



(RESEARCH ARTICLE)



## Midwives' attitudes towards the use of cardiotocography in Greece

Roussou Panagiota, Tzela Panagiota \* and Gourounti Kleanthi

*Department of Midwifery, School of Health and Care Sciences, University of West Attica, Athens, GRC.*

World Journal of Advanced Research and Reviews, 2024, 21(03), 2563–2569

Publication history: Received on 19 February 2024; revised on 28 March 2024; accepted on 31 March 2024

Article DOI: <https://doi.org/10.30574/wjarr.2024.21.3.1013>

### Abstract

**Introduction:** Cardiotocography was designed to monitor the condition of the fetus during childbirth, but is now widely used in the prenatal period and the test is especially important in high-risk pregnancies, as it can detect reduced fetal placental function in conditions such as preeclampsia, hypertension, Rhesus sensitization etc.

**Aim:** The aim of the research is to evaluate and highlight the attitude of Midwives regarding the use of cardiotocography in Greece prenatally and during childbirth.

**Material and Method:** Data were collected using a questionnaire that included questions about the attitude of midwives to the use of cardiotocography. The sample was random and the questionnaires were distributed electronically via google forms.

**Results:** It was found that 82% of the respondents consider the existence of a cardiotocograph necessary in an emergency and 76.7% express a positive opinion regarding its use in general and during childbirth, 49% state that with cardiotocography during childbirth, the mother's anxiety increases but at the same time 50.5% believe that the cardiotocograph does not spoil the beauty of childbirth. Also, 71.8% of the respondents do not consider that their skills are undermined by the use of cardiotocography and 52.4% state that the caregivers are not distracted by the mother. In addition, 71.8% of the respondents do not consider that their skills are undermined by the use of cardiotocography and also 52.4% state that the caregivers are not distracted from the mother. In addition, 43.7% state that their own judgment outweighs the ECG results but in cases where the ECG gives false indications, 36.9% state that they do not trust their judgment. Finally, 61.6% believe that cardiotocography is often used unnecessarily.

**Conclusions:** Midwives in Greece are positive about the use of cardiotocography prenatally and during childbirth and do not consider that their knowledge and skills are undermined through the examination, with the majority of respondents (82%) to consider the existence of a cardiotocograph necessary in an emergency.

**Keywords:** Cardiotocography; Cardiotocogram; Midwives' attitudes; Midwives' beliefs

### 1. Introduction

Cardiotocography (CTG) has become an indispensable tool in prenatal care and monitoring, significantly shaping the landscape of modern obstetrics since its advent in the late 1950s [1]. It enables concurrent recording of fetal heart rate (FHR) and uterine contractions, providing critical insights into fetal well-being and uterine activity [2]. Originally used during labor, the utility of CTG has broadened to include routine antenatal surveillance, particularly in high-risk pregnancies, such as those affected by pre-eclampsia, gestational diabetes, hypertension, prolonged gestation, and Rhesus sensitization [3]. These applications leverage CTG's ability to detect aberrant FHR patterns that might reflect

\* Corresponding author: Tzela Panagiota

fetal hypoxia, a potential outcome of compromised placental function typically observed in such high-risk conditions [4].

In recent years, the advent of computer-based algorithms and software has facilitated the standardized and objective interpretation of CTG tracings, enhancing the value of CTG as a diagnostic tool [5]. The integration of fetal electrocardiography with traditional CTG has shown promise in improving its predictive accuracy [6].

While CTG's importance in obstetrics is widely accepted, varying attitudes and perceptions about its use among healthcare professionals. Midwives, play a central role in the care of mothers and babies. Their attitudes towards CTG are crucial as they often serve as primary care providers during prenatal visits and labor, responsible for the initial interpretation of CTG readings and early identification of potential complications [7].

Despite its significance, a comprehensive study focusing on the attitude of midwives towards the use of CTG in Greece, both prenatally and during childbirth, remains unexplored. This research aims to bridge this gap by evaluating and highlighting the attitudes of Greek midwives regarding the use of cardiotocography in prenatal care and during childbirth. The findings of this study may inform local practice and guide further research in this area, potentially contributing to improved maternal and neonatal outcomes.

---

## 2. Material and methods

The study was conducted from September 2020 to June 2021. A quantitative approach was followed to investigate the research question. Data collection was carried out using a questionnaire that included questions about the attitude of midwives towards the use of cardiotocography. The sample was random, and the distribution of the questionnaires was carried out electronically through Google Forms. A total of 206 questionnaires were completed. The questions were addressed to public or private sector midwives, freelancers working in the delivery room or conducting deliveries as independent professionals, as well as any midwives involved in fetal-maternal medicine units. The subjects who participated in the study were informed that their participation was voluntary and anonymous.

### 2.1. Data Collection Tools

For data collection, a questionnaire was used with 25 closed-ended questions, which was created by the researcher in cooperation with the supervising professor and was subsequently weighted. Demographic data were also collected (age, years of work experience, profession, etc.) in order to correlate the results. The questionnaire was completed electronically via a special platform. The questions concerned the relationship of professionals and cardiotocographic monitoring of pregnant women.

### 2.2. Translation Procedure

After obtaining authorization by its developer (Sinclair Marlene), the 'forward-backward' translation was applied to translate the questionnaire from English to Greek language. Back-translation is highly recommended by experts on cross cultural research [8]. This process must be followed carefully because the values that are reflected by an instrument and the meanings of its component constructs may vary from one culture to another [8]. The questionnaire was translated from English into Greek, by two independent health professionals who were native speakers of the Greek language with a high level of fluency in English and by a professional translator who received beforehand information on the content of the scales. The translation coordinator (first author) compared the two translations and checked them for any discrepancies. Two other health professionals who were native speakers of the English language and were fluent in Greek, back translated the agreed Greek version. The translation coordinator compared the back translation with the original questionnaire. Furthermore, two native English speakers confirmed the contents between the original English version and the back- translated version. Any discrepancies that emerged from the comparison were discussed and two items were actually reworded. After the back-translation was conducted, the translated version was checked in order to minimize misunderstandings concerning especially the terminology and was culturally adapted. Therefore, a version of the Greek questionnaire, which was linguistically and conceptually equivalent to the English version, was developed.

### 2.3. Statistical Analysis

The statistical analysis was carried out using the IBM SPSS (Statistical Package for the Social Sciences) version 22.0 for Windows 10. The Kaiser-Meyer-Olkin (KMO) index was calculated, which evaluates the adequacy of the sample. The Kaiser criterion indicates that when the KMO index value is greater than 0.5, factor analysis is the suitable technique for data analysis. In this analysis, the value of the index was 0.803 and is considered exceptionally satisfactory. In addition, for checking the suitability of the data for processing with the technique of factor analysis, Bartlett's Test of Sphericity

was also calculated. This evaluates to what extent the correlations between variables allow the application of factor analysis ( $p < 0.05$ ). In this analysis ( $p < 0.001$ ), this specific index confirms that the correlation between the elements of the questionnaire is satisfactory.

### 3. Results

A total of 206 questionnaires were completed. Our survey captured a diverse age and professional demographic. The majority, 73.8% of the participants, fell into the age range of 20-39 years, indicating a youthful skew in our sample. However, a small proportion of older age groups was also represented with a mere 0.058% aged 50-59 and an even smaller 0.004% aged over 60 years. The participants' work sectors further diversified the data with 101 working in public hospitals, 46 in private hospitals, and 33 in private clinics. Also noteworthy were the 26 independent professionals contributing to the study. Looking at the professional experience of our respondents, the majority, 73.6%, had up to 5 years of work experience. This was followed by 19.1% with 6-10 years, 21.35% with 11-15 years, and 15% with 16-20 years of experience. The remaining 0.03% and 0.02% had 21-25 years and 26-30 years of experience respectively.

**Table 1** Factor Analysis and Loading Coefficients

Mean	Questions	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
2.59	I feel that CTGs are often used unnecessarily	0.759					
2.42	I think medical colleagues rely too much on CTGs	0.736					
3.42	I think the CTG distracts attention away from the mother	0.612					
2.77	I believe midwives' skills are undermined by over-reliance on CTGs	0.585					
3.34	I only use a CTG when it is absolutely necessary	0.572					
2.81	I believe CTGs can give rise to the wrong decisions being made	0.528					
2.77	I believe midwives' skills are undermined by over-reliance on CTGs	0.759					
3.67	I feel CTGs are so routine, they are virtually invisible during birth		0.716				
4.09	I think using any technology in childbirth is undesirable		0.691				
4.20	I do not like using CTGs		0.568				
2.83	I believe CTGs can lead to unnecessary medical intervention			0.694			
4.00	I think CTGs undermine my own skills			0.600			
2.80	I believe that using a CTG increases a mother's anxiety			0.598			
1.85	I believe CTGs are essential when labour is being induced				0.694		
1.61	I think CTGs are a major benefit to midwives				0.664		
1.96	I think CTGs are vital in helping a midwife to decide when medical intervention is needed				0.514		
2.51	I believe CTGs are essential for ensuring safe deliveries				0.426		

3.26	I always trust the CTG's readouts over my own observations					0.723	
4.01	I don't feel entirely confident in my ability to use a CTG					0.676	
2.46	I feel vulnerable if a CTG is not available					0.477	
2.87	I always trust my own judgement even when the CTG gives contrary indications						0.827
1.97	I feel I can routinely monitor the CTG signals without being distracted from the mother						0.481

To decipher the interplay between these diverse demographics and their responses, we utilized factor analysis. The Principal Components method, in combination with Varimax rotation, was selected to check statistical correlations among questionnaire items. This allowed us to identify and group closely interconnected items, thus reducing them to the smallest number of conceptual constructs and creating homogeneous groups of questions, or cumulative scales (Table 1). Per the guidelines of Aletras et al., 2006 [8], an item could only be included in a cumulative scale if its degree of correlation was less than 0.4 and the difference in its correlation coefficients with other cumulative scales was greater than 0.20. This strategic analysis provided critical insights into our participant responses and their statistical interrelationships.

### 3.1. Questionnaire Findings

#### 3.1.1. Necessity and Usage

The survey results unveil a nuanced understanding of the necessity and deployment of cardiotocograms (CTGs) in obstetric care. A significant 53.3% of respondents are of the belief that CTGs may induce unnecessary medical interventions, an opinion countered by 34.4%, with 12.3% remaining undecided. However, when faced with emergencies, a resounding 82% consider CTGs indispensable. This sentiment is further complicated by a division in views regarding the judicious use of CTGs: 51.4% of respondents disagree with the notion that CTGs are only employed when absolutely essential, while 31.5% concur, and 17% maintain a neutral position.

#### 3.1.2. Perspectives on Routine and Unnoticed Usage

Contrary to the assumption that CTGs have become an unnoticed routine during childbirth, a majority (60.1%) refute this stance. Alongside this, there exists a robust positive sentiment towards the use of cardiotocography, with 76.7% endorsing it, 15.5% remaining neutral, and a mere 7.7% expressing disapproval. This advocacy for technological intervention extends to the general perspective on childbirth, where the same proportion (76.7%) supports the integration of such technology.

#### 3.1.3. Skills and Decision Making

Concerning professional competencies and decision-making, 71.8% of respondents do not perceive their skills as being compromised by CTG usage. However, 12.1% disagree, and 16% are ambivalent. Moreover, there's an acknowledgment of the potential risk in decision-making, with 51.9% recognizing it, 32% opposing, and 15.5% remaining neutral. Strikingly, an overwhelming 87.4% perceive cardiotocography as a significant privilege for midwives, underscoring its perceived value in clinical practice.

#### 3.1.4. Emotional Responses and Confidence

The emotional impact and confidence in CTG utilization generate a spectrum of opinions. Nearly half of the respondents (49%) attribute an increase in maternal anxiety to CTG use, countered by 31.5%, with 19.4% holding a neutral view. Regarding feelings of vulnerability, 61.2% express discomfort in the absence of a CTG, with 22.3% dissenting. The confidence in juxtaposing personal observations with CTG indications presents a mixed landscape, with 33% refraining from taking a definitive stance, highlighting a complex interplay between human judgment and technology.

#### 3.1.5. Dependence on CTG and Impact on Childbirth

The survey also delves into the perceived dependence on CTGs and their influence on the childbirth process. The notion of over-reliance on CTGs among peers is endorsed by 55.3%, with a small minority (20.4%) disputing this. A remarkable 50% concur that midwives' skills might be overshadowed by excessive CTG reliance. Conversely, 81.6% underscore the supportive role of CTG in midwifery practice as being essential. A near-half (50.5%) of respondents believe that CTG

does not tarnish the beauty of childbirth, a perspective further reinforced by 81.6% recognizing its necessity in labor induction and management. Summarily, the answers given in the questionnaire are presented in Table 2.

**Table 2** The responses to the questionnaire are collectively summarized

		D (%)	U (%)	A (%)
1	I believe CTGs can lead to unnecessary medical intervention	34.4	12.2	53.4
2	I could not imagine working without a CTG being available in case an emergency arises	11.6	6.4	82.0
3	I feel CTGs are so routine, they are virtually invisible during birth	60.2	17.5	22.3
4	I do not like using CTGs	76.7	15.5	7.8
5	I think using any technology in childbirth is undesirable	76.7	13.6	9.7
6	I think CTGs undermine my own skills	71.8	16.1	12.1
7	I like using CTGs	8.2	20.1	71.7
8	I believe that using a CTG increases a mother's anxiety	31.6	19.4	49.0
9	I feel I can routinely monitor the CTG signals without being distracted from the mother	10.7	12.6	76.7
10	I think CTGs are a major benefit to midwives	6.3	6.3	87.4
11	I believe CTGs can give rise to the wrong decisions being made	16.1	15.5	51.9
12	I only use a CTG when it is absolutely necessary	31.5	17.1	51.4
13	I think the CTG distracts attention away from the mother	32.5	15.5	52.0
14	I always trust the CTG's readouts over my own observations	23.3	33.0	43.7
15	I think medical colleagues rely too much on CTGs	20.4	24.3	55.3
16	I believe midwives' skills are undermined by over-reliance on CTGs	50.0	17.5	32.5
17	I think CTGs are vital in helping a midwife to decide when medical intervention is needed	7.3	11.1	81.6
18	I feel vulnerable if a CTG is not available	22.8	16.0	61.2
19	I rely on the CTG when I am not sure what is happening	15.5	21.9	62.6
20	I think CTGs spoil the beauty of a birth	50.5	17.0	32.5
21	I don't feel entirely confident in my ability to use a CTG	75.2	8.3	16.5
22	I believe CTGs are essential for ensuring safe deliveries	23.6	20.1	56.3
23	I always trust my own judgement even when the CTG gives contrary indications	44.7	18.4	36.9
24	I believe CTGs are essential when labour is being induced	8.2	5.4	86.4
25	I feel that CTGs are often used unnecessarily	28.6	48.5	61.6
D = % disagree and strongly disagree, A= % Agree and strongly agree, U = % undecided				

#### 4. Discussion

The nuanced views on the necessity and deployment of cardiotocograms (CTGs) in obstetric care are indicative of the complexity of clinical practice. A belief among 53.3% of respondents that CTGs may induce unnecessary interventions aligns with prior concerns in the literature [9]. However, an 82% approval of CTGs during emergencies reflects a dependence on technology in critical situations, despite the divided stance on judicious use, echoing previous observations of conflicting policies and guidelines in practice [10][11][12].

Contrary to the assumption that CTGs have become an unnoticed routine, a majority refute this belief, reflecting an active engagement with technology and a recognition of its implications. This perspective contrasts with criticisms of technology as dehumanizing [13][14]. A significant majority (71.8%) do not perceive their skills as compromised by

CTG usage, attesting to the understanding that midwives rely on experience and intuition [15]. However, acknowledgment of potential risks in decision-making might signal awareness of the possible erosion of professional skills [16], emphasizing the delicate balance between technology and human judgment.

Mixed responses on the emotional impact and confidence in CTG utilization reveal a complex interplay between human judgment and technology. This complexity resonates with previous findings indicating that the effectiveness of CTG technology continues to be hampered by inconsistencies in interpretation [17][18][19]. The perception of over-reliance on CTGs among 55.3% aligns with concerns about technology altering and de-emphasizing certain existing skills [10][16]. Yet, overwhelming support for CTGs in midwifery practice and labor management reflects broader acceptance of technology integration in childbirth.

The duality in the survey findings, with 50% concurring that midwives' skills might be overshadowed by excessive CTG reliance, contrasted by 81.6% recognizing CTGs as essential, resonates with previous findings on the perceived increase in interventions with CTG monitoring [20]. This highlights a multifaceted understanding of CTGs, where clinicians actively engage with, reflect on, and respond to technology in their practice.

---

## 5. Conclusion

The research on midwives' attitudes towards the use of cardiotocography (CTG) in Greece has illuminated a complex landscape of opinions and practices within obstetric care. The findings demonstrate both acceptance and skepticism, reflecting the intricate balance between technology and human judgment in childbirth management. A significant proportion of respondents acknowledged the essential role of CTG, especially in emergencies, but also expressed concerns about unnecessary medical interventions. Although there were divergent views on routine usage, skills, and decision-making, a strong positive sentiment emerged, favoring the integration of technology in childbirth.

This study has unveiled a rich spectrum of beliefs, emotions, perceived dependence, and professional perspectives on CTG. The insights gained reveal not only the supportive role of CTG in midwifery practice but also an acknowledgment of its potential influence on the childbirth process without overshadowing the beauty of childbirth.

This investigation into the attitudes of midwives in Greece contributes valuable understanding to a critical aspect of maternal care. It forms a foundational basis for future research and sheds light on the delicate interplay between technology, professional skills, individualized care, and the evolving landscape of childbirth management. The insights garnered encourage the continuous pursuit of best practices, fostering improved collaboration, training, and policy development in maternal and newborn health.

### *Limitations*

The present study has certain limitations as it focuses solely on the use of continuous cardiotocography in the delivery room and does not examine other routine examinations that may possibly take place. Furthermore, it does not objectively evaluate the respondents' ability for the effective and correct use of cardiotocography, as well as the interpretation of the results. Nevertheless, it studies the attitudes of midwives and obstetricians regarding the use of cardiotocography and constitutes a foundation for conducting corresponding research in the future and drawing reliable conclusions.

---

## Compliance with ethical standards

### *Disclosure of conflict of interest*

No conflict of interest to be disclosed.

### *Statement of informed consent*

Informed consent was obtained from all individual participants included in the study.

---

## References

- [1] Fetal Heart Monitoring. J Obstet Gynecol Neonatal Nurs. 2015 Sep-Oct;44(5):683-6. doi: 10.1111/1552-6909.12743. Epub 2015 Jul 15. PMID: 26183597.

- [2] Ayres-de-Campos D, Spong CY, Chandrharan E; FIGO Intrapartum Fetal Monitoring Expert Consensus Panel. FIGO consensus guidelines on intrapartum fetal monitoring: Cardiotocography. *Int J Gynaecol Obstet*. 2015 Oct;131(1):13-24. doi: 10.1016/j.ijgo.2015.06.020. PMID: 26433401.
- [3] German Society of Gynecology and Obstetrics (DGGG); Maternal Fetal Medicine Study Group (AGMFM); German Society of Prenatal Medicine and Obstetrics (DGPGM); German Society of Perinatal Medicine (DGPM). S1-Guideline on the Use of CTG During Pregnancy and Labor: Long version - AWMF Registry No. 015/036. *Geburtshilfe Frauenheilkd*. 2014 Aug;74(8):721-732. doi: 10.1055/s-0034-1382874. PMID: 27065483; PMCID: PMC4812878.
- [4] Liston R, Sawchuck D, Young D. No. 197b-Fetal Health Surveillance: Intrapartum Consensus Guideline. *J Obstet Gynaecol Can*. 2018 Apr;40(4):e298-e322. doi: 10.1016/j.jogc.2018.02.011. PMID: 29680084.
- [5] Ben M'Barek I, Jauvion G, Ceccaldi PF. Computerized cardiotocography analysis during labor - A state-of-the-art review. *Acta Obstet Gynecol Scand*. 2023 Feb;102(2):130-137. doi: 10.1111/aogs.14498. Epub 2022 Dec 20. PMID: 36541016; PMCID: PMC9889319.
- [6] Sanger N, Hayes-Gill BR, Schiermeier S, Hatzmann W, Yuan J, Herrmann E, Louwen F, Reinhard J. Prenatal Foetal Non-invasive ECG instead of Doppler CTG - A Better Alternative? *Geburtshilfe Frauenheilkd*. 2012 Jul;72(7):630-633. doi: 10.1055/s-0032-1315012. PMID: 25278624; PMCID: PMC4168322.
- [7] James S, Maduna NE, Morton DG. Knowledge levels of midwives regarding the interpretation of cardiotocographs at labour units in KwaZulu-Natal public hospitals. *Curatationis*. 2019 Nov 27;42(1):e1-e7. doi: 10.4102/curatationis.v42i1.2007. PMID: 31793307; PMCID: PMC6890571.
- [8] Maneesriwongul W, Dixon JK. Instrument translation process: a methods review. *J Adv Nurs*. 2004 Oct;48(2):175-86. doi: 10.1111/j.1365-2648.2004.03185.x. PMID: 15369498. Hinsliff SW, Hindley C, Thomson AM. A survey of regional guidelines for intrapartum electronic fetal monitoring in women at low obstetric risk. *Midwifery*. 2004 Dec;20(4):345-57. doi: 10.1016/j.midw.2004.03.001. PMID: 15571883.
- [9] Sinclair M. Midwives' attitudes to the use of the cardiotocograph machine. *J Adv Nurs*. 2001 Aug;35(4):599-606. doi: 10.1046/j.1365-2648.2001.01876.x. PMID: 11529960.
- [10] McKevitt S, Gillen P, Sinclair M. Midwives' and doctors' attitudes towards the use of the cardiotocograph machine. *Midwifery*. 2011 Dec;27(6):e279-85. doi: 10.1016/j.midw.2010.11.003. Epub 2011 Feb 3. PMID: 21295386.
- [11] Buckley, E.R., Dunn, N.J., 2000. Delivering quality in midwifery practice and education. In: Fraser, D. (Ed.), *Professional Studies for Midwifery Practice*. Churchill Livingstone, Edinburgh, pp. 179–197.
- [12] Cooper, M.C., 1993. The intersection of technology and care in the ICU. *Advances in Nursing Science* 15, 23–32.
- [13] Barnard, A., Sandelowski, M., 2001. Technology and humane nursing care: (ir) reconcilable or invented difference? *Journal of Advanced Nursing* 34, 367–375.
- [14] Benner, P., 1984. *From Novice to Expert: Excellence and Power in Clinical Nursing Practice*. Addison-Wesley Publishing Company, Wokingham.
- [15] Barnard, A., Gerber, R., 1999. Understanding technology in contemporary surgical nursing: a phenomenographic examination. *Nursing Inquiry* 6, 157–166.
- [16] Ayres-de-Campos, D., Bernardos, J., Costa-Pereira-Leite, L., 1999. Inconsistencies in classification by experts of cardiotocogram subsequent clinical decision. *British Journal of Obstetrics and Gynaecology* 106, 1307–1310.
- [17] Bracero, L.A., Roshanfekar, D., Byrne, D.W., 2000. Analysis of antepartum fetal heart tracing by physician and computer. *Journal of Maternal Fetal Medicine* 9, 181–185.
- [18] Zain, H.A., Wright, J.W., Parrish, G.E., et al., 1998. Interpreting the fetal heart tracing. Effect of knowledge and neonatal outcome. *Journal of Reproductive Medicine* 43, 337–367.
- [19] Tracey, S.K., Tracey, M.B., 2003. Costing the cascade: estimating the cost of increased obstetric interventions using the population data. *British Journal of Obstetrics and Gynaecology* 110, 717–724