

Acknowledgments

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Conflict of interest

The authors have no conflicts of interest.

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Introduction of cardiotocograph monitoring improves birth outcomes in women with preeclampsia in Ghana



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Perinatal mortality is closely linked to the availability of modern obstetric care [1]. Electronic fetal monitoring, including cardiotocography (CTG), is commonly utilized in high-income countries in the management of high-risk pregnancies. However, CTG is often unavailable in low-income settings, where rates of complicated pregnancy are highest.

The present retrospective observational study, conducted at Komfo Anoyke Teaching Hospital (KATH), a tertiary referral center in Kumasi, Ghana, between March 1 and August 2, 2012 examined the impact of introducing CTG technology on perinatal death among women with preeclampsia. Fetal outcomes were analyzed based on exposure to CTG (monitoring status) and the period of delivery (pre- or post-CTG implementation) to examine the impact of the procedure itself and

associated background impacts. Informed consent was not needed for this study, as it was limited to retrospective analysis of de-identified patient records. Approval for the present study was obtained from the University of Michigan's Institutional Review Board and the Ethics Review Board at KATH.

Data were extracted from patient medical records for 12 weeks before (period A) and 8 weeks after (period B) the introduction of CTG technology at KATH. The inclusion criteria consisted of clinical diagnosis of preeclampsia, gestational age of at least 28 weeks, and fetal heart rate present on admission. Clinical diagnoses of preeclampsia were based on written diagnoses from KATH physicians and were confirmed using the 2010 American College of Obstetricians and Gynecologists clinical guidelines for the diagnosis of preeclampsia (those available at the time of the study). These guidelines included persistently high blood pressure (>140 mmHg systolic, >90 mmHg diastolic) and high levels of proteinuria (>0.3 g) [2]. Records were categorized as monitored if records indicated that the patient had received 20-minute CTG monitoring on admission. All other patients were categorized as unmonitored. Demographic and clinical data were extracted to identify possible confounders. A perinatal death was recorded when records indicated an unexpected stillbirth or neonatal death prior to discharge. Data were analyzed using SAS 9.4 (SAS Institute Inc., Cary, NC, USA). A two-sided t-test was utilized to compare perinatal death rates. $P < 0.05$ was considered significant.

In total, 372 records were analyzed. When comparing outcomes by time period, a perinatal death was noted in 44 of 254 patient records (17.3%) during period A, in comparison with eight of 118 patient records (6.8%) in period B. This represents a significant ($P = 0.01$) decrease in perinatal mortality following the implementation of CTG technology. When period-B records were stratified by monitoring status, a notable, but non-statistically significant ($P = 0.1$) reduction in perinatal mortality was observed in the monitored group; two of the 43 monitored patient records (4.7%) indicated a perinatal death in comparison with six of the 75 unmonitored records (8.0%). There was

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no significant difference in the cesarean-delivery rates following CTG implementation and no significant difference in patient demographic characteristics across the time period and monitoring status.

The observed perinatal mortality rate across both study periods was high. In part, this is likely a reflection of patient acuity at KATH, which, as a tertiary referral hospital, often serves as the first point of care for women with advanced pregnancy complications, potentially with compromised fetuses on admission. Previous studies [3] have suggested that adding fetal-assessment techniques decreases perinatal mortality from fetal hypoxia. The significant improvement in perinatal mortality in period B, regardless of monitoring status, suggests that the process of implementing new technology may also be associated with factors that benefit fetal outcomes (e.g., increased training, clinical awareness). The currently available technology only allows for a subgroup of high-risk women to receive CTG assessments. The demonstrated improvement in perinatal mortality observed illustrates an opportunity to fill a gap in maternal care that could offer high-impact improvements for perinatal outcomes. Full implementation of appropriately applied fetal-assessment technology offers significant potential in allowing obstetricians to end preventable early-neonatal mortality and stillbirth [4].

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Conflict of interest

The authors have no conflicts of interest.

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