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CROSS-SECTIONAL STUDY

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Knowledge of Critical Issues in the Intrapartum Period: a Cross-sectional Study Among Undergraduate Final Year Midwifery Students

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ABSTRACT

Background: Dealing with critical issues in the intrapartum period requires comprehensive knowledge and a full understanding of the basic principles and skills involved, as complications during labor and birth occur unexpectedly. **Objective:** The aim of this study was to evaluate the knowledge of critical issues in the intrapartum period among undergraduate final year midwifery students. **Methods:** This is a descriptive observational cross-sectional study conducted between February-July 2017. Final year undergraduate midwifery students were recruited from one institution and four public hospitals. The research instrument was a questionnaire designed by the research team. Statistical significance was set at $p < 0.05$ and analyses were performed using the IBM SPSS Statistics version 22. **Results:** The final study sample consisted of 100 participants. The 36.0% of the students had started their final year internship, with a mean duration of 4.3 months. Only 2% of the participants had obtained a bachelor degree from another department, 76% had attended general high school, 17% had pre-graduate work experience and 48.0% had attended a seminar on critical issues in the intrapartum period. Participants' final scores ranged from 5% to 90%, with mean value being 49.7% (SD=16.5%). The knowledge score was found to be significantly higher in midwifery students who had started the internship. However, it was not significantly correlated with other educational characteristics. Finally, no significant correlation was observed between knowledge score and age ($r = -0.15, p = 0.138$) or knowledge score and months of internship ($r = 0.27, p = 0.114$). **Conclusion:**

In the core midwifery curriculum, the design and integration of didactic and clinical courses focusing on emergency management in midwifery practice is considered of paramount importance. However, teachers should provide midwifery students with guidance on independent learning ability and implement effective strategies to enhance students' self-study skills.

Keywords: knowledge, critical issues, intrapartum period, midwifery students, obstetric emergencies.

1. BACKGROUND

Dealing with critical issues in the intrapartum period requires comprehensive knowledge and a full understanding of the basic principles and skills involved, as complications during labor and birth occur unexpectedly. In the year 2017, it was estimated that approximately 810 women died daily from pregnancy- and childbirth-related causes that could have been prevented (1). According to the Centers for Disease Control and Prevention (CDC) in 2020, 861 women died of maternal causes in the United States (2). Postpartum hemorrhage is considered the leading cause of maternal mortality, especially in low-income countries, reaching an incidence of 25% worldwide (3). These data indicate the heavy burden of critical issues during midwifery clinical practice.

Undergraduate midwifery curricula should form the core knowledge and define essential competencies on critical issues in the intrapartum period following "The International Confederation of Midwives Essential Compe-

tencies for Midwifery Practice”, updated on 2019 (4). Some undergraduate midwifery programs still require students to integrate essential knowledge, skills and judgment from different courses in order to provide safe midwifery practice. Others are in the process or have recently created a new contemporary curriculum in advanced midwifery including courses in emergencies in midwifery (5, 6). The development of an individual course oriented to more difficult childbearing situations, including early recognition, diagnosis, evaluation, decision-making and management of selected critical issues, should be taken into consideration when updating a midwifery curriculum. The design and implementation of such courses will make students feel more qualified and confident at the time of their final year internship.

2. OBJECTIVE

The aim of this study was to evaluate the knowledge of critical issues in the intrapartum period among undergraduate final year midwifery students and to investigate the relationship between students’ knowledge and demographic/personal characteristics. This topic was considered of great importance as midwives have a significant impact on clinical outcomes during the intrapartum period and thus, they should be trained to remain vigilant and respond effectively to early signs of both maternal and neonatal deterioration (7).

3. MATERIAL AND METHODS

Study design and setting

This is a descriptive observational cross-sectional study conducted in the period February-July 2017. Final year undergraduate midwifery students were recruited from the Technological Educational Institute of Athens (currently the University of West Attica) and from four public tertiary hospitals. The three hospitals are located in Athens, the capital of Greece, and the fourth in Crete which is the largest Greek island. The research team designed a constructed questionnaire based on validated and evidence-based guidelines to meet the objectives of the study. The study proposal was approved by the Ethics Review Board of the Technological Educational Institute of Athens.

Participants

Eligible participants were all undergraduate final year midwifery students who were entering or had already started their final year internship. Successful completion of all academic courses was a prerequisite. During the recruitment period, a total of 110 students accepted to participate in the study. The final study population consisted of 100 students as 10 were excluded from the study due to incomplete responses. Non-participation was mainly due to work overload, time constraints and uncertainty. Participants were not given prior notice of the study and therefore were not given time to revise in order to impartially guarantee the student’s level of knowledge.

Measures

The research instrument was a questionnaire divided into two sections. The first section referred to demographic and personal characteristics and the second section consisted of 20 questions designed by the research team after

a thorough relevant literature review. All the questions were single-answer multiple choice and related to critical issues in the intrapartum period, including preterm labor, preterm rupture of the membranes, severe maternal bleeding, abnormal cardiotocography patterns, malpositions and malpresentations in labor, assisted delivery, shoulder dystocia, perineal lacerations and maternal/neonatal resuscitation. The correct answers were based on internationally validated guidelines.

Procedure

The research team informed the eligible students of the purpose and context of the study and that participation was entirely voluntary. Once they agreed to participate they were personally handed an envelope containing the questionnaire of the study and an informed consent form. This ensured, firstly, that more explanations would be given to participants when needed and, secondly, that completeness and clarity of responses would be achieved.

All students completed the questionnaire under the supervision of the research team so as to secure the quality and reliability of the study. After completion, the questionnaire and the signed consent form were returned to the research team in the closed envelope in order to maintain anonymity and data confidentiality. The coding of all participants was automatically generated from the database used to maintain de-identification.

Statistical analysis

The variables were first tested for normality using the Kolmogorov-Smirnov criterion. Quantitative variables were expressed as mean values (Standard Deviation) and medians (interquartile range) while qualitative variables were expressed as absolute and relative frequencies. Independent samples Mann-Whitney tests were used for the comparison of mean values. Chi-square and Fisher’s exact tests were used to compare proportions. Spearman correlations coefficients (rho) were used to explore the association of two continuous variables. Multiple linear regression analysis was used with knowledge score as the independent variable

	N	%	
Gender	Female	99	99.0
	Male	1	1.0
Age (years), mean (SD)	23.1 (3.2)		
Start of the final year internship	No	64	64.0
	Yes	36	36.0
Months of internship ¹ , mean (SD) median (IQR)	4.3 (0.8)	4 (4 - 5)	
Bachelor from another department	No	98	98.0
	Yes	2	2.0
High school	General	76	76.0
	Technical	24	24.0
Pre-graduate work experience	No	83	83.0
	Yes	17	17.0
Attending a seminar on critical issues in the intrapartum period	No	52	52.0
	Yes	48	48.0

Table 1. Participants’ characteristics. (N=100)

	N	%	
Which medication may be administered to accelerate fetal lung maturation when a preterm delivery is expected?	Magnesium sulfate	14	14.0
	Terbutaline	6	6.0
	Nifedipine	8	8.0
	Betamethasone	72	72.0
Which diagnostic procedure is contraindicated in the presence of preterm premature rupture of the membranes?	The nitrazine test	13	13.0
	The digital vaginal examination	41	41.0
	The sterile speculum exam	34	34.0
	The fern test	12	12.0
A 33 weeks pregnant woman is admitted to the obstetric emergency department with severe abdominal pain, a tetanic uterus, no signs of vaginal bleeding and signs of hypovolemic shock. What is the most likely diagnosis?	Placenta previa	8	8.0
	Acute appendicitis	6	6.0
	Peripheral placental abruption	18	18.0
	Concealed placental abruption	68	68.0
Which is the major complication from ruptured vasa previa?	Maternal end organ damage	15	15.0
	Neonatal sepsis	11	11.0
	Maternal mortality	11	11.0
	Fetal mortality	63	63.0
Which cardiotocographic finding indicates umbilical cord prolapse during labor?	Fetal tachycardia	6	6.0
	Prolonged fetal bradycardia	66	66.0
	Early deceleration	11	11.0
	Late deceleration	17	17.0
Which cardiotocographic finding may indicate fetal hypoxia?	Early deceleration	14	14.0
	Late deceleration	48	48.0
	Variable deceleration	34	34.0
The mode of delivery in a twin pregnancy does not depend on:	Acceleration	4	4.0
	The presentation of the first twin	5	5.0
	The presentation of the second twin	57	57.0
Which presentation from the following cannot result in vaginal delivery?	Gestational age	11	11.0
	Fetal size	27	27.0
	Occiput anterior	5	5.0
Which of the following is not a prerequisite for the correct application of the vacuum suction cup?	Occiput posterior	12	12.0
	Mentum anterior	29	29.0
	Mentum posterior	54	54.0
Assisted vaginal delivery is indicated in:	Empty bladder	34	34.0
	Full cervical dilation	10	10.0
	Knowledge of the position/presentation of the fetus	5	5.0
	History of uterine atony	51	51.0
Following the delivery of the fetal head, you note retraction of the fetal head against the maternal perineum known as "turtle sign". This sign is suggestive of the presence of:	Prolonged second stage of labor	62	62.0
	Placenta previa	9	9.0
	Unengaged fetal head	14	14.0
	Preterm labor <34 weeks of gestation	15	15.0
Following the delivery of the fetal head, you note retraction of the fetal head against the maternal perineum known as "turtle sign". This sign is suggestive of the presence of:	Uterine rupture	12	12.0
	Cephalopelvic disproportion	17	17.0
	Shoulder dystocia	65	65.0
	Uterine inertia	6	6.0

	Maternal hands and knees position	17	17.0
In case of shoulder dystocia, which of the following should not be applied?	Fundal pressure	51	51.0
	Suprapubic pressure	23	23.0
	McRoberts' maneuver	9	9.0
A third-degree perineal laceration does not involve injury to:	Vaginal mucosa	11	11.0
	Perineal muscles	8	8.0
	External anal sphincter	18	18.0
	Anorectal mucosa	63	63.0
Which of the following is not a complication of the trauma of a fourth-degree perineal laceration?	Urinary incontinence	42	42.0
	Rectovaginal fistula	16	16.0
	Faecal incontinence	13	13.0
	Dyspareunia	29	29.0
Which is the most common cause of severe postpartum hemorrhage?	Genital tract lacerations	14	14.0
	Coagulation disorders	4	4.0
	Uterine atony	66	66.0
Which of the following should comprise the first action to evaluate the possible cause of postpartum hemorrhage?	Retained placenta	16	16.0
	Transabdominal ultrasound	15	15.0
	Transabdominal bimanual palpation of the uterus	52	52.0
	A computed tomography scan	9	9.0
How should a pregnant woman be positioned for cardiopulmonary resuscitation?	Laboratory tests (complete blood count, coagulation tests)	24	24.0
	Supine position with manual left uterine displacement	43	43.0
	Supine position with manual right uterine displacement	6	6.0
	Right lateral tilt position	32	32.0
In a woman greater than 20 weeks of gestation, after how many minutes of unsuccessful cardiopulmonary resuscitation should a perimortem cesarean section be performed?	Trendelenburg position	19	19.0
	4-5 minutes	43	43.0
	9-10 minutes	31	31.0
	14-15 minutes	17	17.0
After how many minutes of unsuccessful cardiopulmonary resuscitation in a newborn, may it be reasonable to stop the effort?	19-20 minutes	9	9.0
	5 minutes	18	18.0
	10 minutes	26	26.0
During neonatal cardiopulmonary resuscitation, the ratio of synchronized chest compressions and ventilations in one minute should be:	15 minutes	39	39.0
	20 minutes	17	17.0
	30 chest compressions and 15 ventilations	74	74.0
	40 chest compressions and 20 ventilations	8	8.0
	90 chest compressions and 30 ventilations	12	12.0
	120 chest compressions and 60 ventilations	6	6.0

Table 2. Participants' answers regarding knowledge questions. (N=100)

after its logarithmic transformation. Adjusted regression coefficients (β) with standard errors (SE) were calculated from the results of the linear regression analyses. The internal consistency of the questionnaire was assessed through Cronbach's alpha. All reported p values are two-tailed. Statistical significance was set at p<0.05 and analyses were performed using SPSS statistical software (version 22.0).

4. RESULTS

The final study sample consisted of 100 participants with a mean age of 23.1 years (SD=3.2 years) (Table 1). Almost all participants were female (99%). The 36.0% of the students had started their final year internship, with a mean duration of 4.3 months (SD=0.8 months). Only 2% of the participants had obtained a bachelor degree from another department. In addition, 76% of the sample had attended general high

school, 17% had pre-graduate work experience and 48.0% had attended a seminar on critical issues in the intrapartum period.

The percentages for correct answers ranged from 6% to 72% (Table 2). More specifically, few participants correctly answered “how should a pregnant woman be positioned for cardiopulmonary resuscitation?” and “the ratio of synchronized chest compressions and ventilations in one minute during neonatal cardiopulmonary resuscitation” (6% and 12%, respectively). On the contrary, a higher percentage of correct answers was observed for the questions “Which medication may be administered to accelerate fetal lung maturation when preterm delivery is expected?” and “A 33 weeks pregnant woman is admitted to the obstetric emergency department with severe abdominal pain, a tetanic uterus, no signs of vaginal bleeding and signs of hypovolemic shock. What is the most likely diagnosis?” (72% and 68%, respectively).

The participants’ correct answers were summed and the sum was multiplied by 5. Thus, knowledge scores could range from 0% to 100%, with higher scores indicating greater knowledge. Participants’ final scores ranged from 5% to 90%, with the mean value being 49.7% (SD=16.5%). None of the participants scored 0% or 100%, indicating the worst and best score respectively. The cronbach’s alpha coefficient was equal to 0.73 and above the acceptable value (i.e. 0.70, indicates acceptable reliability of the knowledge score).

The univariate correlations among knowledge score and educational characteristics are shown in Table 3. The knowledge score in univariate analysis was found to be significantly higher in midwifery students who had started their internship. However, it was not significantly correlated with the other educational characteristics. Finally, no significant correlation was observed between knowledge score and age ($r = -0.15, p = 0.138$) or knowledge score and months of internship ($r = 0.27, p = 0.114$).

When multiple linear regression was conducted with the knowledge score as the dependent variable and participant characteristics as independent variables (Table 4), it was noted that midwifery students whose internship was ongoing had significantly higher knowledge scores in comparison with those who had not yet started. None of the other characteristics included in the model were found to be significantly associated with participants’ knowledge score.

5. DISCUSSION

The present study, to our knowledge, is the first in the Greek setting to determine the knowledge of final year midwifery students on critical issues in the intrapartum period. Previous studies relating to this topic have focused mainly on medical students and few of them on nursing students.

Homaifar et al. (8) from Rwanda have previously described rates of improved knowledge and practical skills

		Knowledge score (%)		P Mann-Whitney test
		Mean (SD)	Median (IQR)	
High school	General	50.1 (15.9)	55 (40 - 60)	0.529
	Technical	48.3 (18.6)	45 (35 - 65)	
Pre-graduate work experience	No	50.3 (16.3)	55 (40 - 60)	0.549
	Yes	46.8 (17.9)	50 (35 - 60)	
Attending a seminar on critical issues in the intrapartum period	No	48.4 (16.4)	50 (40 - 60)	0.458
	Yes	51.1 (16.7)	55 (40 - 60)	
Start of the final year internship	No	46.3 (18.4)	45 (35 - 60)	0.038
	Yes	51.6 (15.2)	55 (42.5 - 60)	

Table 3. Univariate associations among knowledge score and educational characteristics. (N=100)

		$\beta +$	SE++	P
Age (years)		0.007	0.006	0.298
Start of the final year internship	No (reference)			
	Yes	0.078	0.044	0.046
High school	General (reference)			
	Technical	-0.014	0.047	0.762
Pre-graduate work experience	No (reference)			
	Yes	-0.046	0.054	0.396
Attending a seminar on critical issues in the intrapartum period	No (reference)			
	Yes	0.049	0.041	0.229

Table 4. Results from the multiple regression analysis with the knowledge score as the dependent variable. (N=100). Note. The regression analysis was conducted after logarithmic transformation of the dependent variable. The duration of the internship was not included in the model as it referred to participants who had started their final year internship. +regression coefficient; ++Standard Error

in medical students after their attendance in a structured 2-day emergency obstetrics training course. Similarly to our study, they examined final year students who scored last on the pre-training test a mean value of 54% (SD=11%) while 80% of the students showed improved knowledge after the training. Our participants’ final score was calculated with a mean value of 49.7% (SD=16.5%) which is in good agreement with the previous study taking into consideration that no intervention training program had been conducted before the assessment. This observation points out that incorporating structured, evidence-based educational programs into healthcare professionals’ curriculum maintains current knowledge, translates knowledge into clinical implementation and thus improves competency and skills to manage critical issues in the intrapartum period (9).

In our study, 52% of the students correctly answered that “transabdominal bimanual palpation of the uterus” should comprise the first action to evaluate the possible cause of postpartum hemorrhage”. Although appropriate interventions for responding to maternal potentially life-threatening complications are primary qualifications, an earlier study (10) that surveyed midwifery students for their clinical decision regarding postpartum hemorrhage in a simulated environment, revealed that a high percent-

age (68%) performed intermittent fundal massage as the initial action and only 30% of the students applied continual fundal massage as needed. These findings suggest that even basic midwifery skills do require regular review to ensure maternal safety and effective performance (10).

Students' knowledge of critical issues in the intrapartum period has received much attention due to the fact that midwives play a pivotal role in decreasing maternal, perinatal and neonatal morbidity and mortality (11, 12). However, very little is known about academics' core competencies which undoubtedly influence the quality of graduates from midwifery programs. A recent study in Kenya (13) investigated the knowledge, skills and confidence of university-based midwifery educators in emergency obstetric and newborn care through an online survey and skills station. The results demonstrated that educators' mean knowledge was 60.3% (SD \pm 13.3) before the skill enhancement workshop as an intervention and improved significantly to 88.3% (SD \pm 12.3) immediately after the training. Overall skill scores increased significantly as well from 44.7% (SD \pm 16.8) to 88.7% (SD \pm 11.3). Evidence reveals that midwifery educators feel more confident in the theory-based applied learning than hands-on teaching (14) but midwifery education should follow the standards of the "International Confederation of Midwives" and the "WHO midwifery educator core competencies" in order to ensure quality education, faculty development and produce graduates who can function within the ICM scope for practice (15-17).

With regard to professional midwives, data from the National assessment in Ethiopia regarding Emergency Obstetric and Neonatal Care (18) showed that midwives achieved an overall knowledge score of 52 on a 100% scale on a set of questions related to antenatal, intrapartum, newborn, postnatal and postpartum care as well as abortion care and violence. Moreover, on the question about the primary aspects of focused antenatal care and the elements of a birth plan, midwives scored overall 60 out of 100. This observation highlights the fact that for healthcare professionals, including midwives, it is essential for them to develop independence in determining their learning needs and seek resources to address them. In order to be qualified in their field, healthcare professionals should be lifelong learners and cultivate self-learning skills (19).

Furthermore, the retention of midwives' knowledge and skills after training in emergency obstetric care has been examined in recent years by multiple countries, especially in the continent of Africa (20). In this study, knowledge and skills were assessed before and immediately after training and longitudinally 3, 6, 9 and 12 months after a structured training program. Years of experience were significantly correlated with skill scores and, similar to our study, experience was found to play a determinant role in knowledge, as midwifery students whose internship was ongoing had significantly higher knowledge scores compared to those who had not yet started ($p=0.038$). Midwives who participated in all post-training assessments sustained skills but not knowledge in comparison to those who attended either one or two assessments. A capacity-building program including all elements of emergency

obstetric care delivered regularly has the potential to ensure improvement and maintenance of up-to-date clinical information and practical skills midwives need during the intrapartum period.

Simulation-based training undoubtedly has numerous benefits and therefore should be an integral part of midwifery programs at undergraduate, postgraduate or continuing learning level. According to Bettina et al. (21), obstetric skills laboratories that imitate the clinical scene and real-life clinical situations and are established nearby or within a healthcare facility, improve teamwork and communication skills among healthcare professionals. Such aspects contribute substantially to increasing staff competence and confidence through 'skills and drills' training without endangering patients.

The findings of this study enhance our understanding of the final year midwifery students' knowledge of critical issues in the intrapartum period, especially in the Greek setting. We fully acknowledge though that our study had some strengths and limitations. The strong points in our study lie in the fact that the final year students came from different midwifery programs indicating a more representative sample in terms of knowledge and they did not have prior notice regarding the completion of the questionnaire, meaning that no time was given for revision, and therefore the level of student's knowledge level was assessed objectively. However, we are aware that generalization in the whole Greek context is restricted due to the limited sample size. Finally, it was not possible to investigate potential significant relationships between theoretical knowledge and knowledge regarding evidence-based clinical practices as students were not evaluated for their practical skills on critical issues in the intrapartum period. Such an evaluation would have further improved our understanding of the difficulties students face in comprehending in-depth intrapartum emergencies. It is proposed that future work should focus on such correlations to provide direction for educational intervention with the goal to optimize midwifery knowledge and clinical skills.

6. CONCLUSION

The evidence from this study implies that knowledge of critical issues in the intrapartum period among undergraduate final year midwifery students is an under-reported problem and highlights the need for systematic training process. In the core midwifery curriculum, the design and integration of didactic and clinical courses focusing on emergency management in midwifery practice is considered of paramount importance. Such courses will undoubtedly help students to develop various competencies, build confidence, strengthen decision-making and work in a team effectively by the time of final year traineeship. However, teachers should provide midwifery students with guidance on independent learning ability and use effective strategies to enhance students' self-study skills.

- **Patient Consent Form:** Patient Consent Form: All participants were informed about subject of the study.
- **Author's contribution:** A.L. and D.M. gave substantial contributions to the conception or design of the work. A.L. and E.L. gave a substantial

contribution of acquisition of data. M.T., K.L. and D.M. gave a substantial contribution to the analysis and interpretation of data for the work. A.L., E.L., and G.P. had a part in article preparing for drafting or revising it critically for important intellectual content. A.L., K.L., and D.M. gave final approval of the version to be published and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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