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Effect of Educational Program on the Knowledge of Internship Nursing Students Regarding Electronic Fetal Monitoring

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Abstract: **Background:** Electronic fetal monitoring is a very important process to assess fetal status during labor. **Purpose**: To assess the effect of educational programs on the knowledge of internship nursing students regarding electronic fetal monitoring. **Design**: A quasi-experimental research design (pre- and post-test) was used. **Methods**: The study was conducted at the Obstetrics and Gynecology Department of Shebin Elkom Teaching Hospital. A convenient sample of all internship nursing students (180 internship nursing students) during the academic year 2022-2023. **The instruments**: A structured, self-administered interview questionnaire consisting of two parts: the socio-demographic characteristics of the study participants and an assessment of internship nursing students' knowledge regarding electronic fetal monitoring (pre- and post-test). **Results**: Internship nurses had higher level of knowledge after intervention than before intervention. There were highly statistically significant differences between the internship nurses' students' knowledge on the pretest and posttest. **Conclusion**: An educational program on electronic fetal monitoring carries a vital value for enhancing internship nursing students' knowledge, which ultimately leads to improved maternal and fetal outcomes. **Recommendation**: Regular educational programs about electronic fetal monitoring should be encouraged for all internship nursing students.

Keywords: *Educational program, Electronic fetal monitoring, Knowledge of internship nursing students.*

Introduction:

EFM has become a generally accepted method for fetal surveillance during pregnancy and labor and offers important information about fetal behavior. EFM, or cardiotocography (CTG), is a continuous recording of the fetal heart rate obtained via an ultrasound transducer placed on the mother's abdomen. EFM is widely used in pregnancy as a method of

assessing fetal well-being, predominantly in pregnancies with an increased risk of complications. During labor, the fetus can repetitively suffer from oxygen insufficiency, and therefore, metabolic acidosis can develop. Severe hypoxic injury can lead to neurodevelopmental disability, cerebral palsy, or even death (Evans et al., 2019).

EFM utilization in clinical practice significantly reduced the incidence of birth asphyxia; however, On the other hand, it has contributed to the rise of the cesarean section rate. This has been a consequencye of poor interpretation of fetal behavior and EFM signals. Training programs on EFM were introduced to improve the interpretations and thus lower the number of born children with acidosis and decrease the rate of cesarean sections as well. Training programs should emphasize the fundamental knowledge required to understand how to deal with and interact properly with EFM (Daglar et al., 2020).

According to the WHO (2019), the main cause of perinatal deaths is a lack of monitoring and care by skilled health professionals, as 99 percent of perinatal deaths occur in developing countries. The Maternal Health Service plays a vital role in reducing perinatal mortality. Nurses are those professionals who spend a lot of time with the mother during labor, so nurses need to be expert enough to perform and interpret the proper and timely tracings to promote measures to reduce fetal death (Mdoe et al., 2019).

It is the responsibility of the nurse to assess FHR patterns, perform independent nursing interventions, and report non-reassuring patterns to the physician or nurse. The emotional, informational, and comfort needs of the woman and her family must be addressed when the mother and her fetus are being monitored (Sergi, 2020).

Significance of the study

Most clinical agencies require nursing personnel to attend continuing education courses or provide evidence of proficiency in the use of electronic fetal monitoring (American College of Obstetricians and Gynecologists, 2019). Also, previous studies, such as Bayley et al. (2019), recommended the need for an effective training program to improve the interpretive skills of maternity nurses, which would ultimately benefit mothers and babies. In addition, most of the research concentrates on improving knowledge and ignoring skills. Above all, there was a lack of research, teaching programs, and training that are provided to internship nursing students that are related to interpreting electronic fetal monitoring. They usually seek the help of doctors to interpret the findings in an emergency (Ramadan et al., 2018). So, the researchers decided to conduct this study to improve the performance of internship nursing students regarding electronic fetal monitoring.

Purpose

To assess the effect of educational programs on the knowledge of internship nursing students' regarding electronic fetal monitoring.

Research Hypothesis

The level of knowledge of internship nursing students is expected to be higher after the implementation of the educational program than before.

Definitions of variables

- **Educational program regarding electronic fetal monitoring**: Educational program refers to an organized set of learning activities designed to enable a student to develop knowledge, understanding, skills, and attitudes relevant to the student's individual needs (Carbonne & Kaci, 2018). Operationally, it refers to a systematically organized, planned, and developed teaching strategy that was designed and implemented by the researcher to provide information for the internship nursing students regarding electronic fetal monitoring to enhance their knowledge and improve their practices. It was assessed using an assessment of internship nursing students' knowledge (instrument no. I).
- **Knowledge of internship nursing students**: knowledge refers to the complete or incomplete information with which a person does something. Something works; it is also defined as the act or process of performing a task, action, etc. The verb performs means to work or function well or badly, an active process in which the information is selected, received, organized, and interpreted from the outside environment to make it meaningful (Blix et al., 2020). Operationally, it refers to the effectiveness of internship nursing students in performing their roles and responsibilities directly related to patient care by increasing their knowledge and skills regarding electronic fetal monitoring. It was assessed using internship nursing students' performance of electronic fetal monitoring (instrument no. II).
- **Electronic fetal** monitoring refers to recording (graphically) the fetal heartbeat (cardio) and the uterine contraction (toco) during the third trimester of pregnancy and labor.

Method

Research Design:

A quasi-experimental research design was used in this study (one group pre-test, post-test).

Research settings:

The study was conducted at the obstetric department of Shebin Elkom Teaching Hospital and Menoufia University Hospital in Menoufia Governorate.

Sampling:

Sample type:

A convenient sample of all internship nursing students (180 internship nursing students) from the Faculty of Nursing at Menoufia University and the Technical Institute of Nursing during the academic year 2022-2023, training at the Obstetric Department of Shebin Elkom Teaching Hospital (98 students) and Menoufia University Hospital (82 students) (32 students from the faculty of nursing and 50 students from the technical institute).

Data collection instruments:

Two instruments were used for data collection.

Instrument one: Structured self-administered interview questionnaire:

This instrument consisted of two parts.

- **Part 1:** Socio-demographic characteristics of the study participants included age, sex, place of living during studying, marital status, residence, and educational certification.
- **Part 2:** Assessment of internship nursing students' knowledge regarding electronic fetal monitoring (pre- and post-test). It was based on Divya et al. (2018), developed by a researcher to accommodate the research. It consisted of 26 questions, such as the meaning of EFM,

Knowledge's Scoring System:

Knowledge questions were determined and coded accordingly. Each item was assigned as follows: correct answers took (2), incorrect answers took (0), and don't know answers took (1) (Divya et al., 2018).

The total score of knowledge was classified as follows:

Good knowledge: > 75% of the total knowledge score.
Average knowledge: 60-75% of the total knowledge score.
Poor knowledge: < 60% of the total knowledge score.

Ethical Considerations:

An approval from the Ethical Committee of the Faculty of Nursing at Menoufia University was obtained on December 12, 2021. Approaches to ensure ethics were considered in the study regarding confidentiality and informed consent. The researcher introduced herself to the studied internship nurses' students and explained the purpose of the study and nature of the research to obtain their acceptance to be recruited in the study as well as to gain their cooperation.

Confidentiality was achieved using locked sheets with the names of the participating students replaced by numbers. All participating students were informed that the information they provided during the study would be kept confidential and used only for statistical purposes after finishing the study. The study findings would be presented as group data without any personal participant's information remaining.

A written consent for approval to participate in the study was obtained from the internship nursing students after explaining the purpose of the study. All internship nursing students were informed that participation in the study was voluntary, and they could withdraw from the study whenever they decided to do so. Each participant was free to ask any question about the study details.

Pilot study:

A pilot study was implemented to test the applicability of the instruments, the feasibility of the study, and to estimate the time needed for data collection. It was performed on 10% of the total participants, or 18 total students. They were excluded from the study sample to assure the stability of the results and

make the necessary modifications. It was implemented to ascertain the simplicity, clarity, applicability, relevance, and content validity of instruments and to detect any problems peculiar to the statements, such as sequence and clarity, that might interfere with the process of data collection.

Procedure:

- The data collection for the study was collected over a period of nine months, starting on August 1, 2022, and ending on May 1, 2023. The researcher visited the settings four days per week from 9:00 a.m. to 1:00 p.m., two days for Shebin Elkom Teaching Hospital and the other two days for Menoufia University Hospital.
- During the initial visits, the researcher greeted the internship nursing students, introduced herself, and explained the purpose and nature of the study to them.
- The researcher distributed the total number of students (180) to small groups; each group contained 15-20 students. This means that all student groups were accounted for 10 groups.
- A pretest was done on all internship nurses' students according to their attendance in shifts using the different data collection instruments for assessing nurses' students' demographic data and evaluating knowledge regarding electronic fetal monitoring.
- After assessing knowledge, the researcher assesses the needs of the internship nurses' students and prepares a guided booklet about the needs of the students, which is then distributed to all nurses on the first day of the training.
- The researchers designed educational sessions based on the assessment results. The overall sessions for each group were five sessions devoted to two theories and three practicals. The duration of each session was approximately 30-45 minutes, including periods of discussion according to their achievement, progress, and feedback.
- For the theoretical part, **the first session** aimed to emphasize rapport between nurses' students and researchers, identify the purpose of the program, and orient them about the program and its expected outcomes, as well as describe the schedule and content of the program. In addition to teaching the nursing students about the definition of the EFM, the importance of the EFM, the appropriate time for using the EFM, and a maternal and fetal indication of the EFM.
- **Second session:** This session included teaching the internship nursing students about types of EFM, maternal position during the procedure of EFM, area for the application of EFM transducers, normal fetal heart rate, signs of fetal distress, and abnormal uterine contraction.
- For Practical Part: **Third Session**, this session included training nurses' students about the care and preparation of mothers for EFM, explaining the procedure to the

mother, and obtaining permission to commence. In addition to suggesting the woman empties the bladder, put the mother in a semi-lateral position.

- **Fourth session**: This session included training the internship nurse students on how to read CTG and differentiate between types of CTG trace: normal, reduced, and increased variability, acceleration, and deceleration (variable, early, late, and prolonged). In addition, train them to sign and note the date and time on the CTG strips.
- Different methods of teaching and training strategies are used, such as lecture, group discussion, demonstration, and re-demonstration, with the assistance of instructional media such as videos and pictures about the trace of CTG.
- A post-test was given to each internship nursing student at the end of the program 2-3 weeks from the pre-test. The same format of pre-program tools was used to evaluate the effect of the educational program on internship nurse student knowledge and performance.

Statistical Analysis

Data were collected, tabulated, and statistically analyzed using an IBM personal computer with Statistical Package of Social Science (SPSS) version 22 (SPSS, Inc., Chicago, Illinois, USA), where the following statistics were applied:

- Descriptive statistics: quantitative data were presented in the form of mean and standard deviation (SD), and qualitative data were presented in the form of numbers and percentages.
- Analytical statistics are used to find out the possible association between the study factors and the targeted variables. The tests of significance used included the following:
- The Chi-squared test ($\chi 2$) is a test of significance used for comparison between two groups with qualitative variables.
- Student t-test: it is a test of significance used for comparison between two groups with quantitative variables.
- Pearson correlation (r) is a test used to measure the association between quantitative variables.

Results

Table 1 illustrates the sociodemographic characteristics of the internship nursing students in the sample. It revealed that less than one-half of the internship nursing students (44.4%) had an age of 22 years, with a mean of 21.83 ± 1.00 years. In addition, 90.6 percent of the internship nursing students were female. Meanwhile, more than two-thirds of the internship nursing students lived in their homes while studying (78.3%). Moreover, 78.9% of them were single. Furthermore. Additionally, 58.9% of students lived in rural areas, and 90.6% of them did not have previous training courses on electronic fetal monitoring.

Table 2 shows knowledge of the internship nursing students about electronic fetal monitoring before and after the educational program (pre- and post-test). It shows that there was a difference between the pre-test and the

post-test that was statistically significant. Additionally, the table shows that the percentages of correct answers in the posttest are higher than in the pre-test, with significant differences between both tests (p = 0.000). Regarding the definition of electronic fetal monitoring, only 42.2% correctly knew the definition in the pre-test; this percentage was increased to 92.8% in the post-test. Regarding the indications of continuous EFM, less than half of the internship nursing students correctly knew the indications in the pre-test; this percentage was increased to 88.9% in the post-test. Regarding the advantages of continuous EFM, 50.5% correctly knew the advantages in the pre-test; this percentage dramatically increased to 90% in the post-test.

Table 3 shows knowledge of the internship nursing students about electronic fetal monitoring before and after the educational program (pre- and post-test). It shows that there was a difference between the pre-test and the post-test that was statistically significant. Additionally, the table shows that the percentages of correct answers in the posttest are higher than the pretest, with significant differences between both tests (p = 0.000). Regarding the disadvantages of continuous EFM, 40.5% correctly knew the disadvantages in the pre-test; this percentage dramatically increased to 87.2% in the post-test. Regarding the methods of continuous EFM, 46.1% correctly knew the methods in the pre-test; this percentage was increased to 88.4% in the post-test.

Table (4) highlights the relationship between the total knowledge score categories about electronic fetal monitoring and the sociodemographic characteristics of the internship nursing students after the intervention. There was a statistically significant relationship between total knowledge score categories about electronic fetal monitoring and their sociodemographic characteristics in terms of age, gender, educational certification, and previous training courses on electronic fetal monitoring after the intervention. However, there was no statistically significant relationship between total knowledge scores about electronic fetal monitoring and their marital status.

Figure 1 presents the internship nursing students' total knowledge score categories about electronic fetal monitoring before and after the educational program (pre- and post-test). It illustrates an improvement in the total knowledge score categories about electronic fetal monitoring of the internship nursing students after the educational program (90% had a good knowledge score) compared to before (30% had a good knowledge score).

Figure 2 shows the internship nursing students' total interpretation of fetal heart rate pattern score categories before and after the educational program (pre- and post-test). It shows that the internship nursing students did better at interpreting fetal heart rate patterns after the educational program (80.0% had good interpretation of fetal heart rate patterns) compared to before (20.0% had poor interpretation of fetal heart rate patterns).

Table 1: Socio-Demographic Characteristics of the Internship Nursing Students (n=180)

Sociodemographic characteristics	The studied participants (n=180)	
	No.	%
Age (years)		
20	28	15.6
21	23	12.8
22	80	44.4
23	49	27.2
Mean ± SD	21.83 ± 1.00	
Gender		
Male	17	9.4
Female	163	90.6
Place of living during the study years		
Home	141	78.3
University housing	39	21.7
Marital status		
Married	38	21.1
Single	142	78.9
Residence		
Urban areas	74	41.1
Rural areas	106	58.9
Previous training courses on electronic fetal monitoring		
Yes	17	9.4
No	163	90.6

Table 2: Knowledge of the Internship Nursing Students about Electronic Fetal Monitoring before and after the Educational Program (Pre- and Post-Test) (n = 180)

Variables	The studied participants (n=180)				X^2	P- value
	Before the intervention (pre-test)		After the intervention (post-test)			
	No.	%	No.	%		
Definition of electronic fetal monitoring (EFM)					217.37	.000 **
Correct	76	42.2	167	92.8		
Incorrect	47	26.1	11	6.1		
Don't know	57	31.7	2	1.1		
Indications of continuous performance in EFM					230.05	.000 **
Correct	77	42.7	160	88.9		
Incorrect	47	26.1	20	11.1		
Don't know	56	31.2	0	0.0		
Advantages of continuous EFM					204.94	.000 **
Correct	91	50.5	162	90.0		
Incorrect	48	26.7	18	10.0		
Don't know	41	22.8	0	0.0		

Table 3: Knowledge of the Internship Nursing Students about Electronic Fetal Monitoring before and after the Educational Program (Pre- and Post-Test) (n = 180)

Variables	The studied participants (n=180)				X2	P- value
	Before the intervention (pre-test)		After the intervention (post-test)			
	No.	%	No.	%		
Disadvantages of continuous EFM					232.91	.000 **
Correct	73	40.5	157	87.2		
Incorrect	53	29.5	23	12.8		
Don't know	54	30.0	0	0.0		
Methods of continuous EFM					251.45	.000 **
Correct	83	46.1	159	88.4		
Incorrect	45	25.0	19	10.5		
Don't know	52	28.9	2	1.1		
Connections to monitor the fetal heart rate and follow the contractions of the uterus					201.32	.000 **
Correct	91	50.5	151	83.9		
Incorrect	48	26.7	29	16.1		
Don't know	41	22.8	0	0.0		

Table 4: Relationship between the Total Knowledge Score Categories about Electronic Fetal Monitoring and Sociodemographic Characteristics of the Internship Nursing Students after the Intervention (Post-test)

Variables	Total knowledge Categories				X^2	P- value
	Average		Good			
	No.	%	No.	%		
Age (years)						
20	11	6.1	17	9.5	51.68	0.000 **
21	7	3.9	16	8.9		
22	0	0.0	80	44.4		
23	0	0.0	49	27.2		
Gender					7.86	0.005 **
Male	5	2.7	12	6.8		
Female	13	7.2	150	83.3		
Place of living during the study years					0.295	0.587
Home	15	8.3	126	70.0		
University housing	3	1.7	36	20.0		
Marital status					0.015	0.903
Married	4	2.2	34	18.9		
Single	14	7.8	128	71.1		

Educational certification					52.00	0.000 **
Faculty of nursing	0	0.0	130	72.2		
Technical institute	18	10.0	32	17.8		
Residence					4.93	0.026
Urban areas	3	1.7	71	39.4		
Rural areas	15	8.3	91	50.6		
Previous training courses on electronic fetal monitoring					51.88	0.000 **
Yes	3	1.7	14	7.7		
No	100	55.6	63	35.0		

Figure 1: The internship nursing students' total knowledge score categories about electronic fetal monitoring before and after the educational program (pre- and post-test)

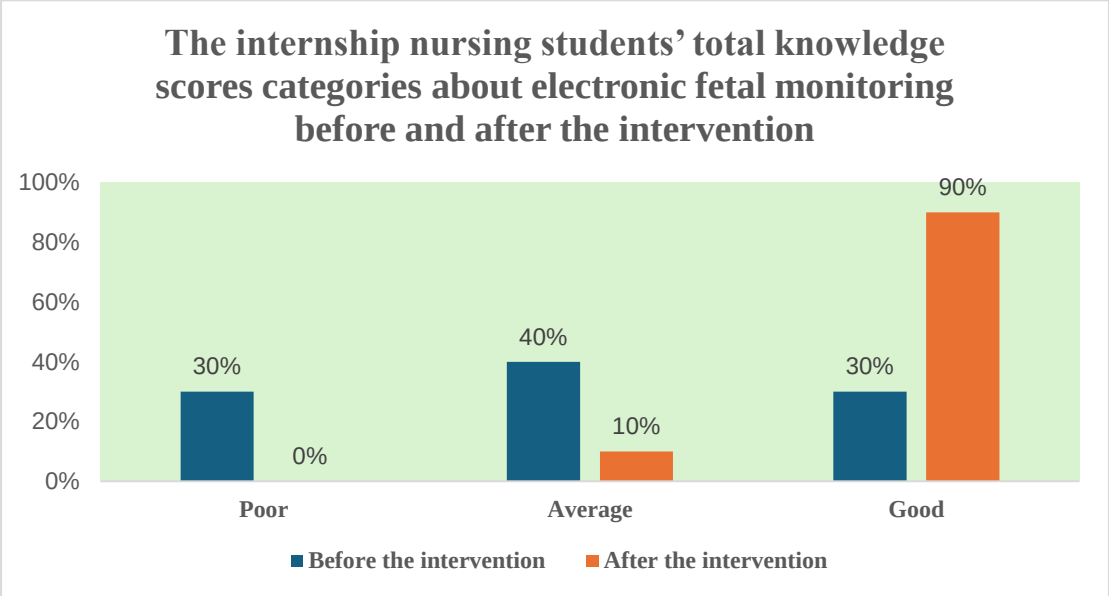
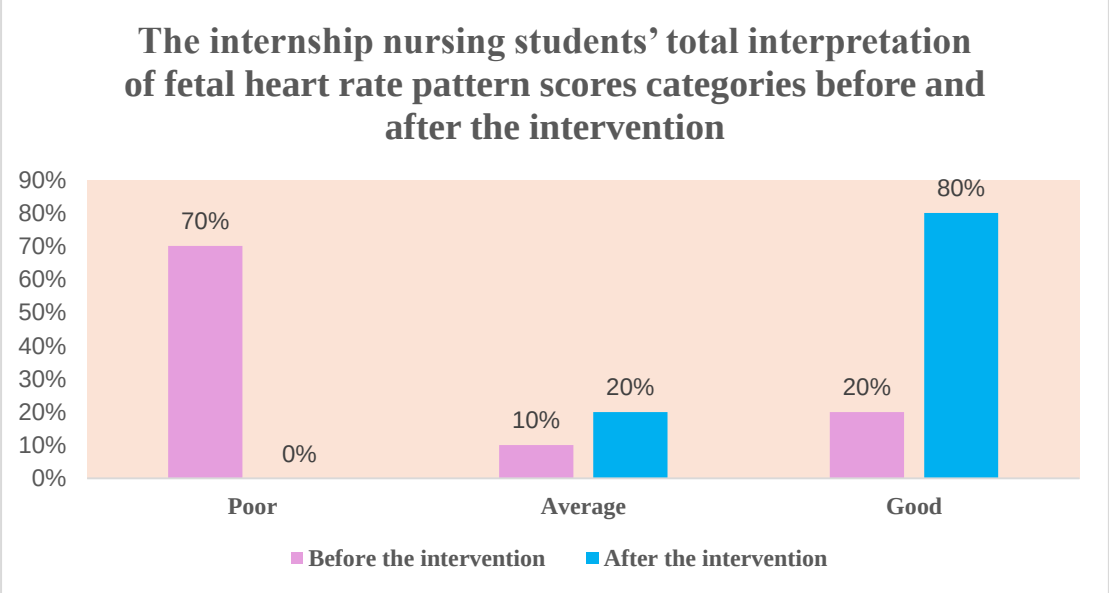


Figure 2: The internship nursing students' total interpretation of fetal heart rate pattern scores categories before and after the educational program (pre- and post-test)



Discussion

Regarding the socio-demographic characteristics of the studied subjects, the result of the present study showed that less than one-half of the internship nursing students had an age of twenty-two years. In addition, most of them were single, female, and from the faculty of nursing. Meanwhile, more than two-thirds of the internship nursing students lived in their homes while studying, and more than half of the students lived in rural areas.

On the same lines as Ibrahim and Arief (2019), who studied "the Effect of Electronic Fetal Monitoring Educational Program on Knowledge and Interpretations of Internship Nursing Students," their findings revealed that the majority of students had an age of twenty-two years old, more than half of them lived in their homes while studying and lived in rural areas, and the majority of them were single and had a secondary education as a previous certification. On the other hand, Daglar et al. (2020), who applied their study to perform a national assessment on teaching residents EFM, found that in this study, about three-fourths of the sample lived in urban areas. Dissimilarities appeared because of the difference in location between both studies.

Regarding the age, the current research results demonstrated that the range of age was from twenty to twenty-three years, which is the corresponding age of studying in the university, but that was less than other studies conducted by Abd El-Razek (2016), who investigated the effect of training programs on assessing methods of Fetal viability during pregnancy in between nurses and reported that more than one-third were twenty to thirty years. This result disagrees with Meena (2019), who studied "A Study to Assess the Knowledge of Staff Nurses Regarding Antenatal Assessment of Fetal Well-being Working in Mahila Chikitsalaya Sanganeri Gate, Jaipur, Rajasthan, India" and revealed that most of the studied nurses were in the age group of thirty to forty years.

From the researcher's point of view, this may be because most of those nurses were newly graduated, young, and tolerated the nature of the work. It may also be explained by the fact that younger nurses are active, more interested, and more motivated than older nurses.

Concerning the level of education, the present finding reported that most of the students in the sample were from the faculty of nursing, and the rest were from the technical institute. This agrees with Ibrahim and Arief's (2019) report that more than three-quarters of the studied sample came from the faculty of nursing and the rest from the technical institute; however, the present study finding disagrees with Rosy's (2019), who studied" the effect of planned teaching programs on cardiotocography among midwives in Alappuzha" in India, showing that the majority of midwives who participated in the study had professional education qualifications up to general nursing and midwifery.

Concerning attending training courses on electronic fetal monitoring, the result of the current study showed that the majority of the studied nurses' students didn't attend any training courses related to EFM. This result is nearly in line with Ramadan et al. (2018), who studied "Maternity Nurses' Performance Regarding Non-invasive Fetal Wellbeing Measures: Educational Intervention, Egypt" and showed that most of the studied nurses had not attended any training courses regarding EFM.

Regarding the knowledge of the studied internship nursing students regarding EFM, the results of the present study showed that most of them had poor knowledge regarding the EFM preprogram. Examples of variables used were EFM definition, indications, advantages, disadvantages, methods, connections, preparations, and procedure. From the researcher's point of view, this may be since nearly all internship nursing students do not have any training courses regarding EFM.

This study finding is in line with Said and Ali's (2020), who studied "the effect of supportive nursing instructions for maternity nurses regarding electronic fetal monitoring" in Egypt and revealed that most nurses had poor total scores during the preprogram. Also, the findings of this study, supported by Sowmya et al. (2020), who studied "the effectiveness of cardiotocography training program on knowledge and skill among nurses working in maternity units" in India, found that the level of nurses' knowledge of general facts on cardiotocography had an inadequate level of knowledge in the preprogram.

On the other hand, throughout the post-program most internship nursing students had a good total score of knowledge. This improvement in students' knowledge during the post-program revealed the effectiveness of the educational program, and during the internship, nursing students became aware of and able to deal with electronic fetal monitoring.

This study finding is in line with Thellesen et al. (2018), who studied " cardiotocography interpretation skills and the association with the size of the maternity unit, years of obstetric work experience, and healthcare professional background" and reported that more than half of nurses had a good total score during the immediate post program. Also, the findings of this study, supported by Sowmya et al. (2020), mentioned that most nurses had an adequate level of knowledge.

The current finding is relatively like the study of Abd El-Razek (2016), which studied the "assessment of the staff nurse's knowledge pre- and immediate post program about electronic fetal monitoring" and revealed that staff nurses had higher knowledge on the immediate post-program than on preprogram. The present finding is also relatively in accordance with the study of Lamé et al. (2019), which showed the improvement in knowledge of midwives after a planned teaching program.

This result disagrees with Bayley et al. (2019), who studied "Knowledge and perceptions of quality of obstetric and

newborn care of local health providers in Malawi" and reported that training had little impact on levels of knowledge and the gap in knowledge could not be overcome by simply providing more training, so most of the staff reported a perception of poor quality of care.

In the present study, every internship student was given fifteen questions about the interpretation of fetal heart rate patterns to answer as baseline, beat-to-beat variability, acceleration, and deceleration. The findings of this study revealed that there was a significant difference between the pre- and post-tests regarding all previous questions.

The present study results were in the same line with Abd-El-Razake (2016), who reported that nurses had an increase in knowledge about EFM post-intervention than pre-intervention, and El-Sayed & Saadoon (2018), who studied the effect of training sessions about CTG on nurses' knowledge and skills at labor and high-risk units. They also reported an improvement in nurses' knowledge about EFM.

On the same line, Dokuz and Çakmak (2022), who performed a study to assess reliability in cardiotocography interpretation, found that there was a significant difference between the pre- and post-tests. Also, a study performed a cross-sectional study in Malaysia to identify the skills of midwifery nurses to interpret cardio-tocograms and reported that the mean marks of CTG interpretation in different graphs as bradycardia, tachycardia, and deceleration graph were sixty-nine, eighty, and seventy-one, respectively (Goldman & Naidoo, 2021).

Regarding the relation between socio-demographic characteristics and the total score of internship nursing students' knowledge, the findings of the present study showed a statistically significant relationship between total knowledge scores about electronic fetal monitoring and their sociodemographic characteristics in terms of age, gender, educational certification, and previous training courses on electronic fetal monitoring. However, there was no statistically significant relationship between total knowledge scores about electronic fetal monitoring and their marital status in both the pretest and posttest. Age: all internship nursing students in the age group 20-23 years had a good knowledge score during the post-program which is due to their young age and their ability to learn.

This result is in line with Hébert (2022), who mentioned there was a significant association between education level and knowledge of CTG. The results of the current study are in harmony with those of Kelly et al. (2021), who revealed that there was a highly statistically significant difference between the studied nurses' total knowledge score and nurses' personnel characteristics. Moreover, the findings of the present study are in contact with Sangeetha (2019), who studied "assess knowledge, attitude, and practice regarding cardiotocography among staff" and found that there is a significant difference between knowledge of the

interpretation of CTG and respondents' educational level and work experience. These results are also supported by Anberg et al. (2018), who did a cross-sectional study to locate the level of knowledge on the interpretation of CTG amongst midwifery nurses working at labor and delivery units in Malaysian hospitals and reported a significant relation between age, education level, and knowledge on CTG interpretation, but this did not coincide with Zaghir et al. (2022), whose results showed a significant difference in nurses' total practice score and their age and level of education only.

On the other hand, Sowmya et al. (2020) reported that there was no significant association between the demographic data and the level of knowledge and its interpretations between nurses in both the pretest and posttest. This may be attributed to the low number of participants in their study (only thirty nurses).

Conclusion

Considering the present study results, it can be concluded that the educational program on EFM carries a vital value for enhancing internship nursing students' knowledge. This finally leads to improved maternal and fetal outcomes. The hypothesis of the present study was being proved by the revelation that there was an improvement in internship nurses' students' knowledge.

Recommendations

Based on the findings of the present study, the following recommendations are suggested:

1) Regular educational programs should be encouraged for all maternity nurses and internship nursing students.
2) Written handouts should be printed and handed out to every internship nursing student regarding EFM. That clarifies the information about the EFM interpretation.
3) New research should be performed to identify the effects of training workshops done to maternity nurses and to assess the staff nurse knowledge and skills about electronic fetal monitoring to evaluate the knowledge of the nurses about the other non-invasive methods of fetal wellbeing assessment.

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