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# Midwives' and Women's Perception on Moyo Fetal Heart Rate Monitor for Intrapartum Fetal Heart Rate Monitoring; A Cross-Sectional Study

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**Background:** The annual global neonatal mortality stands at 2.5 million deaths, 1 million of them dying within the first day of life. An additional 2.6 million are stillborn globally, the majority of them due to intrapartum events. Optimal fetal heart rate (FHR) monitoring has the potential to timely detect fetuses at risk and, if coupled with timely obstetric responses may save more newborns. Moyo is a new Doppler with nine crystals capable of monitoring FHR both intermittently and continuously.

**Aim:** To assess women's and midwives' opinions on the use of Moyo for intrapartum FHR monitoring.

**Methods:** We conducted a cross-sectional study using a structured questionnaire to assess women's and midwives' perception. Women who gave birth at the hospital who used Moyo were interviewed using a questionnaire immediately before discharge from the hospital. Twenty-eight midwives who have been using Moyo for more than 6 months were also interviewed using a structured questionnaire. Data were analyzed using excel and result presented in figures.

**Results:** In total 113 postpartum women who were monitored using Moyo were interviewed before discharge. Out of these, 46 (40.7%) were first-time mothers and the rest were multipara. In total, 95 women (84.1%) used Moyo and other devices for FHR monitoring, 81 (72%) said Moyo was better than Fetoscopes and handheld Doppler, two-third 75 (66.4%) felt that Moyo was comfortable and 93 (82.3%) would like Moyo to be used on them in the future. Out of 28 midwives, 11 (39.3%) used Moyo continuous only, 3 (10.7%) used Moyo intermittently only and 14 (50.0%) used both intermittent and continuous. Thirteen (46.4%) midwives prefer to use Moyo both intermittent and continuous. Sixteen (55.6%) said Moyo was effective, 21 (75%) felt comfortable to use Moyo, and 13 (46.4%) said Moyo was easy to use.

**Conclusion:** The majority of midwives and women who used Moyo felt that Moyo was comfortable for intrapartum FHR monitoring. Moyo can be used both intermittently and continuously depending on the user's preferences.

**Keywords:** Moyo, fetal heart rate, labor, midwives, women

## Introduction

Intrapartum Fetal heart rate (FHR) monitoring intends to assess the well-being of the fetus and the FHR response to labor for timely obstetric responses.<sup>1</sup> Optimal FHR monitoring coupled with timely obstetric responses is key to ensured good perinatal outcome.<sup>2,3</sup> Globally, there are about 2.5 million neonatal deaths and 2.6 million stillborn annually. Almost half of the stillborn are alive at the start of labor. Likewise, 44% of the neonatal deaths occur on the first day of life and are the

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results of intrapartum events.<sup>4,5</sup> Events during labor including birth asphyxia account for one-quarter of the global newborn deaths.<sup>6</sup> More than half of newborns deaths of term babies with normal birth weight in a rural hospital in Tanzania found to be associated with birth asphyxia.<sup>7</sup>

In the resource-limited settings with high neonatal mortality rates, FHR monitoring is mainly performed intermittently using Pinard Fetoscope.<sup>8</sup> However, recently, Doppler has been tested for intermittent FHR monitoring in several parts of low-resource setting showing evidence of effectiveness in detecting abnormal FHR.<sup>9–11</sup> The wind-up hand-held Doppler use among women seems to be more preferred by laboring women as compared to fetoscope.<sup>12</sup>

Moyo is a novel strap-on FHR monitor equipped with a rechargeable battery (Figure 1). When fully charged, the battery can last for more than 10 hrs while being used for continuous monitoring. Moyo monitor contains nine-crystal Doppler ultrasound sensors which facilitate the rapid identification of FHR (within 5 s) and has a wide detection area

(15 cm radius) hence eliminates the necessity of palpating the area of high FHR intensity as is for Fetoscope and ordinary Doppler. It is designed for both intermittent auscultation and continuous monitoring. In a situation where it is uncertain whether the detected heart rate is fetal or maternal, Moyo has two dry-electrode electrocardiograms for the mother to place her fingers. Both the maternal and fetal pulse rates are then simultaneously displayed. The inbuilt alarm function will alert the midwives in case of persistent (>3 mins) abnormal FHR when used in continuous mode.<sup>13,14</sup>

Moyo has been in use since 2015 both in rural and urban Tanzania<sup>13,14</sup> but the users' opinions (both women and midwives) are less explored. The present study assessed the midwives' and women's opinions on the intrapartum use of Moyo for FHR monitoring.

## Methods

### Study Setting

The study was conducted at Haydom Lutheran hospital which is a referral hospital located in rural Northern



**Figure 1** Moyo fetal heart rate monitor.

Tanzania, 300 km from the nearest urban center with a well-established infrastructure for collaborative research and data collection. It is the referral hospital for approximately 500,000 people, while the greater reference area covers about two million people. The hospital has about 4500 deliveries per year with a cesarean section rate of 21%. Intrapartum FHR monitoring was mainly performed intermittently using a fetoscope and handheld Doppler until 2015 when Moyo was introduced into clinical use. The intrapartum care is mainly done by midwives who are responsible for managing normal pregnancy, labor, and delivery. Intern Doctors in consultation with obstetricians are responsible for supporting midwives during difficult deliveries including performing a cesarean section. All midwives and doctors were trained on the use of both fetoscopes, free play handheld Doppler and Moyo. All these devices were used for intrapartum FHR monitoring in the labor ward for at least 1 year prior to the study. Midwives had a choice which device to use for FHR monitoring.

## Study Design and Data Collection

This is a cross-section survey conducted at Haydom Lutheran Hospital maternity ward between July and September 2017. The pretested structured questionnaire was used to interview women post-delivery before discharge. The main focus of the questionnaire was the women's experience of Moyo used on them during labor. The questionnaire included questions regarding preference and if a woman prefers Moyo or other devices. Women were asked to grade the Moyo comfortability as: (1) Very comfortable, (2) Comfortable, (3) Not comfortable, (4) Very uncomfortable. Comparing with other devices, women who ever used other devices were asked to grade Moyo in comparison with previously used devices as: (1) Previous device was better than Moyo; (2) They are the same; (3) Moyo is better than the previous one. Women were asked if they would like Moyo to be used on them next time. They answered the question by grading as: (1) Not at all; (2) Not sure; (3) I want Moyo to be used on me; (4) I would prefer another device if available.

Midwives were interviewed using the structured questionnaire regarding their opinions on using Moyo as compared to other fetal heart monitoring devices used in the setting. The focus was to assess the easiness of use, comfortability of use and perceived effectiveness.

The research nurses interviewed women using the questionnaires at their convenient time using the language of their choice. The midwives were given a self-

administered questionnaire in the Swahili language and asked to fill the questionnaire.

## Sample Size Estimations and Data Analysis

We employed a convenient sampling technique, where postpartum women whom Moyo used to monitor fetal heart rate during the study period were recruited. Women with a negative labor outcome were excluded from the study.

The maternity ward had 36 midwives during the study period, 30 of them involved in labor-management and therefore have used Moyo and other fetal heart rate monitoring devices at the hospital. Twenty-eight of them who had worked in the labor ward for at least 6 months at recruitment, were approached and consented and completed the questionnaire. Data analysis was performed using Excel, bar graphs were used to present results.

## Ethical Considerations

The permission to conduct the study was granted by the hospital authority and Tanzania National Institute for Medical Research (NIMR) ethical committee. Researchers were trained on confidentiality and signed a confidentiality agreement to ensure the confidentiality during the data collection. The hospital and the National ethical committee (NIMR) approved the use of verbal consent which was obtained from all women and midwives before filling the questionnaires.

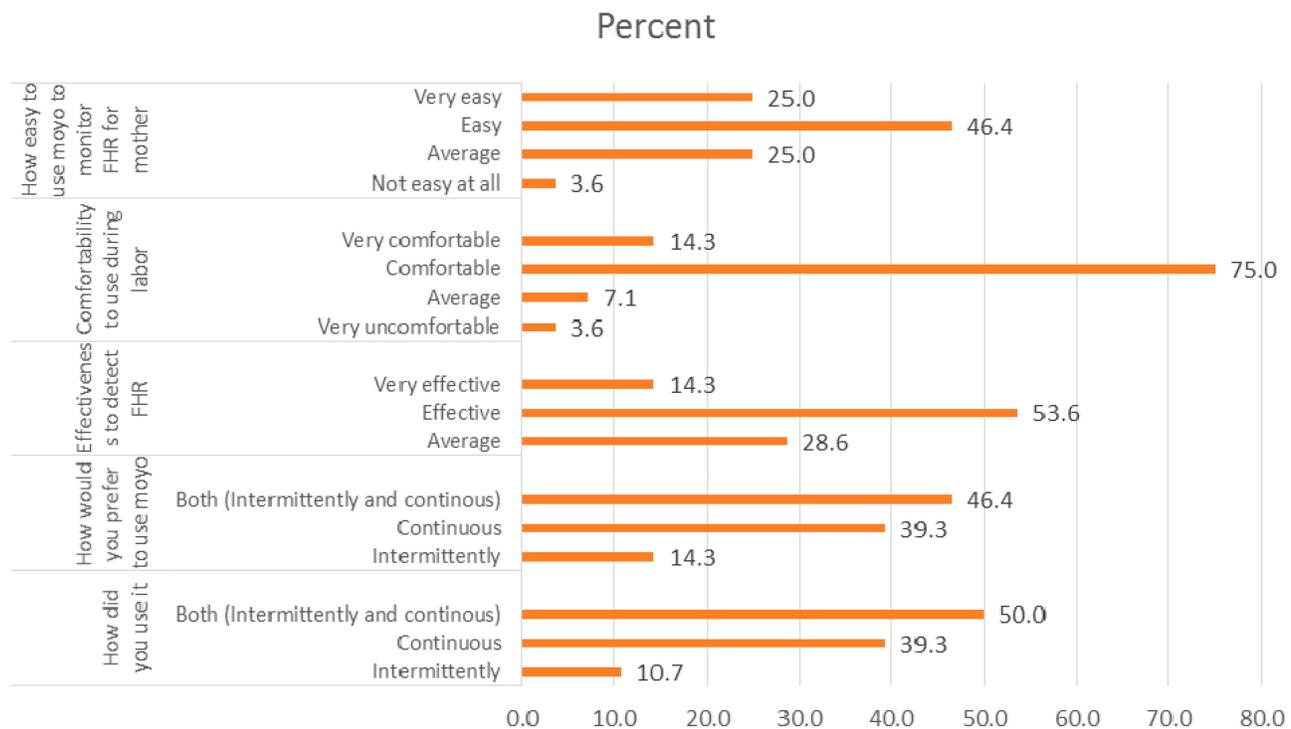
## Results

During the study, 141 midwives and women participated in the study, 28 midwives (24 females and 4 Males), and 113 postpartum women.

The age of midwives filled the questionnaires were in the range of 21–50 years, all of them had used Moyo for monitoring FHR either intermittently (14/28), or continuous only (11/28) or both (14/28). The average years of working as midwife was 3.6 years.

More than 70% of midwives thought that Moyo was either very easy or easy to use for intrapartum FHR monitoring. Almost 90% and more than half of the midwives thought that Moyo was comfortable to use and effective for intrapartum FHR monitoring, respectively, [Figure 2](#).

The age of women interviewed were in the range of 19–44 years, two-fifth of them being first-time mothers at the time of interview. More than 90% of women interviewed admitted that the device was comfortable with



**Figure 2** Midwives opinions on using Moyo for intrapartum FHR monitoring.

them. More than 70% of the interviewed women who have ever used other devices admitted that Moyo was better than the other ever used devices for intrapartum FHR monitoring, [Figure 3](#).

## Discussion

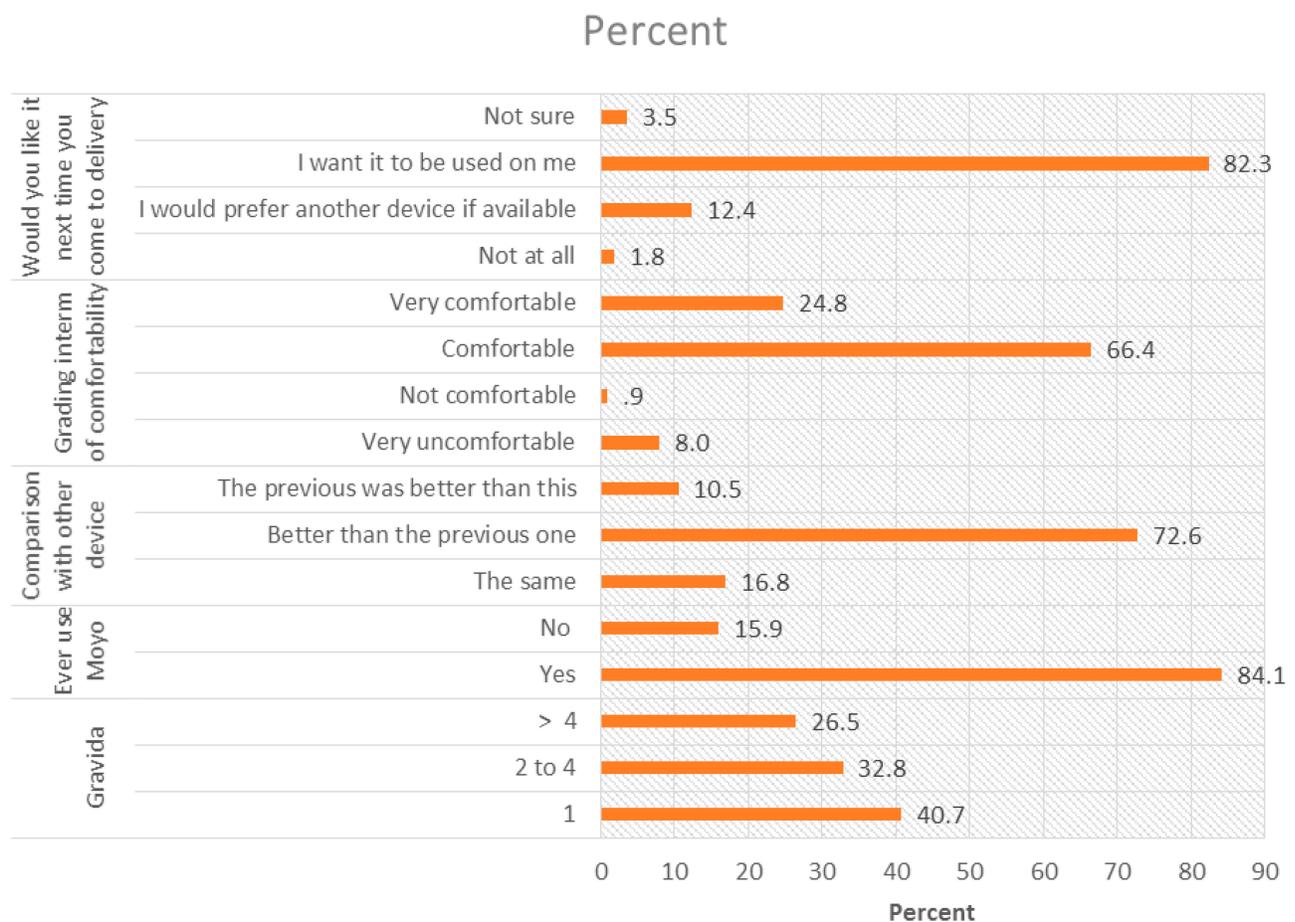
Fetal heart rate monitoring during labor is the most and necessary part of labor management. Devices commonly used to monitor intrapartum FHR were fetoscope and single-crystal Doppler which were used intermittently. Moyo is the multi-crystal Doppler capable of monitoring FHR both intermittently and continuously. It was recently introduced for FHR monitoring, for most midwives Moyo was new and used for the first time at Haydom Lutheran Hospital. Likewise, it was new to most women who gave birth at Haydom even among the multipara's women.

The present study reports that both midwives and women liked Moyo and thought it was much more comfortable in monitoring FHR. The findings concur with Mangesi L et al 2009 findings, that women and midwives were comfortable using Doppler as compared to fetoscope.<sup>12</sup> Likewise, the two studies conducted by Sara et al 2018 and 2019 report similar findings that women felt that Moyo was good on them and they were more comfortable likewise, the midwives liked using Moyo.<sup>15,16</sup>

Midwives and mothers seem to adapt Moyo easily, about 90% of midwives were comfortable using Moyo and 66.4% of women said were comfortable when Moyo used on them. This may mean that they both understand how it works and they are satisfied with the technology. Additionally, this is a good indication that Moyo can easily be adapted by midwives working in the low setting areas as was targeted. The midwives' positive perception of Moyo may have influenced their usage and trust on the device hence facilitate the proper utilization of the device. Likewise, women on whom Moyo used, they liked it which may have facilitated good communication and interaction between laboring women and the attending midwife.

The pre and post-implementation study using Moyo in one of the urban hospitals showed that the level of partogram documentation improved during the Moyo use as compared to before Moyo.<sup>17</sup> In the same setting midwives and women had a strong positive perception towards Moyo in-terms of comfortability and effectiveness.<sup>15,16</sup> Our findings are similar to these studies conducted in the urban hospitals. The result of this present study should be translated into improved FHR monitoring practices including timely responses.

The strength of the study: The measure of both providers and women who received services gave strength to the study. Likewise, interviewing women shortly before



**Figure 3** Women's opinions on Moyo compared with other FHR monitoring devices ever used on them.

discharge gave them more freedom to share their opinions thus reduced the chance of biased information.

## Limitations

The study had several limitations including a single-site study, not including women with unpleasant labour outcomes. Use of questionnaire limit women and midwives to give details or explain themselves about the equipment thus in-depth interview could be more appropriate.

## Conclusion

Intrapartum fetal heart monitoring using Moyo perceived positively by both midwives and women. The majority of women and midwives who used Moyo felt that Moyo was comfortable for intrapartum FHR monitoring. Moyo can be used both intermittently and continuously depending on the user's preferences.

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## Author Contributions

All authors contributed to data analysis, drafting and revising the article, gave final approval of the version to be published, and agree to be accountable for all aspects of the work.

## Disclosure

The authors report no conflicts of interest in this work.

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