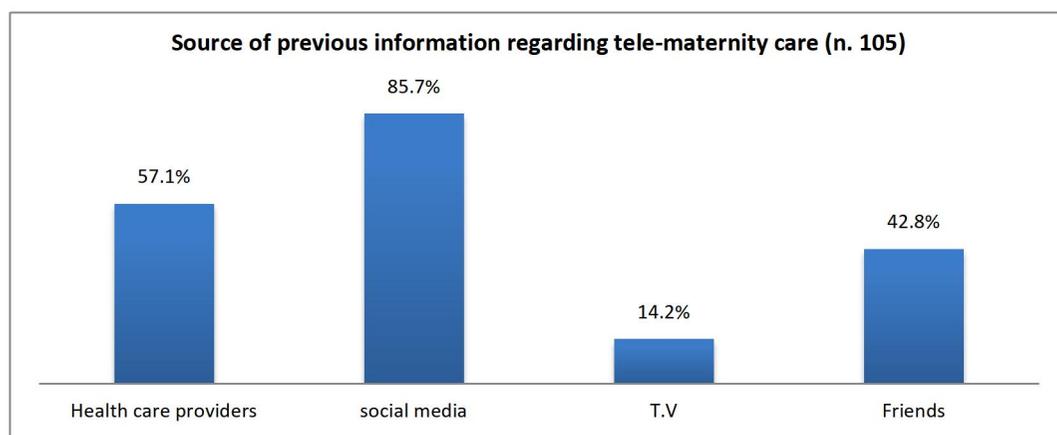
Table (5): Demonstrates that there was statistically significant positive correlation between women's awareness, attitudes and willingness towards tele-maternity care in pre and post intervention (P. <0001). As same as there was statistically significant positive correlation between women's attitudes and willingness towards tele-maternity care (P. <0001) at post intervention.

Table (1): Socio-demographic characteristics of the studied pregnant women (n =300).

Variables	No.	%
Age / years		
18 ≤ 25	60	20.0
26 -30	143	47.7
>30	97	32.3
Mean \pm SD	28.68 \pm 4.68	
Residence		
Rural	182	60.7
Urban	118	39.3
Education level		
Primary/preparatory	81	27.0
Secondary	118	39.3
University education	101	33.7
Occupation		
Housewife	228	76.0
Employer	72	24.0
Family income (pound/month):		
Sufficient and can save	8	2.7
Just enough	171	57.0
Insufficient.	121	40.3

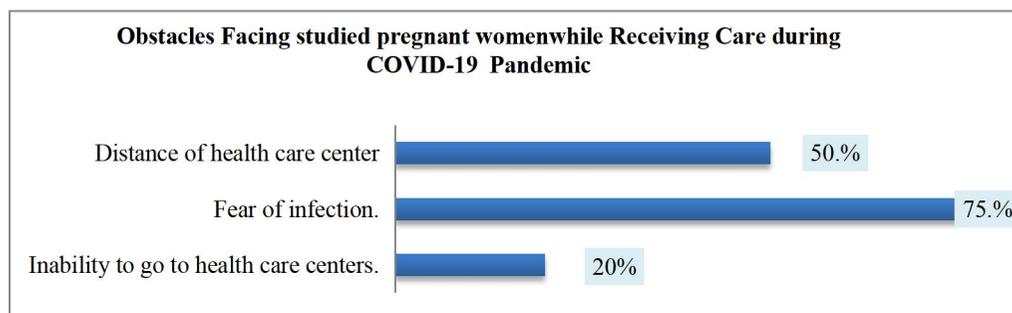
Table (2): Frequency distribution of the studied pregnant women regarding their obstetric profile (n =300).

Variable	No.	%
Gravidity:		
Primigravida	93	31.0
Multigravida	207	69.0
Number of parity (n=186):		
1-2 times	107	57.5
≥3 times	79	42.5
Number of abortion (n =21):		
<2 times	13	61.9
≥2 times	8	38.1
Gestational age / week:		
<20 weeks	223	74.3
≥20 weeks	77	25.7
State of current pregnancy:		
Normal	279	93.0
High risk	21	7.0
Antenatal care pattern:		
Regular	256	85.3
Irregular	44	14.7



N.B. (*not mutually exclusive)

Figure (1): Sources of previous information regarding tele-maternity care among the studied pregnant women (N=105).



*not mutually exclusive

Figure (2): Obstacles facing the studied pregnant women while receiving health care during the COVID-19 pandemic (n=300).

Table (3): Frequency distribution of the studied pregnant women regarding their technology profile (n =300).

Variables	Rarely		Sometime		Often time	
	n.	%	n.	%	n.	%
• Accessing to tele- maternity care more frequently during the COVID-19 period	15	5	42	14.0	243	81.0
Ability to access more pregnancy-related information from tele-maternity than face-to-face care providers during COVID-19	9	3.0	40	13.3	251	83.7
• Using phone/computer to search for information on COVID-19 and its prevention during pregnancy	8	2.7	90	30.0	202	67.3
• Using computer/phone to download and use applications on maternal and child health	7	2.3	40	13.3	253	84.3
• Contacting previously with health care provider for information/advice rather than face-to-face care during COVID-19	14	4.7	5	1.6	281	93.7

Table (4): Distribution of the total score of awareness, attitude, and willingness towards tele-maternity care among the studied pregnant women at two different intervals (pre & post the program implementation) (n=300).

Variables	Study phase				w	P value	% of improvement
	Pre		Post				
	No.	%	No.	%			
- Women's awareness toward tele-maternity care [information, services, and applications]							
Satisfactory	18	16.0	285	95.0			
Unsatisfactory	282	94.0	15	5.0	8.4	.0001	97%
Mean± SD	13.5±14.3		30.1±9.5				
- Women's attitudes toward tele-maternity care :							
Positive	161	53.7	284	94.7			
Negative	139	46.3	16	5.3	6.005	.0001	24.3%
Mean± SD	23.9±11		29.7±8.8				
- Woman's willingness, and readiness to benefit from the services of tele-maternity care							
High	262	87.3	283	94.3			
Low	38	12.7	17	5.7	5.331	.0001	19.3%
Mean± SD	14±6.4		16.7±4.8				

W= Wilcoxon Signed Ranks Test highly significant = $p < 0.001$ % of improvement= percent of improvement score post intervention

Table (5): Correlation between women's awareness, attitude, and willingness towards tele-maternity care at two different intervals (pre & post the program implementation) (n=300).

Variables	Women's awareness toward tele-maternity care		Women's attitudes toward tele-maternity care	
	(r)	p	(r)	P
Pre intervention				
Women's awareness toward tele-maternity care [information, services, and applications]	1	.		
Women's attitudes toward tele-maternity care	0.154	0.126	1	
Women's willingness and readiness toward tele-maternity care.	.273**	0.006	.726**	.0001
Post intervention				
Women's awareness toward tele-maternity care [information, services, and applications]	1			
Women's attitudes toward tele-maternity care.	0.305	0.002	1	
Women's willingness and readiness toward tele-maternity care.	0.316	.001	0.754*	.0001

(r) Correlation coefficient ** Correlation is highly significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed).

Discussion

Tele-maternity is a subset of tele-nursing, which is a system that uses information, communication, and web-based technology to connect with patients during the perinatal period in order to provide health care. Concerning technology profile of participant women our findings reported that the majority of studied participants were have a smart phone / computer or lab top and always use it issues rather than searching for information or applications related to maternal and child health or COVID-19 that already reported among the minority of them. Those were using it as sources of information regarding tele-maternity care were from social media. This may be due to their lack of awareness regarding tele-maternity care information. (Nejadshafiee et al, 2020).

The present study indicated that nearly half of studied women were within the age ranged 26-30 years with the mean age with the mean age 28.68 ± 4.68 years and 60.7% of them were living in rural areas This result supported by Helmy et al., (2021) who found in her study effect of Tele health Nursing program regarding COVID-19 among Pregnant Women who reported that the studied women with a mean age of (28.80 ± 5.24). Also, about two-thirds of the current study was living in rural areas, more than one third had secondary education, about three quarters of them were housewives and more than half of family monthly income had just enough income. This result contradicted with Ahmed et al., (2021) who reported that there was Nearly more than three quarters of participants were had high education, more than two third were working women also about three quarters of participants are living in urban area. According to family income nearly more than three quarters of participants reported insufficient income. This result is in disagreement with Helmy et al. (2021) of them reside in rural, while (86.7%) have got sufficient monthly income.

The current study results displayed that fear from infection and the distant of maternity health care center were the most common obstacles facing participant women while they receiving care during COVID-19 pandemic.

Only less than one quarter of them was in ability to go to health care centers.

Furthermore, the present study revealed that the majority of pregnant women's were accessing to tele-maternity care more frequently during the COVID-19 period often time & able to access more pregnancy-related information from tele-maternity than face-to-face care providers during COVID-19. Also, high proportion of the studied pregnant women were use computer/phone to download ,and use applications on maternal and child health, the majority were often time easier to contact with health care provider for information/advice than my face-to-face provider during COVID-19. This results in disagreement with , Chunara, et al (2020) stated that two studies of different New York City health systems found that black patients were significantly less likely to access tele-health than their white counterparts during the pandemic.

The current study findings revealed that there were a highly statistical significant improvements in women's awareness level regarding tele-maternity care in post-intervention compared to pre-intervention ($P < 0.0001$) that reflects the effectiveness of the program and supported the study hypothesis. This study in the same line with Anikwe et al, (2020) concluded that more than half of their respondents were informed about maternity care using social media, which is becoming increasingly popular and is regarded one of the most popular. This could be a motivator for women to take advantage of and employ safe tele-maternity care services. As regard, tele-maternity care women awareness.

A recent study conducted in Egypt by Omar et al, (2021) backed up this conclusion. Who evaluated the impact of a tele-maternity care teaching program on nurses' knowledge, attitudes, and reported that after receiving the educational program, maternity nurses became much more knowledgeable about tele-maternity care.

Similarly, Ebrahim and Elsayed (2018) found that there were highly statistically significant differences in the knowledge scores immediately post-program and follow up (after

three months) as compared to pre-program in all dimensions when they evaluated the effect of educational programs about tele-nursing for nursing interns at Benha University Hospital. In contrast, **Malhotra et al. (2020)**, as well as **Biruk and Abetu, (2018)** in India and North West Ethiopia, found that the majority of the people investigated had insufficient awareness about telemedicine and its implementation.

Concerning women's attitude and willingness towards tele-maternity care, our findings supported the study hypothesis as the mean total score of pregnant women' attitude towards tele-maternity care were significantly improved with increasing the positive attitude in post program implementation compared to pre- program implementation. ($P < 0.0001$). In the same line, **Omar et al, (2021)**, concluded that percentage of studied maternity nurse negative attitude towards tele-maternity care services in pre-intervention were significantly decreased in post intervention.

Another recent descriptive study by **Ranjbar et al., (2021)**, looked at the attitudes and awareness of Iranian clinical nurses and midwives about tele-nursing and tele-health, and found a positive attitude toward tele-nursing and tele-health. Furthermore, **Biruk and Abetu (2018)** stated that two-thirds of the respondents had a positive attitude toward telemedicine, and **Zayapragassarazan and Kumar (2016)** stated that more than two-thirds of the respondents have a positive and moderate attitude toward telemedicine.

In term of total score of pregnant women's willingness to use tele-maternity care services, the present results showed that there were statistical significant increase in percentage of women who reported high level of willingness towards tele-maternity utilization in pre vs. post intervention intervals ($P < 0.0001$) These findings support the study hypothesis, and suggest that the women will be effectively desirable to use and applicate tele-maternity care. This findings with in consistent by **Omar et al, (2021)**, reported that the mean score of maternity nurse willingness towards tele-maternity were significantly high in post-program implementation compared to preprogram implementation.

In term of correlation between women's awareness, attitude, and willingness towards tele-maternity care there was statistically significant positive correlation between women's awareness, attitudes and willingness towards tele-maternity care in pre and post intervention ($p < 0.0001$). This also reflects the impact of the program, which has the potential to effectively change women's views and desire to use tele-maternity care services, establishing the groundwork for the technology's long-term success in health care settings. The findings of current study were reliable with study findings of **Malhotra et al. (2020)** studied the knowledge, perceptions, and readiness to use telemedicine among medical and allied healthcare students in private institutions and found that 90.9 percent saw telemedicine as a feasible option and were willing to use it.

Conclusion

The tele-maternity orientation program was successful in enhancing pregnant women's awareness, attitude, toward tele-maternity care, as well as greatly improving their willingness to use it.

Recommendations

The following recommendations are based on the findings of the current study:

- Establishing extra continuous education sessions on all updated tele-maternity services by offering a supportive environment, instructional tools, and a consistent framework that enhances patients' willingness to use tele-maternity in the long run.
- Further study must be conducted on a large sample of women covering their perinatal period at diverse health care settings
- Further study investigating barriers of tele-maternity utilization.

Conflicts of Interest

The researchers stated that they have no conflicting interests in this study.

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