Enhancing Nursing Efficiency: The Impact of Artificial Intelligence Techniques on Obstetric Unit Care

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Abstract

Artificial intelligence can completely transform the healthcare system by enhancing maternal outcomes and streamlining procedures, especially in the obstetric unit. This **study aims** to evaluate nursing efficiency and the impact of artificial intelligence techniques in obstetric unit care. **Design:** For this investigation, a quasi-experimental design was adopted. Setting: King Khalid Hospital, a maternity and obstetric facility in Saudi Arabia. **Sample:** A convenience sample of all nurses and a purposive sample of laboring women in the obstetric unit will be included. **Tools**: Three instruments were employed to gather data: an interview to assess the demographic characteristics of nurses and laboring women. 2-nurses' knowledge about artificial intelligence such as E-pantograph sheets and Tools II: nurses' practice regarding uses of E-pantograph sheets Tools III: Nurses and labor women satisfaction. **Result:** The program has beneficial effects on nurses' total knowledge regarding artificial intelligence, 60% of nurses had poor knowledge, 20% had average and good knowledge, and 75% had good knowledge after the program. 65% of nurses had poor knowledge, 25% had average knowledge, and 10% had good knowledge about the characteristics of E-portogram sheets before the program, which increased to 85% of nurses having good knowledge after the program. Also, 60% of nurses had not done practice regarding using E-partographs, and 85% had done practice post-programs. Also, 80% of nurses unsatisfied regarding the use of E-photographs before the program improved to 70% of nurses satisfied after the program, and 85% of labor women's satisfaction of nurses' performance after applying E-partograph sheets was a highly significant difference (p=0.000). **Conclusion:** The study and research hypothesis concluded that applying artificial intelligence techniques through utilizing E-partographs in the labor unit will positively affect nursing performance and satisfaction. As well as laboring women's satisfaction This improvement was statistically significantly different in nurses' knowledge and practice (pre – post-program). **Recommendation:** Continuing educational programs for nurses about artificial intelligence techniques, such as E-partograph sheets, to improve nursing performance and labor for women's health and satisfaction.

Keywords: Artificial Intelligence techniques, E-partograph sheets, nurses' performance, and obstetric unit.

Introduction:

Artificial intelligence (AI), sometimes called machine intelligence, is intelligence demonstrated unlike the natural intelligence displayed by humans and animals. Leading AI textbooks define the field as the study of "intelligent agents": any device that perceives its environment and takes actions that maximize its chance of successfully achieving its goals. Colloquially, the term "artificial intelligence" is often used to describe machines (or computers) that mimic "cognitive" functions that humans associate with the human mind, such as "learning" and "problem-solving." **Russell & Norvig (2017)**.

Artificial intelligence (AI) is largely described to be of 2 types: virtual and physical. **Virtual AI** includes informatics from deep learning applications, such as electronic health records (EHRs) and image processing, to assist physicians with the diagnosis and management of disease states. **Physical AI** includes mechanical advances, such as robotics in surgery and physical rehabilitation. Algorithms have been developed to train data sets for statistical applications to enable data processing with accuracy. These principles underline machine learning (ML), which enables computers to make successful predictions using past experiences. **(Litwin et al; 2018).**

Maternal mortality & morbidity can be reduced markedly by proper monitoring of Labar that calls for the detection of any complication during labor and necessary actions to be taken at the earliest possible time. The paper partograph advocated by the WHO to monitor labor could play a pivotal role here **(Hasan et al; 2017)**

The E-partograph sheets is a table-based application developed to improve care for women in labor by addressing documented challenges in partograph use. The application is designed to provide real-time decision support, improved data entry, and increased access to information for appropriate labor management **(Frost & Sullivan (2016).**

The E-partograph sheets, tracking women using a paper instrument for clinical data gathering during childbirth, have shown a decrease in obstructed labor. The World Health Organization (WHO) has approved the partograph sheet, which is a one-page collection of measurement tables and graphs to be completed during labor. Longer labor is more noticeable thanks to the tool's graphs that show the evolution of labor and its standard structure for the most pertinent women's data. **(Schweers et al., 2016).**

The E-partograph sheets are designed to increase data entry efficiency by automatically graphing data and storing all women's files within the application. Overall, the E-partograph sheets system aims to improve documentation and use of intrapartum data to inform clinical labor management decisions. Plotting partograph sheets is a useful technique for tracking the progression of labor, preventing protracted and obstructed labor, and assisting in the decision-making process for augmentation, cesarean sections, and moving women to more advanced facilities for full emergency obstetric treatment. **(Gonmei et al.;2019).**

Women's Health and Maternity nurses who have been trained in normal childbirth and who can diagnose, treat, and refer issues, if necessary, should help women throughout delivery to reduce the risk of complications or maternal mortality. One of the most economical strategies to achieve Sustainable Development Goal 3, which is to lower the maternal death ratio to less than 70 per 100,000 live births, is the provision of expert care during delivery and in the immediate postpartum period. **(Gonmei et al., 2019).**

Significance of the study:

Nearly two-thirds of maternal deaths arise from complications during labor and the early postpartum period, Routine care and early identification of complications play an important role in preventing maternal death and morbidity**. (Greenspan, et al (2016).** From 1996 to 2015, Egypt's maternal mortality rate was 33 fatalities for every 100,000 live births. From 78 fatalities per 100,000 live births in 1996 to 33 deaths per 100,000 live births in 2015, it decreased at a modest pace. **(Griffiths, 2016).**

One critical strategy for reducing maternal morbidity and mortality is ensuring that every baby is delivered with the assistance of a skilled birth attendant, which generally includes a medical doctor, nurse, or midwife. Experts agree that the risk of stillbirth or death due to inter-partum-related complications can be reduced by about 20 percent with the presence of a skilled birth attendant **(Hsieh, 2017).**

Data must be recorded in real time, and organizations should encourage the conversion of data into processes that can be understood. The dissemination of new clinical and scientific discoveries should be open source and aggregated data should be made

immediately available as point-of-care information and displayed for public viewing by doctors and nurses. For individualized medication, early detection, and focused prevention, electronic medical or health records are crucial instruments that can boost clinical value and save healthcare costs. **(Hamet& Tremblay .2017)**

Aim of the study

To evaluate how artificial intelligence methods affect nursing performance in obstetric units by achieving the following goal:

1-Assess nurses' knowledge and practice about new E-partograph sheets using AI techniques at obstetric units according to nurses' needs.

2-Design and implementation of a program for new E-partograph sheets using AI techniques at obstetric units.

3- Evaluate the effect of using E-partograph sheets in an obstetric unit on nursing performance, nurses, and obstetric women's satisfaction.

Research Hypothesis:

Applying artificial intelligence techniques through utilizing E-partograph sheets in the obstetric unit will have a positive effect on nursing performance and satisfaction. As well as labor women's satisfaction.

Research design:

A quasi-experimental design was utilized in this study.

Setting:

Data will be collected from the obstetric unit at a maternity hospital in King Khalid Hospital in Saudi Arabia. The Obstetrics and Gynecology Unit uses artificial intelligence, such as the E-partograph sheets system in the field of nursing, to provide the highest service to pregnant mothers and reduce the rate of morbidity and mortality. The nursing system has been updated on the E-Partograph sheets to raise nursing efficiency and improve service.

Sample:

A convenience sample of all nurses in the labor unit will participate, and a purposive sample of laboring women in the labor unit will participate. Six months, beginning in early September 2020 and ending in late February 2020. 100 nurses and 100 laboring women. According to the Criteria for laboring women:

Women who are in labor and have a single fetus, spontaneous labor in the first stage, a question mark of at least 37 weeks, a cephalic presentation, cervical dilation of 4–7 cm, and no problems.

Tools of data collection:

An interview questionnaire for nurses will be developed by the researcher, including the following:

Part I: Demographic characteristics for nurses and laboring women such as age, qualification, years of experience, marital status, training program on the use of E-partograph, and used E-partograph before working, laboring women, age, level of education, occupation, monthly income, and marriage years.

Part II:1- Nurses' knowledge about artificial intelligence as E-partograph sheets, such as the definition of artificial intelligence as E-partograph sheets, components, uses, benefits, and barriers for using E-partograph sheets.

2-The nurses' knowledge regarding characteristics of E-partograph sheets, such as the partograph that is available in your obstetric units, used to monitor all of the women in your hospital, accustomed to the active phase of labor, and the management's policy that all laboring women should be tracked using a partograph so that later diagnoses and evaluations can be made.

Scoring system: The answers to these questions were scored as "2" for the correct answers, "1" for the incomplete answer, and "0" for the wrong or "I don't know the answer."

The score of each item was stumped up and then converted into a percentage score.

Poor knowledge > 50%   Average 50-70%
Good knowledge <70%

Tools II: Nurses practice using and utilizing E-partograph sheets, such as using an E-partograph sheet before, defining the E-partograph sheets, using artificial intelligence techniques, and receiving any training on the use of E-partograph sheets that provide information on the vital signs of laboring

women, the sound of the fetal heart, cervical dilatation, rupture of the membranes, and other information that comes up.

Scoring system: Nursing practices about using E-partograph sheets were classified as done, which scored (1), and not done, which scored (zero).

The total scoring system for practices was classified as follows:

- Don practice scored > 50 %

Not don practice scored < 50 %.

Tools III: Nurses were satisfied regarding the use of E-partograph sheets, which are easy to use, accomplished with ease from start to finish, and increased in ease throughout the shift.

 - laboring women's satisfaction regarding nursing performance, such as women's satisfaction after nurses use the E-partograph

Scoring system: for assessment of nurses and labor women's satisfaction regarding nursing unit services, consisted of 7 questions. The responses are scored either 0 or 1, (1) for a satisfactory answer, and (0) for an unsatisfactory answer, with scores ranging from 1 to 7. The nurse and labor woman satisfaction was considered satisfactory if the percent was ≥60%, and the nurses and labor woman satisfaction was considered unsatisfactory if the percent was < 60%.

 Operational Design

 The Preparatory Stage Using books, papers, the internet, periodicals, and magazines, a review of the historical, contemporary, local, and global relevant literature and theoretical understanding of different study aspects was conducted.

Tool validation: To ensure completeness and relevance, five experts from the College of Industrial Intelligence and the Obstetric Health Nursing department conducted content validity.

Reliability: For each questionnaire item, reliability coefficients were computed. The alpha coefficient was 76.0 percent for knowledge, 88.0 % for practice, and 78.0% for nurses and labor woman satisfaction.

Pilot Study: Pilot research was conducted on 10% of the workforce (10 labor and nurses) as a pre-test to evaluate the tool's content clarity

and completion time. No changes were made, according to the pilot study. As a result, the study sample included the pilot research sample.

A Consideration of Ethics Before data collection began, each nurse and labor woman were briefed on the study's goals and advantages, and their oral agreement was sought. The study was conducted with strict confidentiality. In addition to being advised of their ability to withdraw at any time without facing any repercussions, nurses and labor women were given the assurance that all data would only be used for research.

 Fieldwork: Following formal approval to conduct the study, the chosen participants were informed of its purpose. Beginning in early September 2020 and ending at the end of February 2020, the study was conducted over a 6-month period. Filling the tool took an average of thirty minutes. The researchers visited the locations twice a week, Between 10:00 am and 2:00 pm on Saturday and Thursday.

Artificial Intelligence as E-photograph sheets Program: it included 4 phases: -

Phase I: Assessing: To get baseline data, this step involved interviewing the labor women and nurses who were working in the obstetric unit. The researchers greeted the labor women and nurses and gave their introductions to each participant in the study at the start of the interview. The pre-program evaluation provided the baseline data, and textbooks, papers, and magazines were used to review previous and current local and international related literature on various facets of the issues that nurses and labor women face.

 Phase II: Planning stage: Creating the program with the overall goal and implementing artificial intelligence methods in the obstetric unit using the E-partograph would improve nursing satisfaction and performance. as well as the satisfaction of labor women. The program defined the uses of the E-partograph and how to apply it to laboring women. It also explained how to use one previously and defined artificial intelligence techniques as E-photograph sheets. The data covered included the laboring

woman's vital signs, fetal heart sound, cervical dilatation, rupture of membranes, and data arising.

Program objectives Applying artificial intelligence techniques through utilizing E-partograph sheets in the obstetric unit will positively affect nursing performance and satisfaction. As well as labor women's satisfaction**.**

Content of the program: the definition of artificial intelligence as E-partograph sheets, components, uses, benefits, and barriers for using E-partograph sheets. Gain a comprehensive understanding of using E-photograph sheets, the theoretical framework of using E-photograph sheets, characteristics of E-partograph sheets, such as the partograph that is available in your obstetric units, used to monitor all of the women in your hospital, accustomed to the active phase of labor, and the management's directive that all laboring women be tracked using a partograph so that examinations and diagnoses can be made later.

Acquire essential practices regarding using the E-partograph .: such as using an E-partograph sheet before, defining the E-partograph sheets, using artificial intelligence techniques, and receiving any training on the use of E-partograph sheets that provide information on the vital signs of laboring women, the sound of the fetal heart, cervical dilatation, rupture of the membranes, and other information that comes up.

The methods and teaching strategies include lecture/discussion, role play, demonstration, and brainstorming. The researcher employed a range of audiovisual aids, such as a data projector, booklet, audio recordings, photographs, and physical objects.

Phase III: Implementing: Over six months, the program was implemented in eight sessions. Each session lasted anywhere from 20 to 30 minutes. The program was run in groups of two to four labor mothers and nurses. The researchers began each session by providing a summary of the previous session's contents, considering the educational level of the labor women and nurses by using straightforward language. After each session, the sample under study was informed of the schedule and agenda for the following one.

Phase V: Evaluating: To find out how this novel method affects nursing performance during labor, as well as the satisfaction of labor women with regard to nurses' performance, the researcher gathers and examines E-partograph sheets from the E-partograph program. The program was evaluated immediately post-program implementation. The evaluation used the same pre-program framework.

Administrative Items:

Permission to conduct the study was sought through an official letter to the directors of King Khalid Hospital in Saudi Arabia. This letter was addressed to the director of the obstetrics and gynecology units at the Hospital, requesting their approval to carry out the study. The letter also granted permission to collect the necessary data and explained the study's purpose and nature.

Statistical Design: Version 24 of the Statistical Package for Social Science (SPSS) was used for data entry and analysis. Descriptive statistics: the data was presented using metrics using metrics like frequency, machines, percentages, averages, and standard deviations for quantitative variables. The paired t-test was used to compare qualitative category variables. A P-value of less than 0.05 was deemed statistically significant.

Discussion:

Artificial intelligence. AI applications can improve the effectiveness and efficiency of healthcare by saving money and time when identifying and treating disease states. AI makes it possible to analyze large data sets quickly and thoroughly, facilitating accurate and timely decision-making. **(Poole et al., 2018).**

A decrease in obstructed labor has been observed in tracking nurses who use the E-partograph, a paper tool for recording clinical data during childbirth. A single page with measuring tables and graphs, the E-partograph is recommended by the **World Health Organization (WHO)** and is to be completed

during delivery. Long-term labor is more noticeable thanks to the tool's graphs that show the course of labor and its standard structure for the most pertinent women's data. **(Hasan et al; 2017).**

Regarding nurses' demographic characteristics, the current study revealed that more than half of nurses aged between 20-< and 30 years, mean age of 27.5± 4.9 years, regarding nurses qualification more than half of them had a bachelor's education, nurses years of experience more than half of them had 5-10 years, and the majority of them were married, this result agreed with (**Ahuja et al., 2019)** the study conducted in the Netherlands about "Understanding Artificial intelligence's introduction in the workplace. "Showed that the mean age of nurses was 28.6 ± 4.9, regarding nurses' qualification 80% of them had a bachelor's or master's degree in education and years of experience ≥ 10 years.

Regarding nurses' training about the use of E-partographs, the majority of them use E-partographs, more than two-thirds of nurses received the training from in-service training, and the majority of nurses have not used partographs before working, this result agrees with **(Akkus et al. (2017**) The study conducted in Turkey about "Deep learning for brain MRI segmentation: state of the art and future" found that 65% of nurses training about use of partograph, 85% of them use the partograph before working. From the researcher's point of view, most of the nurses had a bachelor's degree in nursing and had good information about the use of artificial intelligence in the field of nursing.

Regarding labor women demographic characteristics, the majority of women aged 25<30 years, regarding the level of education, more than half of them had university or more education, nearly three-quarters of them were working, most of them had a monthly income enough, and one-third of them the duration of marriage between 7<10 years. This result agrees with **Bresnick (2017)** the study conducted in Pakistan about "Big data, artificial intelligence, IQ may change healthcare "found that the majority of women aged 27<31 years, regarding the level of

education, 60% of them had a university education, 75% of them were working, 90% of them the monthly income enough. And 40% of them have a duration of marriage between 8< and 10 years.

Answer the research Hypothesis: Applying artificial intelligence techniques through utilizing an E-partograph in the obstetric unit will positively affect nursing performance and satisfaction. As well as laboring women's satisfaction.

Regarding the nurses' total knowledge regarding artificial intelligence, such as E- - partograph, more than half of them had poor knowledge, and one-fourth of them had average and good knowledge regarding the definition of artificial intelligence, its components, uses, benefits, and barriers for using before the program, improved to the majority of them good knowledge, the minority of the average and poor knowledge after the implementation of the program. There was a statistically significant difference in this improvement between the pre-post programs. This result agreed with **Copeland's (2016)** study conducted in London about "What's the difference between artificial intelligence, machine learning, and deep learning practice," which found that 75% of nurses' poor knowledge about artificial intelligence, such as E-partograph, before programs improved to 85% good knowledge after participating the program. From the investigator's point of view, the study results indicate the importance of nurses' participation in training courses to improve the level of information and skills.

Regarding the nurses' total knowledge regarding characteristics of E-partograph sheets, more than half of nurses had poor knowledge, one-quarter of them had average knowledge, and the minority of them had good knowledge regarding the characteristics of E-partograph sheets such as the partograph that is available in your labor world, used to monitor all of the women in your hospital, accustomed to the active phase of labor, and the managerial policy that all women in labor should be monitored with a partograph, which can be used to make diagnoses and

assessments afterward. Before the program improved, most of them had good knowledge after implementing the program. Nurses' knowledge improved in a statistically meaningful way between before and after the session. This result agreed with **Crevier (2019)** the study conducted in New York about "the tumultuous search for artificial intelligence in the obstetric unit "found that 70% of nurses had poor knowledge regarding characteristics of E-partograph sheets before the program improved to 80% good knowledge after participating the training program. From the investigator's point of view, the application of the program is new to the work of nurses, so it required the participation of nurses in how to deal with the new sheets to increase their knowledge and skills.

Regarding the nurses' total practice regarding the use of E-partograph sheets, most nurses had not done practice regarding the use of E-partograph sheets such as using an E-partograph before, defining the E-partograph, artificial intelligence methods, as well as getting any instruction on using E-partographs that include information about the vital signs of laboring women, the fetal heart sound, cervical dilatation, rupture of membranes, and other data that comes up before the program, which improved to the majority of the nurses had done practice after implementing the program. The improvement in nurses' practice (before and after the program) was statistically significant. This result agreed with **"Dyche et al. (2018)** study conducted in Australia about "artificial intelligence's potential for obstetric unit disease diagnosis. "Found that 65% of nurses had not done practice regarding the use of E-partograph sheets before the program, which improved to 80% had done practice after participating in the training program. From the investigator's point of view, the presence of the program in the hospital and training nurses to use the program led to an increase in knowledge and contacts and the provision of better nursing services.

Regarding nurses' satisfaction regarding the use of E-partographs, most nurses were unsatisfactory regarding the use of E-partographs before the program improved, but most were satisfied after implementing the program. Nurses' knowledge improved in a statistically meaningful way between before and after the session. This result agreed with **Houssami et al. (2017).** The study conducted in Pakistan about "Artificial intelligence for women screening" found that 70% of nurses were unsatisfied with the use of E- partograph before the program improved to 80 % of them satisfied after implementing the program. This improvement in nurses' knowledge (before and after the program) was statistically significant. This improvement was statistically significantly different in nurses' knowledge (pre – post-program. From the investigator's point of view, the nurses who were not trained to use the program were not satisfied, but after the training, they became very satisfied after the program because the program improved their performance, saved their work time, and helped them to complete the work in a shorter and faster time.

Regarding labor women's satisfaction regarding nurse's performance, the majority of women were satisfied with nurses' performance after the application of E-partograph, this result agreed with **Kent's (2018)** study conducted in Turkey about " How artificial intelligence is changing radiology, in labor unit" found that the 80% of lobar women unsatisfactory regarding nursing performance improved to 85% satisfactory after nursing give program lead to improved nursing performance, from the investigator point of view, using the program has saved the nurses' time and effort and has speeded up the service provided, which has had a clear impact on the level of labor woman satisfaction.

Conclusion: The research hypothesis and study concluded that applying artificial intelligence techniques through utilizing E-partographs in the labor unit will positively affect nursing performance and satisfaction. As well as laboring women's satisfaction This improvement was statistically significantly different in nurses' knowledge and practice (pre – post-program). P=0.00

Recommendations: Based on the findings of this study, the following recommendations were suggested:

1- Applying artificial intelligence techniques through utilizing E-partograph in all departments to improve nursing performance and satisfaction

2- Further research is needed in other areas, especially all hospitals. To implement an E-partograph sheet to improve the quality of nursing care and patient satisfaction

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Russell &Norvig (2017) (who prefer the term "rational agent") write "The whole- *Neumann, Bernd; Möller, Ralf (January 2008). "On-scene interpretation with description logics." Image and Vision Computing. 26 (1): 82–101.*

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Result:

Table (1): Frequency distribution Demographic Characteristics of nurses (n=100).

Nurse demographic characteristics	Nurses	
	No	**%**
Age		
20 - <30	55	55.0
30 - <40	20	20.0
40 or more	25	25.0
Mean ±SD　　27.5 ± 4.9		
Qualification		
Diploma	10	10.0
Technical Nursing Institute	20	20.0
Bachelor	50	50.0
Master or more	20	20.0
Years of experience		
≤ 5 years	10	10.0
5 - 10 years	60	60.0
> 10 years	30	30.0
Mean S. D　　8.3±9.2		
Marital status		
Married	70	70.0
Not Married	30	30.0
Training on the use of E-partograph		
Yes	80	80.0
N0	20	20.0
If yes, training received by no=80		
From a colleague	20	25.0
From a medical doctor	10	12.5
From in-service training	50	62.5
Used E-partograph before working		
Yes	30	30.0
No	70	70.0

Table 1 shows the demographic characteristics of the nurses. As regards age, 55% of nurses aged between 20 - < and 30 years, and the mean age was 27.5 ± 4.9, regarding nurses' qualifications, 50.0% of nurses had a bachelor's in nursing. Concerning years of experience, 60.0 % had 5-10 years of nursing experience. Regarding marital status, 70.0% of them were married, 80.0% of them were trained in the use of E- e-partographs, 62.5% of them received the training from in-service training, and 70.0% of them had not used E- partographs before working.

Table (2): Frequency distribution Demographic Characteristics of labor women (n=100).

Labor women's demographic characteristics	Labor women's	
	No	**%**
Age		
< 25	15	15.0
25-30	80	80.0
≥ 30	5	5.0
Mean ±SD 28.5 ± 3.9		
Level of education		
Not reading and writing.	5	5.0
Read and write	20	20.0
Diploma	20	20.0
University or more	55	55.0
Occupation		
Working	70	70.0
Housewife	30	30.0
Monthly income		
Enough	80	80.0
Not enough	20	20.0

Table 2 shows the demographic characteristics of the labor women, 80.0% of them were aged between 25 and 30 years, and the mean age was 28.5± 3.9, regarding the level of education, 55% of them had a university education or more, 70% of them were working, and 80% of them had a monthly income enough for their basic needs.

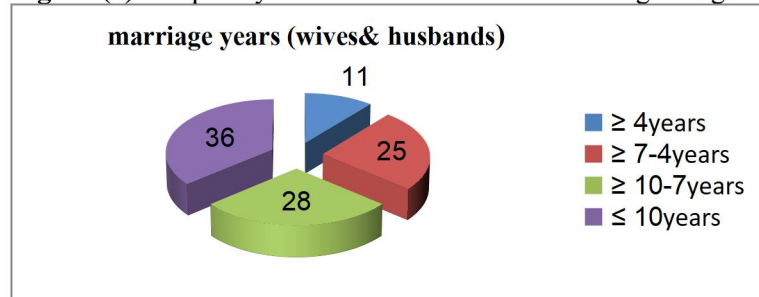**Figure (1):** frequency distribution of labor women regarding the duration of Marriage Years (n=100**).**

marriage years (wives& husbands)
- 11 — ≥ 4years
- 25 — ≥ 7-4years
- 28 — ≥ 10-7years
- 36 — ≤ 10years

Figure 1 illustrates that in 36% of women's labor woman, the duration of marriages lasts < 10 years.

Figure 2: Nurse's total knowledge about artificial intelligence as E-partograph pre-post program (n=100)
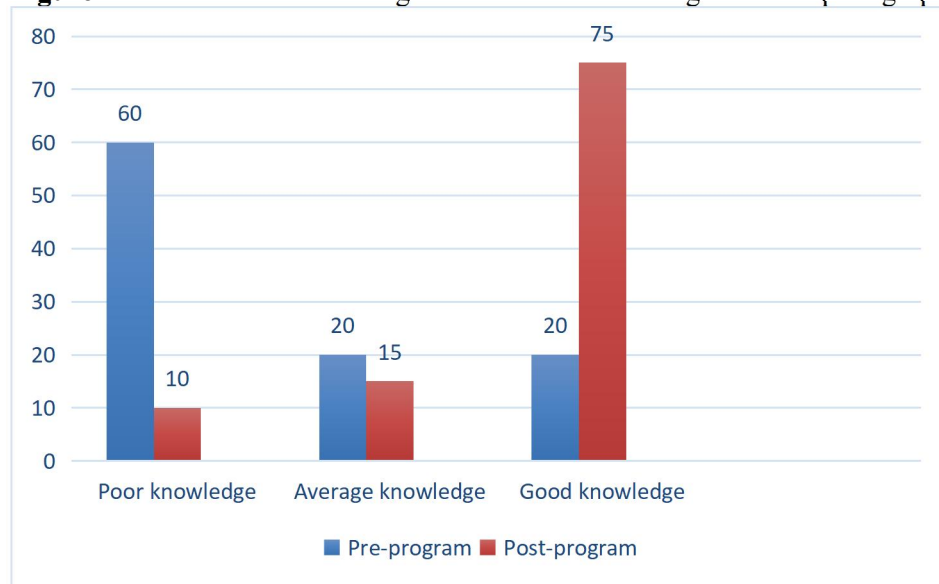

Figure 2. shows that 60% of nurses had poor knowledge, 20% of them had average knowledge, 20.0% of them had good knowledge about artificial intelligence as E-partographs before the program, improved to 75% of them had good knowledge, 5.0% of the average knowledge and 5% of the poor knowledge after the implementation of the program at p≤0.00.
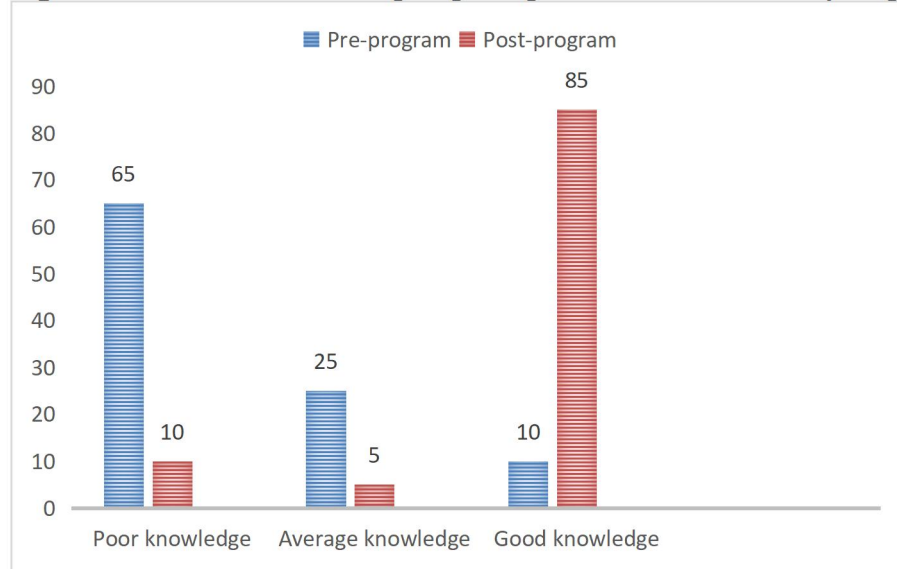
Figure 3. Nurses' total knowledge regarding the characteristics of E-partograph sheets pre-post program   (n=100)

Figure 3 shows that 65% of nurses had poor knowledge, 25% of them had average knowledge, 10% of them had good knowledge about the characteristics of E-partograph sheets before the program, improved to 85% of them had good knowledge, 5.0% of the average knowledge and 10% of the poor knowledge after implementing the program. p=0.00
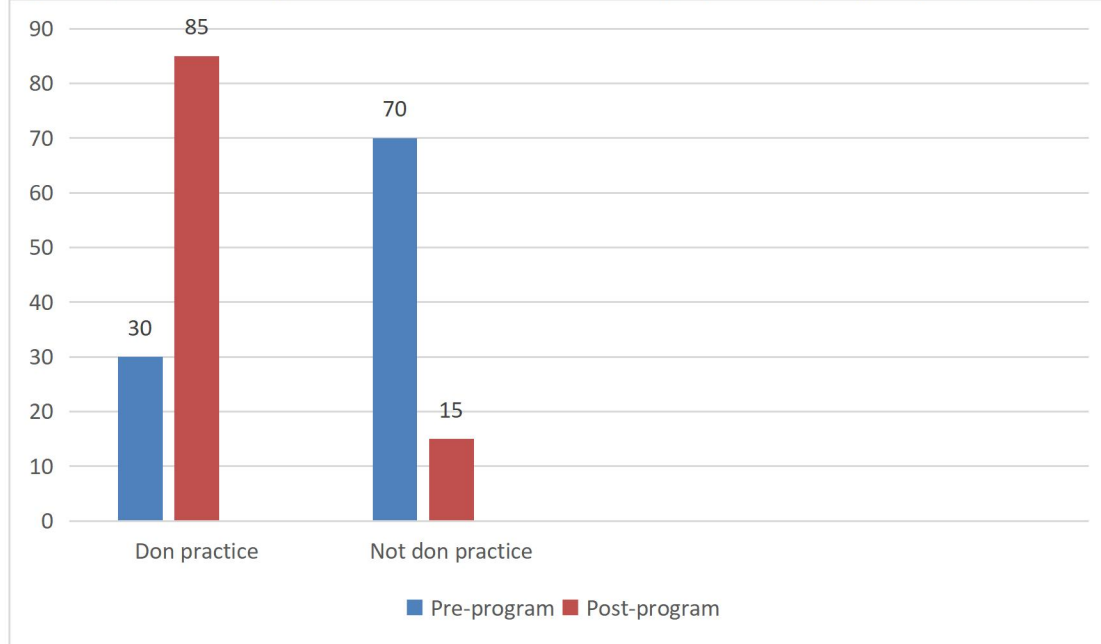
Figure 4, Nurse's total practice about the use of E-Partograph sheets pre-post program (n=100)

Figure 4 shows that 85% of nurses had not done practice regarding the use of E-partograph sheets before the program, and 70% of them had done practice after implementing the program. p=0.00

Figure 5, Nurses satisfaction regarding use E-Partograph sheets   pre-post program (n=100)
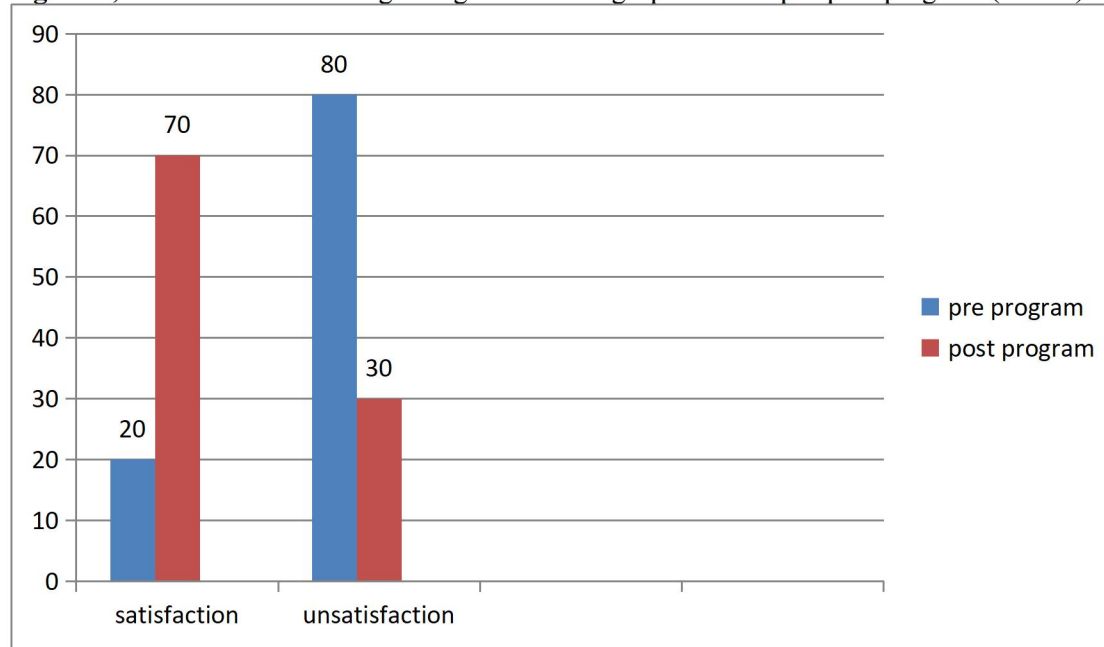
Figure 5 shows that 80% of nurses were unsatisfactory regarding not using E-Partograph, which improved to 70% satisfactory after the program.p=0.00
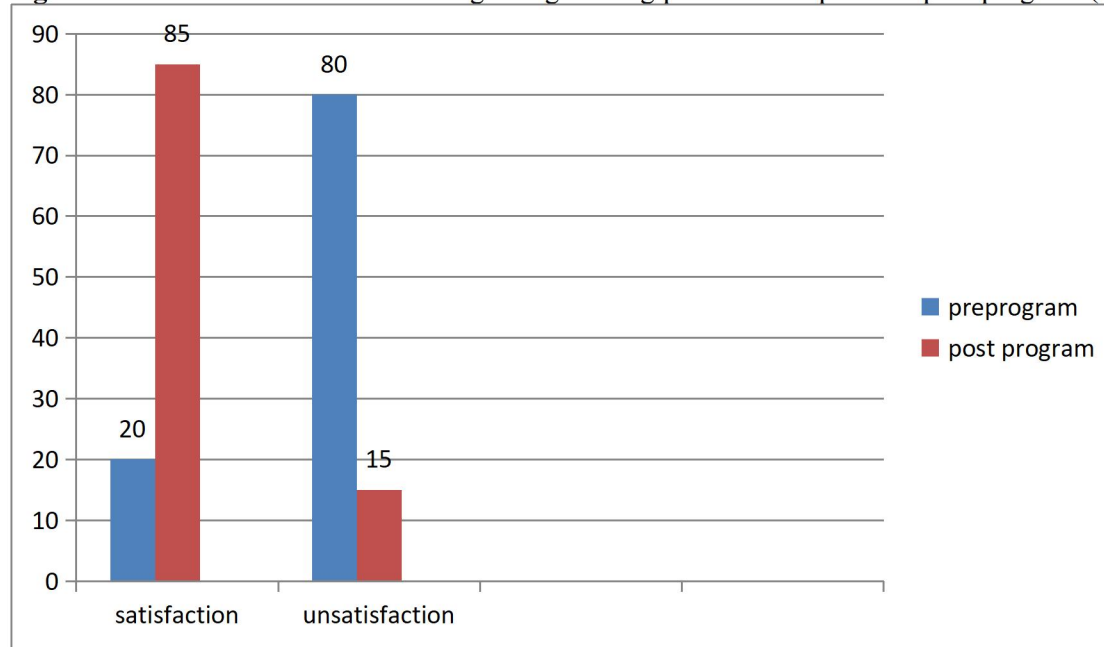
Figure 6: labor women's satisfaction regarding nursing performance pre- and post-program (n=100)

Figure 6 shows that 80% of labor women were unsatisfactory regarding nursing performance pre-program, which improved to 85% satisfaction post-program. p=0.00

According to research hypothesis number 2, Following the educational program, the pregnant women self-reported practice with thyroid disorders pre-, post, and follow-up implementation of the program (table 8).

Table (7): Distribution of Frequencies among the (study and control groups) self-reported practice before, post, and follow-up the implementation of the program.(n=120)

Self-reported practice items	Pre-test				X^2 P-value	Immediately(Post-test)				X^2 P-value	During the first trimester (follow up)				X^2 P-value
	Study group n=60		Control group n=60			Study group n=60		Control group n=60			Study group n=60		Control group n=60		
	No.	%	No.	%		No.	%	No.	%		No.	%	No.	%	
Daily living habits :															
Food	-	-	-	-	1.1 > 0.05	51	85.0	-	-	99.1 <0.001**	40	66.7	-	-	88.4 <0.001**
Rest	-	16.7	6	10.0		8	13.3	9	15.0		15	25.0	13	21.7	
Sleep	50	83.3	54	90.0		1	1.7	51	85.0		5	8.3	47	78.3	
Exercise	1	1.7	-	-	1.0 >0.05	54	90.0	2	3.3	92.3 <0.001**	48	80.0	-	-	81.0 <0.001**
Dental and foot care	23	38.3	22	36.7		6	10.0	30	50.0		12	20.0	52	86.7	
Follow -up	36	60.0	38	63.3		-	-	28	46.7		-	-	8	13.3	

Table (8): The frequency distribution of pregnant women's total self-reported practice score levels of the study and control groups concerning thyroid disease before, after, and following the program's implementation (n=120).

Total reported practice score level	Study group n= 60		Control group n=60	
	r	*P*	r	*P*
Pre-test	0.6	<0.01**	0.5	<0.01**
Post-test (immediately)	0.7	<0.01**	0.6	<0.01**
Follow-up (during the last trimester)	0.8	<0.01**	0.6	<0.01**

 Table (8) shows that a highly statistically significant positive correlation coefficient between total self-reported practice scores level pre-program r=0.6 in the study group and r=0.5 in the control group for the program improved to r=0.7 in the study group after implementing the program and r=0.6 in the control group post-program. Also, r=0.8 was found in follow-up in the study group, and r=0.6 was found in the control group after program implementation.

Table (9): The correlation between the total reported practice score levels and the total knowledge score levels of the study and control groups concerning thyroid disease before, after, and Follow-up the program's implementation (n=120).

Items	Study group n= 60		Control group n=60	
	r	*P*	r	*P*
Total knowledge	0.9	<0.01**	0.5	<0.01**
Total self-reported practice	0.8	<0.01**	0.5	<0.01**

Discussion:

The status of pregnancy in women with thyroid disorders remains a complex issue due to its correlation to elevated risks of maternal and fetal illness and mortality, particularly in underdeveloped nations. It is imperative for nurses to actively address the disparity between the available evidence and the challenges faced by women in recognizing the signs and symptoms of thyroid dysfunction. Education plays a crucial role in surmounting these obstacles. Nurses are vital client advocates in assessment, education, and referral. There is a need to develop and implement formal and informal education programs that are culturally appropriate to convey knowledge about thyroid disorders effectively. Nurses must leverage their leadership role to disseminate knowledge to the general public and identify women susceptible to thyroid disease. This necessitates fostering collaboration among many healthcare fields. **Leah, (2018).**

Regarding pregnant women's demographic characteristics, the present study shows that the mean age of the study group was 28.68 ± 4.68 compared to 27.77± 4.52 years for the control group. This finding agrees with a study by **Taha et al . (2018)** conducted in Egypt about" Structural thyroid diseases in pregnancy in El-Minia," who reported that the mean age of the study groups was 28.6 ± 5.63 years. From the investigator's perspective, the women experienced thyroid issues, married around their middle years, had late pregnancies, and were concerned about potential concerns that could arise as complications of thyroid disorders.

Regarding the pregnant women's level of education, the study group and control group revealed that less than two-thirds had secondary education., and less than two-thirds lived in urban areas. For most of the study group and control group, the monthly income was insufficient for their basic family demands; this finding agrees with a study by **Farag (2017),** the survey conducted in Egypt about "stress and coping strategies among thyroid-pregnant women. reported that more than half of the studied women had secondary education, and more than half lived in urban areas and the majority of them had insufficient income. From the investigator's perspective, the living standards in Egypt are high, and the family's monthly income is inadequate to meet their daily demands.

The present study results showed that the majority of the study group were housewives, while more than half of the control group had to work. This finding agrees with a study by **Pop et al . (2017),** which was conducted in Pakistan, titled "Maternal Hypothyroxinemia during Early Pregnancy and Subsequent Child Development: a 3-year Follow-up Study." The report showed that most participants were housewives. From the investigator's point of view, the majority of pregnant women inability of pregnant women with thyroid conditions to engage in excessive or strenuous activities may be attributed to pregnancy.

Regarding family size, the present study findings revealed that the mean family size was 4.22± 0.68 for the study group and 4.35± 0.79 for the control group. Also, more than half of the study group and control group the number of rooms 2-3 rooms. This finding agrees with a study by **Badge et al. (2017)** about the quality of life of pregnant women with thyroid disease, who found 4.99 ± 0.88 for the study group and 4.88 ± 0.92 for the control group.

Concerning the post-obstetric history., the findings noticed that nearly one-third of the studied and control groups had a normal single baby, and almost a quarter and one-fifth of them had low birth weight. This finding agrees with **Smyth et al.**

(2017), a study conducted in Iran, about "Maternal iodine status and thyroid volume during pregnancy: correlation with neonatal iodine intake who reported that most thyroid-pregnant women's outcomes were normal live babies.

Regarding pregnant women receiving health education about thyroid disease, the present study findings revealed that most of the studied women did not receive any health education about thyroid disease**.** This finding agrees with **Diao et al. (2016) and Bonow and Carabello (2017),** the study conducted in Sub-Saharan Africa about **"**pregnant women with thyroid disease' who reported that only a few thyroid-pregnant women had received appropriate prior counseling. From the investigator's point of view, it may be due to the absence of physicians who give health education most of the time. Also, a shortage of nursing staff leads to no time to provide instruction, which leads to the risk of maternal and fetal complications during pregnancy and delivery.

Concerning pregnant women's complications, the present study findings showed that one-third of the studied women had thyroid problems, and nearly half of them had severe anemia**.** This finding is in contrast with **Taha et al. (2016)**, who showed that thyroid complications were observed among the study sample as follows: anemia (5.8%), fatigue and weakness (0.8%), skin rash (2.5%), and fever (1.7%)**.** Also, the finding is incongruent with **Koregol et al. (2017**), a study conducted in Turkish about the "Association of maternal thyroid during early pregnancy with offspring IQ and brain morphology in childhood: a population-based prospective cohort study" was observed in (10.9%) who had anemia (2.7%) who had a weakness, and 4.5% who had a fever. From the investigator's point of view, this could be due to hemodynamic compromise,

placental insufficiency, and antithyroid drugs.

Regarding the medical history of the studied women about the types of thyroid disease in the current study, findings revealed that the majority of the study and control groups had hypothyroidism. On the other hand, one-tenth of them had hyperthyroidism**.** These findings are in agreement with **Badge et al. (2017),** who found that more than two-thirds of cases had hypothyroidism. Additionally, this finding was consistent with *Koregol et al. (2017*), who showed that most thyroid patients had rheumatic heart disease, including mitral stenosis, mitral regurgitation, aortic stenosis, and aortic regurgitation. From the investigator's point of view, this may be due to the high prevalence of thyroid disorder in developing countries (Egypt), especially in females, as females remain confined to households and there is a lack of healthcare access due to non-compliance with prescribed treatment. Meanwhile, thyroid disorder is less apparent in developed countries due to their high level of education and socioeconomic conditions other than other diseases are more prevalent.

Meanwhile, this finding is incongruent with the study conducted in Singapore about quality of life about nutritional attitude and practices during pregnancy by **Mirsanjari et al. (2016),** which reported that the mean body weight of the pregnant women in the initial antenatal visit was 60.4 ±12.2 kg.

Regarding laboratory investigations, the present study findings indicated that all studied women did a complete blood count, blood group, and Rh factor, as well as noninvasive tests (cardiac radiology, ultrasonography, and fetal heart rate)**.** This finding agrees with *Mohy-Eldine (2017),* who clarified that most pregnant women made laboratory investigations as blood group, hemoglobin,

Rh factor, urine, and blood sugar. From the investigator's point of view, this may reflect the availability of antenatal care in the clinic at governmental hospitals and increased awareness of studying women about the importance of follow-up for antenatal care.

Regarding medications used, the present study findings showed that more than two-thirds of the studied women used thyroid hormones, and more than one-third of them used anti-arrhythmic, anti-hypertensive drugs. On the other hand, more than two-thirds of the control group, compared to one-half of the study group, used iron supplements. This result is in disagreement with the study conducted in Japan about risk factors associated with preterm delivery in women with thyroid disease by **Makino et al. (2016),** which constituted 3.2% thyroid hormones, 1.2% antihypertensive, 2.2% iron, and 1.0% for anticoagulant drugs. From the investigator's point of view, this could be explained that thyroid pregnant women comply with drug regimens during pregnancy to improve maternal and fetal circulation under medical supervision.

Concerning the side effects of antithyroid medications in the present pregnancy, our study findings showed that less than one-quarter of the studied women had health problems such as yellowing of the skin and persistent sore throat, and one-third of the studied women reported vague abdominal pain and more than one-quarter of them suffered from fever. On the other hand, less than a tenth of them suffered from liver failure. This finding is in disagreement with *Rosediani et al. (2015),* who reported yellowish skin (86.6%) and abdominal pain (85.9%), followed by fever (81.0%). In the same stream*, Farag (2017)* found that the most common health problems among pregnant women with thyroid disorder were fever 94%, fatigue 98%, skin rash 90.7%, and headache 94%.

Concerning the knowledge of the studied women about thyroid diseases, the present study findings revealed that the majority of the study and control groups did not have complete, correct answers regarding the concept, types, causes, risk factors, signs and symptoms, maternal and fetal complications as well as treatment in pretest phase**.** This finding agrees with **Abd-Elmoatey (2016),** who found that most of the study group needed more knowledge before implementing the health education intervention. Meanwhile, this finding disagrees with *Rosediani et al. (2015)* in a study about knowledge, attitude, and practice on thyroid disorder among women in the North-East Coast in Malaysia, who found that about half of women had correct knowledge about thyroid disorder.

Regarding the reported knowledge levels of the studied women about thyroid diseases, the present study results revealed that the majority of the study and control groups had unsatisfactory knowledge regarding the relation of thyroid disease with pregnancy, the importance of investigations, and the importance of follow-up before program implementation (table 6). This finding is in agreement with *Rosediani et al. (2012),* who clarified that pregnant women with thyroid disorders have inferior knowledge regarding the importance of investigating thyroid hormones and follow-up during pregnancy. These may reflect the improvement of study women's knowledge after program implementation. The two groups had a statistically significant difference in the post-test and follow-up. This indicates that the women who were studied needed this information because it may affect their knowledge and health.

As regards psychological and social stressors of thyroid pregnant women, the present study findings revealed that nearly half of the study

group and more than half of the control group had high levels of psychological and social stresses in the pretest. More than half of the study group had lower levels of psychological and social stresses immediately **(post-test)** and during the last trimester **(follow-up)** after program implementation **(table 7)**. This could be explained by the study group expressing their internal feelings during the educational sessions and feeling assured about their psychological and social conditions as well as the outcome of the pregnancy in the future. There was a highly statistically significant difference between the two groups in post-test and follow-up.

Regarding assessment outcomes (newborn) after program implementation, the present study results revealed that most studied women had full-term and normal live birth babies (table 8). This finding is in agreement with the study conducted in India about the clinical profile and obstetric outcome in pregnancies complicated by thyroid disease (a five-year rural experience) by **Badge et al. (2013),** who reported that the gestational age had full term at the time of delivery was between 37-42 weeks. Also, **Diao et al. (2016)** found that most of the fatal outcomes for pregnant women with thyroid diseases were normal live births, and few of them had preterm. This agreement between the two studies may reflect the advanced worldwide management of pregnant women with thyroid disease, including the medication effect and new technology for the treatment of thyroid disease in pregnant women.

As regards the mode of delivering, the present study results revealed that the majority of the women had delivered by normal vaginal mode **(table 8)**. This may be due to the most cases, pregnant women with thyroid disease should be preferred delivered by vaginal mode with an episiotomy to shorten the second stage of

labor compared to cesarean section as well as the previous delivery of them was through the same mode. This finding is in the same stream as **Badge et al. (2017)**, who found that more than two-fifths of the women had a spontaneous vaginal delivery, and less than one-fifth of them had delivered by cesarean section.

According to the present study, findings revealed that the mean and SD of the study group was 9.30 ± 1.32 compared to 8.62 ± 1.56 of the control group **(table 8)**. This finding is in line with a study about the impact of intervention programs on a nurse's knowledge and practice regarding nursing care of pregnant thyroid women during labor, Faculty of Nursing, Zagazig University, Egypt; conducted by **Elsabagh and Zaiton, (2013)** who stated that the mean of Apgar score at 5 minutes was 8.04 ± 1.65.

About newborn birth weight, the present study findings revealed that the majority of birth weight were within the average weight of newborns **(table 8).** This may be explained as the improved fetal outcome due to the presence of specialists during labor, such as an obstetrician, cardiologist, anesthetist, hematologist, nurses, and neonatologist. This finding is in agreement with **Taha et al. (2016),** who found that the mean birth weight was **2513.7 ± 922.2 Kg. and Elsabagh and Zaiton (2013),** who reported that the mean birth weight was 2897 ± 838 Kg among patients with cardiac disease in pregnancy.

Regarding the study of women's total knowledge score levels about thyroid disorders, the findings showed that more than two-thirds of the study and control groups had poor total knowledge score levels before program implementation (Table **9)**. This finding is in agreement with the study about knowledge, preventive action, and barriers to thyroid disorder prevention by race and ethnicity in women with **Greenberger, Simpson, and Mosca (2015),** who found that two-

thirds of women with thyroid disease indicated that they had limited awareness regarding thyroid disorder.

Meanwhile, the findings showed that most of the study group had good total knowledge score levels in the post-test and a slight decline in follow-up after program implementation. This could be explained by the fact that most of the studied women had secondary education and were more able to read the printed material (booklet) and remember the basic information about thyroid diseases, as well as their affection for the program and their positive participation. There was a statistically significant difference between the two groups in the posttest and follow-up after program implementation. This finding agrees with Abd-Elmoatey (2014), who found that most mothers' knowledge increased to 95.0 % immediately and after post-program implementation.

Regarding the correlation between total knowledge score and total reported practice score levels, the present study findings showed a statistically significant positive correlation between total knowledge score levels and total reported practice score levels through the phases of educational programs in the study group **(table 10)**. This result could explain the relationship between having good knowledge and correctly reported practice. This finding is in agreement with the study conducted in Kelantan, Malaysia, about the association between knowledge, attitude, and training on thyroid disease among pregnant women with Ranimah, Rosediani, and Harmy *(2015)* found that a solid significant association (p<0.001) between practices and knowledge of thyroid disease.

To summarize, according to the research hypothesis, the results showed a highly statistically significant relation between the total knowledge score levels of the studied women before and after program implementation.

The study results supported the educational program to improve health and outcomes for pregnant women with thyroid disorders through program implementation.

Conclusion:

Based on the findings of the present study, it can be concluded that:

The educational program that was established demonstrated a statistically significant enhancement in the knowledge and reported practices of pregnant women with thyroid disorders, both in comparison to the control group and pregnant women with thyroid disorders. There was a strong correlation between the health of the fetus and the overall knowledge and practice scores of women before, after, and following the program's implementation.

Recommendations:

In light of the present study findings, the main recommendations can be stated as follows:

- Regular follow-up is necessary for pregnant women with thyroid disorders who have a positive history of thyroid illnesses. Additionally, routine screening for thyroid function tests should be conducted in the antenatal clinic to enhance health and improve outcomes

- The designed educational program will be regularly implemented in the antenatal clinic at MCH centers, outpatient clinics, and hospitals for pregnant women with thyroid disorders. Its purpose is to provide them with the necessary knowledge and practice related to thyroid disorders. Is obligatory.

- The illustrated booklet designed for pregnant women with thyroid problems should be distributed and implemented in the prenatal clinic within hospital settings and family health centers.

- Further research is needed to examine the enduring impact of this educational intervention on the well-being of women and their infants.
- The newborn should be evaluated promptly following delivery using the **APGAR** score at 1 and 5 minutes. Additionally, the newborn should be assessed within the first week after delivery by referring to the mother's record at the place of delivery. Furthermore, it is essential to monitor all mothers and their infants' well-being through telephone communication.

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