

Maternal perception of fetal movements: views, knowledge and practices of women and health providers in a low-resource setting

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Abstract

Objective To assess the perception, knowledge, and practices regarding maternal perception of fetal movements (FMs) among women and their healthcare providers in a low-resource setting. **Design** Qualitative study. **Setting** The maternity unit of Mnazi Mmoja Hospital, Zanzibar, Tanzania. **Population** Pregnant and postpartum women, and health providers. **Methods** Semi-structured interviews, questionnaires and focus group discussions were conducted with 45 Zanzibar women (18 antenatal, 28 postpartum) and 28 health providers. **Main outcome measures** Descriptive and thematic analyses were conducted to systematically extract subthemes within four main themes 1) knowledge/awareness, 2) behavior/practice, 3) barriers, and 4) improvements. **Results** Within the main themes it was found that 1) Women were instinctively aware of (ab)normal FM-patterns and healthcare providers had adequate knowledge about FMs. 2) Women often did not know how to monitor FMs or when to report concerns. There was inadequate assessment and management of (ab)normal FMs. 3) Women did not feel free to express concerns. Healthcare providers considered FM-awareness among women as low and unreliable; lack of staff, time and space for FM-education, and no protocol for FM-management. 4) Women and health providers recognized the need for education on assessment and management of (ab)normal FMs. **Conclusion** Women expressed FMs in an adequate way and perceived abnormalities of these movements better than assumed by health providers. There is a need for more evidence on the effect of improving knowledge and awareness of FMs in order to construct evidence-based guidelines for low resource settings.

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Keywords Fetal Movements; Stillbirth; Low- and middle-income countries; Low-resource settings

Tweetable abstract Women and health workers in Zanzibar recognize the relevance of fetal movements, evidence on its integration in care is needed

Introduction

Effective interventions are needed to meet the Sustainable Development Goals and The Every Newborn Action Plan for newborn mortality and stillbirth reduction ([?]12 per 1000 births by 2030), particularly in middle- and low-income countries where the burden is greatest.(1) A range of simple to sophisticated methods to detect problems during pregnancy and birth have been developed.(2) Fetal movements (FMs) are the oldest and most basic form of fetal monitoring and can be done by the mother herself without any resources. The complexity of movements requires fetal neuromuscular development and a normal metabolic state of the central nervous system.(3) Women, on average, start to feel movements between 18-20 weeks of gestation and will quickly be aware of a regular, personal pattern of movements of their child.(4, 5) The amount of daily movements increase during the third semester and reach a plateau in the last six weeks of pregnancy. Direct experimental evidence in fetal lambs (6) and observational evidence in human fetuses (7) indicate that reduced body movements and breathing movements is an appropriate physiological response to conserve energy during hypoxia or acidaemia. These alterations in movements have been shown to precede a stillbirth before any other recordable fetal changes, and are registered as early as 48 hours to two weeks before the confirmation of fetal death.(8-12) Newborn babies with hypoxia are typically limp and immobile, until the physiological transition to continuous respiration.(13) This suggests that early detection and management of reduced FMs may prevent adverse perinatal outcomes. (8-11) However there is insufficient evidence from randomized trials to guide clinical practice. (14-16) Limitations of these randomized trials is that reporting decreased fetal movements is an intuitive action which cannot be eliminated from the control group and the fact that all trials have been conducted in high-income countries.(17) There is a dearth of evidence on women's and healthcare provider's awareness, knowledge, subsequent practices and use of FMs as a strategy to prevent stillbirths in low-resource settings. Therefore, this study aimed to explore knowledge and perspectives on maternal perception of FMs and practices on perceived abnormal fetal movements among mothers and healthcare providers in a busy maternity unit in a low-income country.

Methods

Study design

This study was embedded within a large prospective study that investigated a tool to assess and triage women on admission to the labor ward.(18) Assessment of maternal perception of fetal movement was an important component of this tool. This part of the study used a mixed-method approach to provide a comprehensive and in-depth understanding of the topic within the contextual limitations. Semi-structured interviews were conducted with women and antenatal care (ANC) nurses; focus group discussions (FGDs) supplemented with questionnaires were used among skilled birth attendants. This study was reported according to the COREQ checklist (Tabel S1).(19)

Setting

This study was conducted in the new maternity unit of Mnazi Mmoja Hospital (MMH), the referral hospital on the Zanzibar archipelago that caters for 11,000-13,000 births annually.(20) The facility-based stillbirth rate at MMH is 39 per 1000 total births, around half of which occur intrapartum.(21, 22) The maternity unit consists of a maternity ward with one admission-, three labor- and delivery rooms, and two ANC clinics. The regular ANC is run by nurses. The obstetric ANC functions as referral clinic for women with complications during pregnancy and is operated by registrar doctors.

Participant selection

Participants in both the antenatal and postpartum period were interviewed to elicit women and healthcare providers' experiences and practices with FMs throughout pregnancy and labor care (including the time of admission). Between October 2017 and February 2018, all nurse-midwives and doctors (registrars and intern doctors) of the department were invited to participate in a questionnaire and FGD which took place

outside working hours. In addition, pregnant women, [?]18 years and [?]18 weeks gestational age presenting to the ANC clinics (either routine or obstetric clinic) were selected via convenient sampling for one-time semi-structured interviews. Postpartum women were recruited before hospital discharge using purposeful sampling to include women with and without adverse perinatal outcomes (stillbirth, neonatal death and/or Apgar score <7 at 5 minutes). Privacy was ensured by interviewing women in private rooms or spaces.

Data collection

The researchers developed a questionnaire and interview- and FGD-guidelines to explore the main themes (Table S2): awareness and knowledge, behavior and practices, barriers and opportunities for improvements in the usage of maternal perception of FMs for fetal surveillance. Behavior and practices around FMs were assessed at three distinct time points: during antenatal care, on admission to the labor ward and intrapartum. Data collection tools were translated to Kiswahili and pilot tested. A Kiswahili speaker, either a female intern doctor or a female researcher with a diploma in psychology, conducted the antepartum and postpartum interviews, assisted by a foreign medical student (KW). A male intern doctor and native speaker (RSK) with prior experiences in moderating FGDs mediated the FGDs, assisted by KW and NH. All researchers except NH did not work at the maternity unit at the time of the study. Antepartum and postpartum interviews lasted 15-30 minutes and 5-20 minutes respectively, while the FDGs with staff members lasted 40-90 minutes. Recruitment of participants continued until saturation of information was reached. Interviews were translated immediately to English and detailed field notes were written down during interviews, both in Kiswahili and English. FGDs were audio recorded with the permission of participants and afterwards transcribed and translated by RSK. Transcripts were not returned to participants. Questionnaires (a combination of multiple-choice and five-point Likert scale questions) were anonymously self-administered and completed by the health providers prior to the FGDs (Table S3).

Sociodemographic characteristics (age, marital status, education, occupation and obstetric history) and perinatal outcomes of participating women were collected from participants, ANC cards, hospital files and, if necessary, from data of the main study.

Ethics

The study was approved by the Zanzibar Medical Research and Ethics Committee in August 2017 (Protocol no: ZAMREC/0004/AGUST/17). Written informed consent was obtained from all participants, interviews were voluntary and participants were able to decline participation at any time.

Data analysis

Qualitative data was analyzed using thematic analysis using the major themes of interest: knowledge/awareness, behavior/practice, barriers, and improvements. These themes were selected in advance in order to fulfill the aim of this study. Data of the FGDs were analyzed using whole groups (i.e., nurse-midwives and doctors). After familiarization with FGDs and interviews, open coding was conducted by KW using the software MAXQDA version 12. Codes were analyzed for patterns and systematically combined into subthemes. Questionnaires were entered into a KoBoToolbox electronic database. Quotes of antepartum women, postpartum women and ANC nurses were reported as 'AP[number]', 'PP[number]' or 'N[number]' respectively. For FGDs, quotes of nurse-midwives and registrars were reported as 'M[number]' or 'R[number]'. If the researchers were unable to determine the exact nurse-midwife or registrar, the individual was reported as 'Mx' and 'Rx' respectively. Descriptive analysis was performed on quantitative data using Microsoft Office Excel 365 ProPlus with the aim of substantiating the qualitative data.

Results

Baseline characteristics

Eighteen women in the ANC clinics, 28 post-delivery women and three ANC nurses were interviewed. In addition, 25 skilled birth attendants (six registrar doctors and 19 nurse-midwives) participated in four FGDs; one group with six registrars and three groups with nurse-midwives (consisting of five, eight and six

participants). This selection was considered a good reflection of the entire staff. The health providers also completed the questionnaire (n=28). Characteristics of women and health providers are summarized in table 1. The median age for ANC and postpartum women was 28.3 [Interquartile range (IRQ): 19-41] and 26.2 [IQR: 19-37] years respectively. The majority of participating women at least finished primary education and were unemployed (housewives). Gravidity and parity were equal in both groups of women. Due to purposeful sampling, half of the postpartum women experienced adverse perinatal outcomes. The majority of staff members had one to five years of experience in labor care (table 1). As expected, the nurse-midwives performed admission assessment of women in labor.

An overview of themes and subthemes is presented in figure 1.

Knowledge and awareness

Variety in describing perceived FMs

Women used a variety of Kiswahili vocabulary to describe movements they experienced: ‘*anacheza*’ (it plays), ‘*anapiga*’ (it kicks), ‘*anazunguka*’ (it rotates), ‘*anatembea*’ (it walks) and ‘*anaogelea*’ (it swims), ‘*anasukuma*’ (it pushes) and ‘*anatwita*’ (it beats/flicks). Healthcare providers considered fetal movements as kicks, rolling, hiccups or playing of the fetus (table 2).

General awareness of FMs

All ANC women remembered the first time they felt their baby move and the pattern of their baby’s movements in the recent days. Participant descriptions of FM patterns were variably associated with time-of-day, maternal activity and in many cases environmental stimuli such as maternal hunger, eating, maternal position or touching the abdomen.

AP3: ‘*Normally, I feel it kicking mostly after eating, in the morning and in the afternoon. When I’m resting the baby starts kicking... I know what’s normal for my baby.*’

AP1: ‘*With the stillbirth I had before, it happened that I was worried then. Now I’m even more alert.*’

All health providers understood FMs that was line with the following:

M5: ‘*Fetal movement (‘*uchezaji wamtoto*’) is the movement felt by the mother during pregnancy, which normally starts to be felt from the 16th week of gestation age until the time of delivery.*’

Interpretation of fetal movements and their abnormal patterns

All women interviewed in the ANC considered FMs as a sign of life of the fetus and a form of communication between fetus and mother.

AP12: ‘*When the baby is kicking, I know it’s continuing in good health. It’s doing well*’ AP6: ‘*When I’m too busy the baby will let me know by kicking me once very strongly. That’s how it tells me to slow down. Normally the baby is quiet at night, but when I’m lying on one side for too long the baby will kick strongly, as if to tell me, or reminds me ‘Hey! Turn the other side!’*’

Half the ANC women perceived FMs as abnormal, or worrisome, if they become absent. Other women found FMs abnormal if they become weaker or less frequent than usually.

AP17: ‘*I would be worried if the baby won’t kick when I’m used to feeling it kick or when I feel that it’s uncomfortable*’ AP3: ‘*If the baby is not kicking, I will be worried (...). Because maybe the baby already started to die*’

Furthermore, women also perceived FMs and their changes during labor:

PP13 (36 years old gravida 6, delivered a healthy baby): ‘*When my blood pressure was high [250/120 mmHg], I felt the baby was moving differently. It moved slower than before that. During labor also it sometimes stopped moving which worried me.*’ PP22 (37 years old gravida 7, delivered a baby with Apgar score of 2 in 1 minute. The baby died within minutes after): ‘*At home it [FMs] was just fine, but since I arrived, I felt it became*

less and less. I already started to drain [losing amniotic fluid] at home but once I arrived here, I drained more and after that the movements became even weaker'

All health care providers also considered the presence of FMs as a sign of health of the fetus and mother. Reported worrying changes included reduced ($n = 23$, 82.1%), absent (54.6%, $n=15$) and increased FMs (46.4%, $n=15$). (Table 2) Various causes of abnormal FMs were given such as maternal as well as fetal conditions such as fetal maternal emotions, activity, hunger, intake of herbal medication, anemia, infection, hypertension and bleeding, position and sleep state of the baby, polyhydramnios and oligohydramnios. Pointing to a poster on the wall, an ANC nurse also indicated that abnormal FMs is one of the danger signs they look out for.

M14: *'To ask a mother whether her baby moves or not helps us to decide whether it's alive or not. They [FMs] may be increased or decreased which will help us to know whether the baby is healthy or not.*R1: *'If it's absent, the baby died already, if it's decreased the baby could be in distress'*

Behavior and Practice

Monitoring and assessment of FMs

Staff assessed FMs by asking women (78.6%, $n=22$) whether the baby is playing ('*anacheza*') or kicking ('*anapiga* '), by palpation of the abdomen (39.3%, $n=11$) and/or by ultrasound (39.3%, $n=11$).

Antenatal

All ANC women stated they instinctively knew when something was wrong with their baby through the way the fetus moves. None of the women in the ANC said they monitored FMs by means of writing down or counting.

AP5: *'I don't monitor; I just know when something is wrong. I recognize every change'*

Nearly all staff responded that they '*almost always*' or '*often*' assess FMs when assessing women in the clinic, on admission and during labor (table 2). However, answers were variable during interviews and FGDs: the two nurses in the regular ANC said they always assessed FMs, and staff in the obstetric clinic stated they assessed FMs only if there was a complaint from the mother. Yet, the majority of women (13/18, 72%) told they were never asked about FMs at the ANC clinics of MMH.

Admission to the labor ward

Postnatal women remembered being asked about FMs on admission to the labor ward (24/28, 85.7%; either by a research assistant as part of this study or by routine nurse-midwives). However, only 9/28 (32.1%) women had FMs findings documented in their hospital file. Nurse-midwives were almost unanimous in reporting that they always ask mothers about FMs on admission to the labor ward. Although many claimed they assessed timing and perceived changes in FMs, only information about the presence or absence of FMs was documented on the patient file.

M15: *'I will ask whether the baby is playing and then after she answers I will ask again how he plays: is it a lot or is it less?'*M5: *'You ask the mother: 'Is the baby playing?' and she will say it moves normally or not normally compared to how she used to feel it.'*Mx: *'You ask the mother 'How are your baby's movements today?' and will say 'It's normal or today the playing increased it decreased or I didn't feel the baby move today.'* Mx: *'...when we assess the mother and find no fetal heart rate we always ask about fetal movement to confirm fetal condition of health and viability'*

Intrapartum care

Opinions were divided regarding assessment of FMs during labor. Amongst nurse-midwives it appeared not to be routine practice.

Mx: *'In the ward we don't ask because even if you can ask, the mother cannot give the true answer while in labor. She may say that she doesn't know if there are movements because of the labor pain.... we just*

monitor fetal heart rate but movements we almost never assess during labor.'

Half of the registrars said they assessed FMs during labor, however the rest did not agree and elaborated:

R6: *'We normally don't ask in the labor ward, honestly. When we check the admission form and we find a [positive] FHR then we just monitor these women.'* R1: *'During labor, you only ask about FMs if there is an alarm sign. For example, you listen to the FHR and then you don't hear it, then you ask them: 'When did you feel your baby kick?'* R5: *'Or when there is bleeding, you ask them'*

Management of abnormal maternal perception of fetal movements

During pregnancy, women said they would eat, rest, massage the abdomen and wait if they get worried about the way their baby was moving. For how long they would wait before seeking health care differed from a few hours (22.2%, n=4), to more than 24 hours (44.4%, n=8) or up to two weeks (27.8%, n=5). All women who said they would present within a few hours had received health education in peripheral ANC clinics. Twenty-two percent (n=4) of the ANC women mentioned they had a history of seeking medical help because of abnormal FMs and wanted a fetal ultrasound. One woman in the ANC said she went to a midwife in her community for an abdominal massage.

AP2: *'When the baby will stop moving or I'm worried about it, I will not directly come to the hospital. First, I will wait and see what the situation is. If it's still not moving after 2 days, I will come to the hospital. I'm afraid to directly come to the hospital because maybe I will get shocking information or they will send me home because it was nothing. I prefer to wait and see'*

Asking for advice from relatives, their husband, friends or neighbors in case of worrisome FMs was mentioned by 10/18 (55.6%) of women in the ANC.

PP6 (20 years old gravida 1, experienced a stillbirth): *'I was concerned on admission, but actually 3 days before already, my baby had stopped moving. I asked my neighbor about this, she told me it was normal for the baby to stop moving towards term. So, I didn't worry that much. I also asked my mom whether it was normal for the baby to stop, but she didn't remember it anymore because it was too long ago she was pregnant herself. She could not advise me on this'*

Midwives stated that they will first assess a mother's mental, physical and social health and lifestyle because these all can contribute to abnormal FMs. All health providers stated they advise women to stimulate their baby with various means in case of absence of FMs: to exercise, drink cold water, eat something (sweet), change position or rest. Moreover, the staff unanimously responded that women should go to nearby clinic or hospital *'immediately'* or *'as soon as possible'*, *'even during the night'* in case of worrisome changes in FMs.

R2: *'You can save a baby or lose a baby in 1 hour, so why waste any time? Why wait?'*

Management of decreased or absent FMs at the clinic or hospital consisted of auscultation of fetal heart rate (FHR) and performing fetal ultrasound. Nurse-midwives commonly evaluated the mother and fetus to rule out problems and reassure mothers while registrars doctors usually suspected intrauterine fetal death. Women were advised and reassured if fetal viability was confirmed or they proceeded to further management in case of an intrauterine death or other complications.

Mx: *'First, I will ask the mother what happened before I can think of what caused the changes in FMs. Then we do an ultrasound and advise the mother to change position, especially if the ultrasound is normal. If it is abnormal we have to take action accordingly'* R2: *'When a woman for example comes to the hospital in the evening and complains about reduced fetal movements or that the movements have been absent for a couple of hours: you check FHR and you confirm [fetal] death'* R1: *'...we check FHR and if it's there and there are no other danger signs, we tell her to come back in 2 weeks.... Why not observe her here if there's any change in fetal movements?'*

Barriers to practice

Lack of knowledge and education

ANC and postnatal women said they have never been told or taught how to monitor FMs by health providers. Three women mentioned they were asked sometimes, particularly if there is a medical problem (e.g. hypertension). One third of women (n= 6/18) said they attended antenatal classes in other, peripheral, ANC clinics where they were taught about FMs. Three (11.1%) postnatal women told they did not know anything about the importance of FMs or what to do when changes were perceived.

PP1 (34 years old gravida 5, experienced a stillbirth): *‘Before and on admission my baby was moving less and less. During labor the baby stopped moving, I did not feel it anymore. What should I do next time when it stops moving?’*

Inability to always express concerns about perceived abnormal fetal movements

Many postpartum women said that they experienced worrying reduced or absent FM by the time of admission (11/28, 39.3%) and/or during labor care (13/28, 46.4%). We confirmed through our main study (18) that 7/11 of the women reported abnormal FMs on admission but, according to the documentation, four women did not report their concerns.

Only one third of women with reduced/absent FMs said that they expressed their concerns about FMs in the labor room. Reasons for not reporting include: women thought it was not important, they did not feel free, they were not asked, or the doctor was too busy. The majority of women who said they had perceived abnormal FMs on admission and during labor care (84.6%, n=11/13) had adverse perinatal outcomes (9/14 were perinatal deaths). The remaining two women had pre-eclampsia and delivered vaginally with healthy babies.

PP10 (Age and parity unknown, delivered a fresh stillborn baby): *‘During labor I was very worried because I didn’t feel the baby moving the way I was used to. In the evening the baby totally stopped moving and then I got an ultrasound scan. The baby was already dead when they did the ultrasound scan. Before the operation I heard it wasn’t alive anymore’* PP20 (20 years old gravida1, delivered a baby with Apgar score of 1 in 5 minutes. The baby died within 24 hours): *‘This is my first child and I didn’t know anything about pregnancy or how my baby should be moving. Before I was in labor my baby was moving just fine. When I got into labor, it was moving very slowly. I didn’t tell the doctor because I didn’t know anything about it. I was worried because I wasn’t experienced: I never delivered before’*

Additionally, both nurse-midwives and registrar doctors stated that women rarely present at the hospital because of decreased FMs or present if it is too late (e.g. the fetus has died or there are serious obstetric complications). If women are not asked, they will not express their concerns.

R1: *‘Mothers who come here don’t tell you ‘I haven’t felt my baby kicking for 4 hours’. They tell you: ‘I haven’t felt my baby move since yesterday, or longer’* R3: *‘Yes, it does happen that women express concerns about the way their baby is moving. There are some mothers that are really concerned about their baby. They come to you and tell you that their baby is moving differently. Not all mothers, just a few. Very few’*

Staff perception of women’s awareness of FMs

In all FDGs, health providers agree that the best judge about FMs patterns is the mother herself. However, they were convinced that women did not have enough awareness and knowledge about FMs, do not understand questions about the way their baby is moving, and therefore asking them about it does not contribute to their care.

R1: *‘Only if the mother does routinely check the FMs, it’s possible to know if the baby is asleep or not. She has to know the rhythm of the baby. Most mothers don’t know the pattern of their baby’s movement and they don’t really know whether the baby is kicking or asleep’* Mx: *‘Some mothers are asked and know about changes but most do not understand’* N3: *‘Primes don’t really know what a kick or a push is, so you have to explain to them how it feels’*

ANC nurses said to trust women's perception of FMs.

N1: *'I think it is worrisome when it's [FMs] abnormal for the mother. A mother knows when something is wrong with her child. So, if she says it [FMs] is different and she's worried: it is'.*

Limited resources for teaching and assessment: space and staff

The timing of antenatal classes was a problem for four women who attended ANC clinics elsewhere:

AP10: *'I wasn't taught about it, but I know that in the nearby clinic they teach women about it [FMs]. But I always come late for this, since they start around 7am with the class'*

The main problem for the ANC nurses when it comes to educating women, was lack of space to hold antenatal classes. All registrars and nurse-midwives stated that the high volume of women and too few staff were problems for assessing FMs during admission and labor care. They suggested an extra nurse and room for admission.

Mx: *'As my colleagues said, sometimes due to overcrowding of women on arrival the nurse forgets to ask some details to the mother.'* M19: *'Also we need time, adequate number of staff, especially in the admission room.'* R1: *'Most of the time, we don't pay much attention to low-risk women unless there is a problem. We prioritize women. For high-risk women we ask everything. But low risk: no'*

Attitude and habit

The most common reason for staff not to ask about FMs was that it is just not routine practice (15/28, 60%), although they said it may not take much time and could be done while performing physical examination.

N1: *'It's a habit, it's not our routine to ask women about it. We are used not to ask'* R1: *'I actually think it's just a habit. ... We never do it, although it only costs one minute to go into the low-risk labor ward and ask 'Which women did not feel their baby move today?'. But we don't do that, because that's the habit'*

Opportunity for improvement

Education and guidance

All the interviewed participants, women, and staff responded positively towards more education and training about maternal perception of FMs. ANC nurses mentioned they want to have antenatal classes to educate women about pregnancy, if they get another room for this.

AP13: *'Yes, I would like to have a course about it so I learn more about what it is and about what to do. I wish the public to be taught because otherwise we just sit at home and wait'*

A simple, short standard questionnaire was also suggested to improve assessment in both the ANC, on admission and intrapartum.

R3: *"If we change the partogram and add a question about FMs, maybe things will change because it can remind them about asking the patient."*

Several nurse-midwives suggested to have guidelines for assessment and management:

M14: *'I think we should have a chart, a short questionnaire posted on the wall of the admission room to remind the midwife the importance of FMs, how to assess and what actions to take with the findings.'*

Discussion

Main findings

This mixed-method study showed that women and their healthcare providers in a low-resource setting have high awareness of maternal perception of fetal movements. Pregnant women instinctively knew the unique normal and abnormal patterns of their baby's movements, both in the antepartum and intrapartum period more than assumed by their health providers. However, there was a lack of acquired knowledge and guidance

of maternal perception of FMs and how to use this information by both women and staff alike for routine fetal surveillance and management. This led to unexpressed concerns, delayed presentation with reduced FMs and missed opportunities to save lives.

Strengths

This is the first study that assessed women and their healthcare providers' awareness, knowledge, and practices on maternal perception of fetal movement in low- and middle-income countries (LMICs). It benefited from both quantitative and qualitative methods, however, to improve understanding, the scope could have been widened to include the views of FMs within the community and other clinical settings. Also, the questionnaires used may have been biased towards agreeable responses and might not reflect true opinions and practices, hence the usefulness of FGDs.

Interpretations

Of the 2.6 million pregnancies that end in stillbirth, the overwhelming majority occur in LMICs. However, the evidence to guide optimal fetal monitoring is limited. Although strong evidence suggest that reduced fetal movement is associated with intrauterine fetal death, it remains unclear whether it is a symptom of inevitable fetal death or whether it can be used as an alert to prompt action and improve outcome.(23, 24) This study showed that FMs assessment during labor, including on admission to the labor ward may be important as many women who prospectively and retrospectively reported abnormal FMs during labor had subsequently developed perinatal adverse outcomes.

The little evidence available in LMIC indicates that women's awareness of the importance of FMs and reduced FMs as a danger sign of adverse pregnancy outcomes was shown to be low and varied from 3.1% to 62.3% across LMICs; and no studies were found to assess healthcare providers' knowledge of FMs.(25) In this study setting, it was found that all women were aware of the unique patterns of FMs – supporting an individualized definition of abnormal/reduced FMs in accordance with the perception of the mother. Also, most women and all their healthcare providers knew the importance and interpretations of FMs as a sign of health of the child and mother. However, there were no assessment of FMs or management guidelines for women presenting with reduced fetal movement which also reflects the lack of evidence and international consensus.(24)

Although there has been recent interest in maternal perception of FMs and evidence is being sought in large trials in high-income countries, there is no single RCT in settings with the highest burden.(17) Recent trials in HICs showed educational and management packages or FMs awareness intervention did not improve perinatal outcomes.(23, 26) However, awareness of fetal movement is already incorporated in stillbirth reduction strategies in HIC and stillbirth are much less common. We can assume, therefore, that the high baseline knowledge of FMs of both women and health provider and the already-existing protocols on reduced FMs minimizes the effect of new or specific package of intervention being tested. Thus, the current evidence might not be readily applicable to settings with lower awareness and knowledge and no established guidelines for assessment and management of abnormal FMs. The role of maternal perception of fetal movement as part of a stillbirth prevention strategy needs to be explored in these settings where the stillbirth rates are much higher. It is especially relevant in low-resource settings like MMH, where human resource is scarce and the workload is considerably high, with little time for adequate fetal heart monitoring, that an educated, alert and involved woman might help improve her own care. Whether formally or informally monitored, FMs can be the *only* signal in absence of regular antenatal and intrapartum checks especially in high-risk pregnancies.

Whether or not fetal movement monitoring is advised or encouraged, some women did have concerns about fetal movement. They should be able to express their concerns and healthcare providers should be equipped with evidence-based knowledge and practice to address them. However, in this study, women lacked the agency to express concerns and staff did not always assess FMs due reasons related to attitude/unfamiliarity with assessing them, workload, lack of (human) resources and staff misconception and mistrust of women's perceptions and knowledge of FMs. Trust in women's perception of FMs was even less during labor where the general view is that labor pain obscures maternal perception of FMs. The potential benefits and harms

of FMs monitoring and interventions, including unnecessary maternal anxiety and obstetric interventions, prematurity, hospital admissions, and increased work overload for staff in an already overwhelmed system, makes it a priority area for research.(18)

Conclusion

This study shows that women and their healthcare providers in a low-resource setting have high awareness of maternal perception of fetal movements, but little use of FMs assessment in routine clinical practice to improve care. Thus evidence-based monitoring and management guidance for reduced FMs is essential and an opportunity to prevent adverse outcomes in low-resource settings.

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Disclosure of interests

The authors report no conflict of interest.

Contribution to authorship

KW conceived and designed the study, managed data acquisition, analysed the data, interpreted the results, drafted the first version of the manuscript and led the drafting process of the manuscript.

NH conceived and designed the study, contributed to data acquisition and critically revised the manuscript.

RSK contributed to data acquisition and critically revised the manuscript.

TM contributed to the study design and critically revised the manuscript.

GJH contributed to the study design and critically revised the manuscript.

JLB conceived and designed the study, contributed to interpretation of the results and critically revised the manuscript.

MJR conceived and designed the study, contributed to interpretation of the results and critically revised the manuscript.

Details of patient's consent

Written informed consent was obtained from all participants.

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Details of Ethics Approval

The study was approved by the Zanzibar Medical Research and Ethics Committee in August 2017 (Protocol no: ZAMREC/0004/AGUST/17)

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