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Effect of an educational program about utilization of tele-maternity care on nurses' knowledge, attitude and willingness during COVID-19 pandemic

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Abstract

Background: The pandemic has forced health care systems and their providers to rethink how they can provide care. As a result, tele-maternity care as a category of tele-health is becoming an inevitable, quick solution for meeting maternity needs and ensuring care continuity. Evidences indicated that nurses played a vital role in preventing and lowering maternal problems by employing a tele-nursing method.

Aim: To evaluate the effect of an educational program about utilization of tele-maternity care on nurses' knowledge, 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 conducted at Mansoura University Hospital, Mansoura city, Dakahlia governorate, Egypt.

Sample: A convenient sample of 50 maternity nursing staff including nurses, nursing supervisors, assistant nurses, those working in labor unit, outpatient ANC clinic, high risk unit, inpatient wards of obstetrics and gynecological department at Mansoura University Hospital.

Tools of data collection: A five parts structured self-administered questionnaire was used in this study to collect the following data: nurses' personal & professional data, nurses' information about computer access and its literacy data, nurses' knowledge regarding tele-maternity care, nurses' awareness regarding types of tele-maternity services and nurses' attitudes towards tele-maternity attributes.

Results: Finding of this study revealed that there were highly statistically significant differences with an improvement in total score of maternity nurses' knowledge, attitude towards tele-maternity care in post-intervention as compared with pre-intervention P-value < 0.0001. also There was a positive fair association between maternity nurses' years of experience and their pre-educational intervention knowledge scores about tele-maternity care ($r=0.276$ & P value 0.05), but no such association reported between maternity nurses' age and years of experience with their total knowledge, awareness, and attitude score educational intervention ($r=0.276$ & P value 0.05).

Conclusion: This study concluded that the maternity nurses' knowledge, attitude, willingness to using tele-maternity care were significantly improved after the implementation of the educational program.

Recommendations: This study suggests that nurses' capabilities should be strengthened by providing additional practical training sessions on updated tele-maternity services, as well as establishing proper and effective communication channels among organizations dedicated to health-care education, particularly the Faculty of Nursing, in order to include tele-maternity in undergraduate and postgraduate nursing curricula.

Keywords: Educational program, nurses' knowledge, COVID-19

Introduction

The COVID-19 pandemic had a tremendous influence on all countries around the world, posing numerous issues in terms of health, healthcare access, and rapid, unprecedented changes in the way maternity services are delivered around the world. Women, their partners and support people, midwives, medical professionals, and midwifery students have all been affected by these changes in maternity services^[1].

Changes in maternity service provision have largely encompassed reduced face-to-face contact and increased infection prevention and control in healthcare settings have been the mainstays of changes to maternity service provision. The rapidity with which health services have had to adapt their maternity care models is likely to have influenced both those who receive maternity care (women and their partners) and those who offer maternity care

(Women and their partners) (Midwives, midwifery students and doctors). The pandemic has compelled physicians and systems to re-think about access to care in a new way. The capacity of the healthcare system facilities, employees, and supplies have begun to be strained as the number of cases has increased. In addition, many health appointments are now delivered via tele-health or in ways that reduce face-to-face interaction [2].

In order to fulfil community needs and improve continuity of care, tele-health is being quickly integrated throughout health and social sectors. Tele-health is defined as "the delivery of health care services over a long distance between patients and providers." Tele-health is the use of information technology to exchange data for the diagnosis and treatment of diseases and injuries, as well as for research and evaluation [3].

Tele-health has been used to replace in-person visits, implement at-home monitoring, and enable consultation with distant specialists, postpartum follow-up visits, and access to lactation consultants, among other maternity services. The American College of Obstetricians and Gynaecologists [4] recommends virtual psychosocial support with the assistance of telecommunications.

Tele-nursing is now having an impact on nursing and maternity nursing services. Tele-maternity nursing is a subcategory of tele-health that focuses on using telecommunications technology to deliver, manage, and coordinate care and services before, during, and after pregnancy. Patient education, nursing tele-consultations, analysis of medical test findings, and help to physicians in the implementation of medical treatment regimens are the most typical uses of tele-maternity nursing [5].

According to Aziz *et al.*, [6] tele-health is effective in managing high-risk cases such as hypertensive disorders of pregnancy, such as preeclampsia, gestational hypertension, gestational diabetes mellitus, cardiovascular disease; and bad obstetrical history, such as postpartum care. These new options open up the possibility of expanding access to pregnancy and delivery services, which could help pregnant women avoid negative health outcomes.

Nurses, according to current findings, play a critical role as human resources in the crisis management cycle. Using the tele-maternity approach, they also play a significant part in the prevention and decrease of maternal complications [7].

The utilization of remote maternity care has an impact on maternal care and women's health, according to the literature. Farrag & Metwely [8], reported that tele-nursing support could improve the health promotion lifestyle profile and self-efficacy scores, as well as maintain blood glucose levels and promote antenatal visit compliance among women with gestational diabetes.

In a systematic study titled "Tele-health Interventions to Improve Obstetric and Gynecologic Health Outcomes," Nicola; *et al.* [9] concluded that tele-health interventions improved overall obstetric outcomes like smoking cessation and breastfeeding. So, the practicality and benefits of tele-nursing are backed up by a large body of evidence [10].

Significance of the study

In response to the COVID-19 outbreak, health institutions, particularly perinatal service and support providers, have been forced to rely on tele-health, or the remote provision of care via telecommunications technology to contact their clients. This has resulted in tremendous innovation, quick reimbursement modifications, and critical lessons gained

that will help shape the future of telemedicine in maternal and perinatal care [11].

Furthermore, since tele-health and tele-nursing are still relatively new concepts in the Egyptian health-care system, their implementation has been less than ideal. However, because of the substantial changes in health-care services as a result of the pandemic, there may be a fresh window and opportunity for tele-maternity care to be integrated into the health-care system [12]. Many factors that influence the application of information technology in the health-care system are human-related components, such as users' knowledge and attitude toward technology, are extremely important in one of them. Consequently, it is necessary to think about expanding users' knowledge of the technology and demonstrating its capabilities and benefits, because adequate knowledge and positive opinions of the technology are critical components in convincing users to use it in the future is a phone number [13]. As a result, the researchers hope that this study will help to improve the knowledge, attitude, and willingness of maternity nursing staff to use tele-maternity care approaches during a COVID-19 pandemic.

Aim of the study

To evaluate the effect of an educational program about utilization of tele-maternity care on nurses' knowledge, attitude and willingness during COVID-19 Pandemic.

Research hypothesis

The maternity nurses' knowledge, attitude, willingness to using tele-maternity care will be improved after implementation of the educational program.

Operational definition

Tele-maternity care. Care was provided by maternity nursing staff for the mother during preconception, pregnancy, labour, and postpartum period using telecommunications technology.

Subject and methods

Research Design

A quasi-experimental pre and post-test one-group only design was utilized for this study.

Setting

The present study was conducted at Mansoura University Hospital, Mansoura city, Dakahlia governorate, Egypt. Mansoura University Hospital is a University Hospital that provides all free services as medical, surgical, neurological, emergency and obstetrics and gynaecological to women during life cycle such as; pregnancy, labour, postpartum and, family planning.

Subjects

A convenient sample of 50 maternity nursing staff including nurses, nursing supervisors, assistant nurses, those working in labor unit, outpatient ANC clinic, high risk unit, inpatient wards of obstetrics and gynecological department at Mansoura University Hospital

Tool of data collection

Data collected in this study by using a structured self-administered questionnaire

It was designed and modified by the researchers after

reviewing the previous related national and international literature, ⁽¹³⁾ it was written in Arabic, including five parts that were filled out by the subjects.

Part 1: Personal and professional data: Such as age, residence, educational qualification, years of experience, working area, and previous attendance of training program about tele-health.

Part 2: Nurses' information about computer access and its literacy data: It comprised seven questions about nurses' computer literacy and access, with participants being asked to rate each statement on a three-point scale ranging from 0-2. (0) for never, (1) for sometimes, (2) for never.

Part 3: Nurses' Knowledge regarding tele-maternity care: This part was utilized on two occasions: before and after the program's implementation. It consisted of 20 multiple - choice closed questions and open- end questions covering and asking for nurses' knowledge on the following topics: definition of nursing informatics, tele-health, tele-nursing, tele-maternity nursing (4 questions), advantages & disadvantages of tele-maternity care (6 questions), guidelines and resources of using tele-maternity care (6 questions), 4 questions regarding the role of maternity nurse.

For each topic, the following scoring system was used: correct answers were scored (2), partially correct answers were scored (1), and incorrect answers were scored zero. For all questions, the scores were converted into numbers and a percentage of the overall score: The items' scores were added together and the total was divided by the number of items, yielding a mean score for the part. These results were then transformed to a percentage.

The total knowledge scores (50 degrees) (100%) were termed good if the total knowledge scores were $\geq 75\%$ (≥ 37.5 degree), average if it was $< 75\%$ (from $25 < 37.5$ degree), and poor if it was $< 50\%$ (25 degree).

Part 4: Nurses' awareness regarding types of tele-maternity services: it included 7 most common types of tele-maternity services and applications in which the nurses were asked to provide response for each type on a three point scale ranged from 0-2. (Zero) for don't know, (1) for hear, (2) for know

The total awareness scores (14 degrees) (100%) were termed good if the total awareness scores were $\geq 75\%$ (≥ 10.5 degree), average if it was $< 75\%$ (from $7 < 10.5$ -degree), and poor if it was $< 50\%$ (7 degree).

Part 5: Nurses' attitudes towards tele-maternity attributes: this part was used on two occasions before and after implementation of the program. It included 5 attributes (tele-maternity advantages, compatibility, complexity, applicability, and willingness to its utilization. Each attribute included five questions designed to evaluate the respondents' attitudes regarding telemedicine. This section requested a graded response on a five-point Likert scale ranging from 0 to 4 with '0' for strongly disagree, '1' for disagree, '2' for sometimes, '3' for agree and '4' for strongly agree.

Scoring system

Scores for each perceived tele-maternity attribute were averaged to create the specific mean score. In this part, mean score of ≥ 12.5 ($\geq 50\%$) categorized as positive attitude, < 12.5 ($< 50\%$) categorized as negative attitude.

Validity and reliability

By exhibiting the tools to one medical obstetrics and gynaecological, two maternity and new- born health nursing specialists, the researchers ensured the tools' content validity. They did not necessitate any changes to the goods. The correlation coefficient Alpha was used to account for the tools' reliability coefficient (Cronbach). It showed a variation in the reliability coefficient value of 0.90, which is still statistically significant and indicates very high reliability.

Ethical Considerations

To conduct this study, official approvals were granted from the director of Mansoura University Hospital as well as the dean of the faculty of nursing. Before the study was implemented, the participants had been individually told about the study's nature and aim for obtaining their oral consent and willingness to participate in the study. They were also assured of the obtained data's privacy and confidentiality. The participants were given the option to leave the study at any time.

Pilot study

To determine the clarity and applicability of the study tool, a pilot study was conducted on 5 nurses (10%) of the sample. Minor modifications and rearranging of some statements were made based on the findings of the pilot research. As a result, all nurses from the pilot study were excluded from the study.

Fieldwork

To achieve the study aim, the researchers conducted this study through 3 phases: preparatory, intervention, and evaluation phase. These specified phases were carried out from the beginning of February 2021 till the end of May 2021 for about 4 months. The researchers visited the designated hospital three days/week.

1. Preparatory phase

The researchers began reviewing the relevant literature to create the study tool and the substance of the intervention program after getting official permits from all authorities. A timetable was created based on the participants' morning shift and work location. Because the entire number of participating nurses was divided into ten groups, each with five nurses, the program was designed to last one session of two hours each day for each group.

2. Intervention phase

Each group of participants was interviewed to explain the study's purpose and the questionnaire items. Before beginning the program, all participant nurses were given a pre-test questionnaire to measure their knowledge and attitudes towards tele-maternity care. Following the collection of the completed pre-test questionnaire, the researcher started the session by providing them with a program that covered the following (definition of nursing

informatics, tele-health, tele-nursing, tele-maternity nursing, advantages & disadvantages tele-maternity care, applications, role of maternity nurse, resources and guidelines of using tele-maternity. Using. Figures, videos and data show. In addition, each nurse received a booklet at the end of the session that was written in Arabic and had detailed information on the issues of tele-maternity care.

3. Evaluation phase

After three months of program implementation, the effectiveness of the program was evaluated using the same self-administered questionnaire during this phase.

Statistical Analysis

All statistical tests were conducted using SPSS for windows

version 25.0 (SPSS, Chicago, IL). Continuous data were normally distributed and were expressed in mean \pm standard deviation (SD). Categorical data were expressed in frequency and percentage. Chi-square test was used for comparison of variables with categorical data. The comparisons were determined using Paired t test for two variables with continuous data. Statistical significance was set at $p < 0.05$, while highly significance was set at $p < 0.001$. To quantify the degree and direction of the linear relationship between the research variables, the Pearson correlation coefficient (Pearson's r, test) was used to measure correlation among variables.

Results

Table 1: Percentage distribution of the studied nurses' personal and professional characteristics (n=50).

Socio-demographic characteristics	No.	%
Age / years		
20- < 30	20	40.0
30- < 40	23	46.0
40 – 50	7	14.0
Mean \pm SD	31.0 \pm 7.5	
Educational qualification		
Diploma	16	32.0
Technical institute	22	44.0
Bachelor of Nursing	12	24.0
Years of experience		
1- 5	13	26.0
6 - 10	13	26.0
11 – 15	10	20.0
16- 20	8	16.0
21 – 25	6	12.0
Mean \pm SD	11.6 \pm 7.2	
Working area		
Inpatient ward	27	54.0
High risk unit	7	14.0
Labor department	8	16.0
Antenatal clinics	8	16.0
Current job		
Nurse	35	70.0
Assistant nurse	4	8.0
Specialist nurse	11	22.0
Residence		
Rural	35	70.0
Urban	15	30.0

Table (1) Shows that near to half of the studied maternity nurses (46.0%) are aged from 30 -< 40 years with mean \pm SD= 31.0 \pm 7.5, and two-fifths of studied maternity nurses (44.0%) had technical institute. While more than half (52.0%) of studied maternity nurses their years of

experience ranged between 1 – 10 years with mean \pm SD = 11.6 \pm 7.2 and more than half (54.0%) of them worked in an inpatient ward. In relation to residence, more than two-thirds (70.0 %) of studied maternity nurses were from rural areas and their current job description was a nurse.

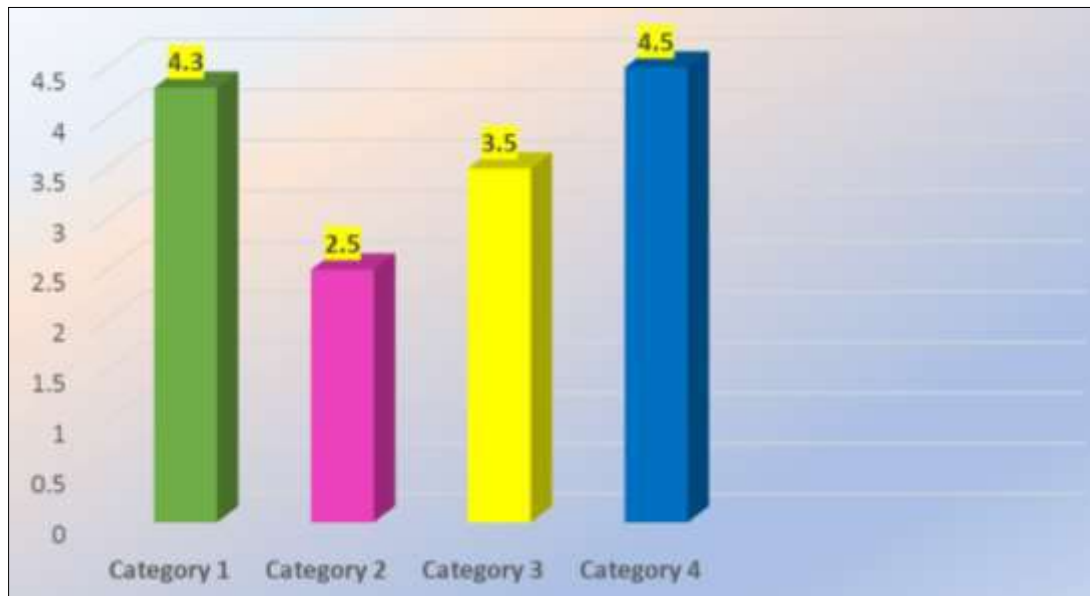


Fig 1: Percentage distribution of the studied maternity nurses for their source of knowledge regarding tele-maternity care (n = 50)

Figure (1): Presents that more than two-thirds of the maternity nurses whose main source of tele-maternity knowledge was doctors and colleagues followed by half of

them their source was the internet and nearly one-third of them whose source was booking and more than one-fifth whose source was workshops & radio & television.

Table 2: Percentage distribution of studied maternity nurses information about computer access and its literacy (n=50).

Factors	Never		Some times		Almost	
	No	%	No	%	No	%
Dealing with computer & internet generally	0	0.0	34	68.0	16	32.0
Using the smart phone for work-related purpose	0	0.0	26	52.0	24	48.0
Using a computer for work- related purpose	1	2.0	23	46.0	26	52.0
Using the internet to browse for work-related information	11	22.0	23	46.0	16	32.0
Receiving any training through distance learning	24	48.0	22	44.0	4	8.0
Visiting health related websites internet (medical and nursing field)	19	38.0	21	42.0	10	20.0

Table (2) shows that more than two-thirds of studied maternity nurses (68%) sometimes dealt with computers and the internet. Also, more than half of studied maternity nurses (52%) sometimes used the smart phone for work-related purpose and more than half of studied maternity nurses (52%) almost used computers for work-related

purpose. While nearly half of studied maternity nurses sometimes used the internet to browse for work-related information and never received any training through distance learning (46% & 48%) respectively. Also, two-fifths of studied maternity nurses (42%) sometimes visited the health -related websites

Table 3: Percentage distribution of the studied maternity nurses' knowledge regarding tele -maternity care (n=50).

Items	Pre intervention						Post intervention						Test of significance	
	Incorrect		Partially correct		Correct		Incorrect		Partially correct		Correct			
	No	%	No	%	No	%	No	%	No	%	No	%	X ²	P- value
Definition of nursing informatics, telehealth, and telenursing	30	60.0	15	30.0	5	10.0	6	12.0	17	34.0	27	54.0	31.250	0.0001**
Definition of tele-maternity care	17	34.0	23	46.0	10	20.0	5	10.0	14	28.0	31	62.0	19.491	0.0001**
Resources and guidelines of using telematernity	18	36.0	27	54.0	5	10.0	0	0.0	20	40.0	30	60.0	36.900	0.0001**
Advantages tele-maternity care	20	40.0	25	50.0	5	10.0	8	16.0	25	50.0	17	34.0	11.688	0.003*
Disadvantages tele-maternity care	17	34.0	22	44.0	11	22.0	7	14.0	9	18.0	34	68.0	21.374	0.0001**
The role and responsibility of maternity nurse	6	12.0	43	86.0	1	2.0	2	4.0	25	50.0	23	46.0	26.931	0.0001**

Table (3): shows that more than half of the studied maternity nurses' had correct knowledge regarding disadvantage, definition, needs and resources of tele -

maternity care, and definition of nursing informatics post-educational intervention with statistically significance differences which P - value < 0.0001.

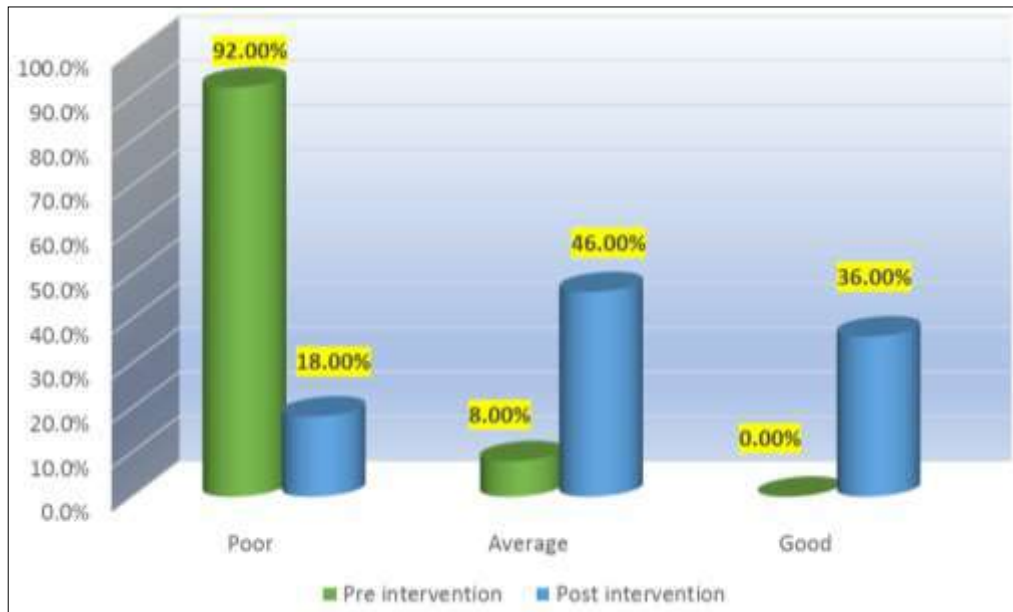


Fig 2: Percentage distribution of studied maternity nurses total knowledge level regarding tele-maternity care (n= 50)

Figure (2): illustrates that most of the studied maternity nurses had poor knowledge levels regarding tele-maternity care pre-educational intervention decreased to the minority of them post educational intervention while near to half of

them had average knowledge level and more than one-third of them had good knowledge level post educational intervention which P-value < 0.0001.

Table 4: Percentage distribution of the studied maternity nurses' awareness about types of services and applications related to tele-maternity care (n=50).

Items	Pre intervention						Post intervention						Test of significance	
	Don't know		Hear		Know		Don't know		Hear		Know		X ²	P- value
	No	%	No	%	No	%	No	%	No	%	No	%		
Remote family planning services	8	16.0	30	60.0	12	24.0	1	2.0	8	16.0	41	82.0	34.049	0.0001**
Tele antenatal care services	8	16.0	36	72.0	6	12.0	1	2.0	10	20.0	39	78.0	44.340	0.0001**
Tele lactation	3	6.0	21	42.0	26	52.0	0	0.0	3	6.0	47	94.0	22.541	0.0001**
Tele-care after cesarean delivery and wound care	9	18.0	19	38.0	22	44.0	0	0.0	6	12.0	44	88.0	23.093	0.0001**
Tel-care and monitoring for high risk pregnancy	9	18.0	24	48.0	17	34.0	0	0.0	14	28.0	36	72.0	18.443	0.0001**
Tele -Fetal monitoring	19	38.0	17	34.0	14	28.0	1	2.0	14	28.0	35	70.0	25.490	0.0001**
Virtual Psychological support	8	16.0	26	52.0	16	32.0	0	0.0	9	18.0	41	82.0	27.222	0.0001**

**Highly statistically significance differences < 0.01

Table (4): presents that most of the studied maternity nurses' had good awareness about tele-lactation applications related to tele-maternity care and the majority of them had had good awareness about tele-care after cesarean delivery and

wound care, family planning services and virtual psychological support applications related to tele-maternity care post educational intervention with statistically significant differences which P - value < 0.0001.

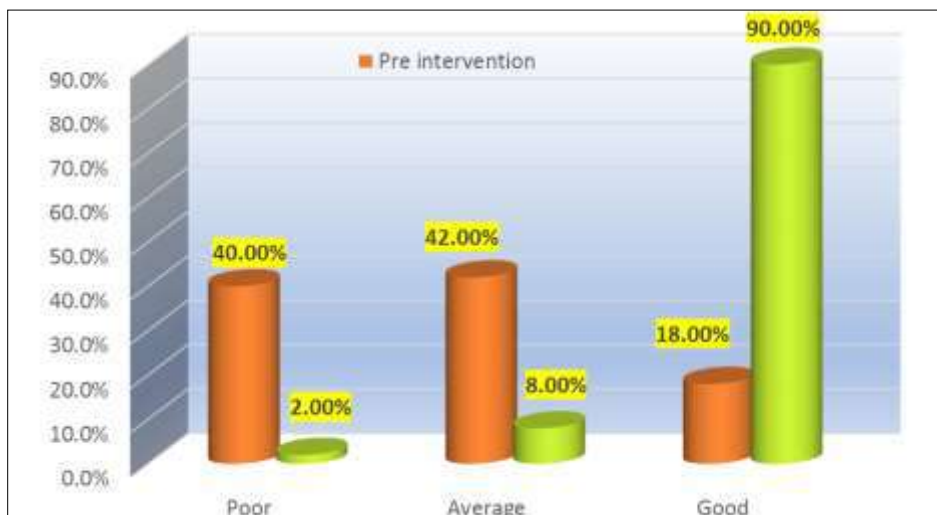


Fig 3: Percentage distribution of the studied maternity nurses total awareness level regarding tele-maternity care (n= 50).

Figure (3): demonstrates that more than one-third of the studied maternity nurses had poor awareness levels regarding tele-maternity care pre-educational intervention decreased to the minority of them post educational intervention. While more than one-third of them had

average awareness level pre-educational intervention decreased to the minority of them post educational intervention and the minority of them had good awareness level pre-educational intervention increased to most of them post educational intervention which P-value < 0.0001.

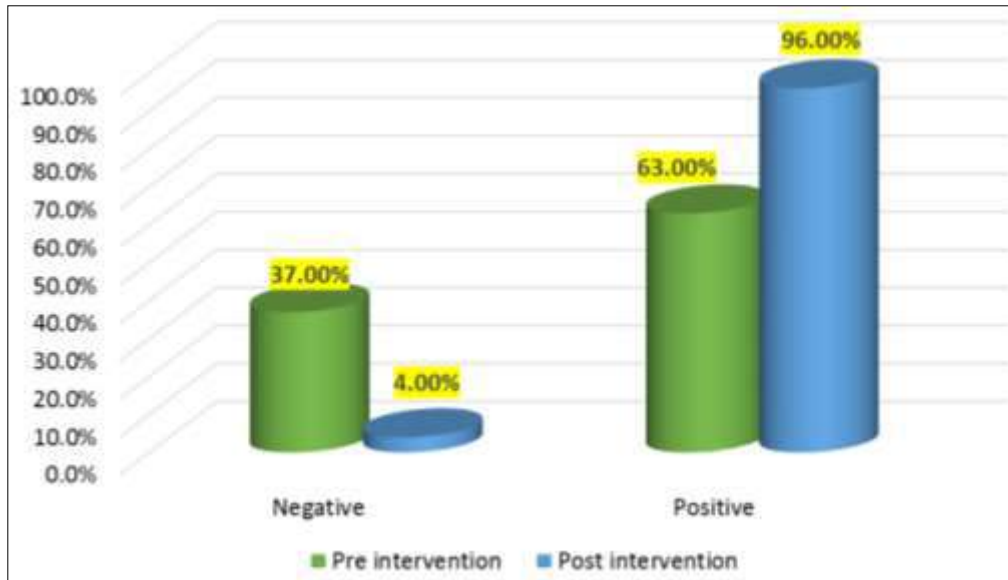


Fig 4: Percentage distribution of maternity nurses total score of attitude toward tele-maternity care (n= 50)

Figure (4): illustrates that more than one-third of the studied maternity nurses had a negative attitude level regarding tele-maternity care pre-educational intervention decreased to the minority of them post educational intervention. While near

to two-thirds of them had a positive attitude level increased to most of them had a positive attitude level post educational intervention which P-value < 0.0001

Table 5: Mean scores of maternity nurses 'attitude towards tele-maternity attributes during pre and post- intervention (n = 50).

Items	Pre-intervention	Post-intervention	Test of significance	
	Mean ± SD	Mean ± SD	T test	P- value
Advantages	3.6 ± 0.6	4.4 ± 0.4	7.788	0.0001**
Compatibility	3.3 ± 0.6	4.0 ± 0.6	5.887	0.0001**
Complexity	3.0 ± 0.5	3.5 ± 0.8	3.849	0.0001**
Applicability	3.4 ± 0.5	4.1 ± 0.4	8.374	0.0001**
Willingness	3.7 ± 0.5	4.5 ± 0.5	7.605	0.0001**
Overall attitude	3.4 ± 0.4	4.1 ± 0.3	9.560	0.0001**

**Highly statistically significant differences < 0.01

Table (5): presents that the highest mean scores were regarding willingness, advantage followed by mean scores

of overall attitude, compatibility, and complexity attribute which P-value < 0.0001 for all domains.

Table 6: Correlation between the maternity nurses' age and years of experience with their total knowledge, awareness, and attitude scores pre and post intervention (n = 50).

Items		Age		Years of experience	
		r	P- value	r	P- value
Knowledge	Pre intervention	0.143	0.320	0.276	0.05*
	Post intervention	0.099	0.492	0.080	0.580
Awareness	Pre intervention	0.122	0.399	0.135	0.352
	Post intervention	0.011	0.938	0.085	0.558
Attitude	Pre intervention	0.007	0.959	0.010	0.947
	Post intervention	0.081	0.572	0.025	0.861

*Correlation is significant at the 0.05 level

Table (6): evidence that there was a positive fair association between years of experiences of the maternity nurses' and their knowledge scores pre-educational intervention about tele-maternity care (r=0.276 & P value < 0.05), but there was no association between maternity nurses' age and years of experience with their total knowledge, awareness and

attitude score educational intervention.

Discussion

Tele-nursing is a component of tele-health, a system which uses information, communication, and web-based technologies to connect with patients to provide health care.

The delivery, administration, and coordination of care; delivered via information and telecommunications technologies [14].

To the best of our knowledge, this is one of the first studies of its kind, providing a snapshot of maternity nurses' knowledge, attitude, and willingness to use maternity care before and after implementation of an educational program during the COVID-19 pandemic.

Concerning the studied maternity nurses' knowledge regarding tele-maternity care pre and post educational programs (table 3), the current findings showed that there were highly statistically significant differences with an improvement in knowledge level post-intervention as compared with pre-intervention as regard to definition, needs, and resources, advantage, disadvantage and role and responsibility regarding tele-maternity care. The fact is that maternity nursing became knowledgeable for the definition of nursing informatics and tele-maternity care, needs, resources, advantage, disadvantages, and the role and responsibility of maternity nurses.

This result, consistent with Malhotra *et al.* [15], assessed the knowledge, perception, and willingness of healthcare students to use telemedicine in India and reported that Forty-three percentage of the total population said insufficient knowledge of telemedicine, and more than half had inadequate knowledge about its application.

Also, Ebrahim and Elsayed [16] evaluated the effect of educational programs about tele-nursing for nursing interns on their knowledge and attitude at Benha University Hospital showed that there were highly statistically significant differences, with an improvement in the knowledge scores immediate post-program and follow up (after three months) as compared to pre-program in all dimensions.

In terms of total score of maternity nurses' knowledge level of regarding tele-maternity care (figure 2), the current support the hypothesis that most of the studied maternity nurses' had poor knowledge pre-educational intervention decreased to near to one-fifth post educational intervention while near to half of them had average knowledge level and more than one-third of them had good knowledge level post educational intervention.

This result is in the same line with a recent study in Egypt conducted by Ebrahim and Elsayed [16], which indicated that more than half of nursing intern had good knowledge regarding tele nursing immediate post-program as compared to more than one-third pre-program and near to half follow up (after three months) of the program and Biruk and Abetu [13] assessed knowledge and attitude toward telemedicine among a cross-section of health professionals working in three hospitals in North West Ethiopia, found that only 37.6% of the respondents had demonstrated good knowledge of telemedicine.

But, Zayapragassarazan and Kumar [17] assessed the awareness, knowledge, attitude, and skills of telemedicine among the health professionals working in the teaching hospitals of the Puducherry Region of India and reported that three-quarters of the respondents found their knowledge level to be good and fair. This result may be due to the sample population were all health professionals working, not nurses only.

Concerning total awareness level of the studied maternity nurses regarding tele-maternity care (figure 3), the current result showed that more than one-third of the studied

maternity nurses had poor awareness levels regarding tele-maternity care pre-educational intervention decreased to the minority of them post educational intervention. while more than one-third of them had average awareness level pre-educational intervention decreased to the minority of them post educational intervention and the minority of them had good awareness level pre-educational intervention increased to most of them post educational intervention.

This result is consistent with Kong *et al.*, [18] which explored medical students' experiences and opinions regarding tele-medical. It indicated that only 17.4% of medical students had prior exposure to tele-medical. However, the increased exposure to TM helped not only to increase awareness of the technology but also helped students form opinions on tele-medical and Zayapragassarazan and Kumar [17] mentioned that one-fifth of the participants had average awareness about it.

With regard to the total attitude level of the studied maternity nurses', the results of the present study support the hypothesis as one-third of studied maternity nurses' had a negative attitude regarding tele-maternity care pre-educational intervention decreased to the minority post educational intervention. while more than one-third of them had average awareness level pre-educational intervention decreased to the minority of them post educational intervention and the minority of them had good awareness level pre-educational intervention increased to most of them post educational intervention. This result may be due to more than two-thirds of our studied lives in rural areas.

This finding, in the same line with Ranjbar *et al.* [19] examined the attitudes and awareness of Iranian clinical nurses and midwives towards tele-nursing and tele-health reported that positive attitude towards tele-nursing and tele-health. Also, Biruk and Abetu [13] mentioned two-thirds of the respondents had a good attitude toward telemedicine, and Zayapragassarazan and Kumar [17] reported that more than two-thirds of the respondents possess a high & moderate attitude, and one third possess a low level of attitude.

In terms of maternity nurses' attitudes toward tele-maternity care attributes (table 5), the current findings showed that mean attitude scores in all attributes (relative advantage, compatibility, complexity, applicability, and willingness) were higher after educational intervention than before educational intervention, with statistically significant differences. These findings suggest that an educational intervention might effectively transform maternity nurses' attitudes toward telemedicine, laying the framework for the technology's successful and long-term adoption in Egypt.

This result supported by Biruk and Abetu [13] they mentioned that their participants had a generally positive attitude toward telemedicine. However, they also had significant concerns about its complexity and observability that 65.8% of them agreed and strongly agreed that telemedicine increases staff workload, and 68.2% thought telemedicine creates new responsibilities for the staff.

Also, Malhotra *et al.* [15] who assessed knowledge, perception, and willingness of using telemedicine among medical and allied healthcare students studying in private institutions, mentioned that 90.9% viewed telemedicine as a viable approach, and they were willing to use telemedicine. Regarding correlation between the maternity nurses' age and years of experience with their total knowledge, awareness,

and attitude scores pre and post-educational intervention (table 6), there was a positive fair association between years of experiences of the maternity nurses' and their knowledge scores pre-educational intervention about tele-maternity care but there was no association between maternity nurses' age and years of experience with their total knowledge, awareness and attitude score educational intervention.

This result was similar to Sheikhtaheri *et al.* [20], who found that knowledge level was unrelated to the age of the study sample. However, Biruk and Abetu [13] found that 63.4 percent of health professionals with good knowledge of telemedicine had one to five years of experience with statistical significance.

Conclusion

The findings of this study proved that after implementing the educational program, maternity nurses' knowledge, attitude, and willingness to utilize tele-maternity care were significantly improved, indicating that the research hypothesis was accepted.

Recommendations

- This study suggest that nurses capabilities need to strengthen through providing further practical training sessions regarding updated tele-maternity services
- Establish a proper and effective communication channels among Organizations dedicated to health-care education, in particular the Faculty of Nursing to including the tele-maternity in undergraduate and postgraduate nursing curriculum.
- Health care organizations must provide continuous knowledge and training on tele-nursing and tele-health systems by creating an environment that offers strong administrative support and educational resources, which will provide a consistent theoretical framework and ultimately improve nurses' intention to participate in tele-nursing.

Further research is needed to

- Look into the level of awareness, attitude, and willingness of mothers towards utilization of tele-maternity services.
- Assess factors influencing the utilization of tele-maternity services

Conflicts of Interest

The researchers declare that they have no conflicts of interest.

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