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**Women's experiences of fetal movements before the confirmation of fetal death —
contractions misinterpreted as fetal movement**

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Short title: Fetal Movements before Stillbirth

Abstract: Background: Decreased fetal movement often precedes a stillbirth. The objective was to describe women's experiences of fetal movement before the confirmation of fetal death. Methods: Data were collected through a Web-based questionnaire. Women with stillbirths after 28 gestational weeks were self-recruited. Content analysis was used to analyze the answers to one open question. The statements from mothers of a stillborn, born during gestational weeks 28–37 were compared with those of a stillborn at term. Results: 215 women's answers were sorted into three categories: Decreased, weak, and no fetal movement at all, including 154 (72%) of the descriptions, was divided into three subcategories: decreased and weak movement 106 (49%), no movement at all 35 (16%), and contraction interpreted as movement 13 (6%). Category; Fetal movement as normal, includes 39 (18%) of the descriptions. The third category; Extremely vigorous fetal activity followed by no movement at all, includes 22(10%) of the descriptions. Eight (15%) of the women with stillbirths in gestational weeks 28–37 interpreted contractions as fetal movement as compared to five (5%) of the women with stillbirths at term. Discussion: Uterine contractions can be interpreted as fetal movement. A single episode of extremely vigorous fetal activity can precede fetal death. The majority of the women experienced decreased, weaker, or no fetal movement at all two days before the fetal death was diagnosed. Mothers should be educated to promptly report changes in fetal movement to their health care providers. Using fetal movement information to evaluate possible fetal distress may lead to reductions in stillbirths.

BACKGROUND

Guidelines for management of decrease fetal movement has the potential to reduce the stillbirth rate (1). In clinical management, the quality of the information about fetal movement from the mother-to-be becomes crucial.

The frequency of fetal movement increases from the 24th week of pregnancy until the 32nd week. From this stage of gestation, the frequency of fetal movement tends to plateau until the onset of labor; thus, fetal movement does not decrease at the end of pregnancy (2). However, the type of movements may change as the pregnancy advances (3). Maternal perceptions of changes of the fetal activity correlate with fetal wellness, and maternal perceptions of increased strength and frequency of fetal movements, fetal hiccups, and frequent vigorous fetal activity are associated with a reduced risk of late stillbirth (4). Further, pregnant women's experience of decreased fetal movement pattern is associated with adverse pregnancy outcome: preterm birth (1), fetal growth restriction (5, 6), and intrauterine fetal death (1). Besides the experiences of a decrease in the frequency of the fetal movement, maternal perception of a decrease in the strength of the movement is associated with increased risk of late stillbirth as is a single episode of vigorous fetal activity (4).

A dysfunctional placenta can contribute to a suboptimal growth of the fetus, and the risk for intrauterine fetal death increases when the fetus is 10% less than estimated size, based on the estimated gestational length (7-10). The mechanism for a fetal death due to a dysfunctional placenta probably includes that the placenta does not contribute to an optimal intrauterine environment for the fetus. Logically, insufficient oxygen and nutrition supplies result in a physiologic saving of energy for the brain and central organs, and the fetus moves less often and less intensively (11).

In Sweden, 440 children were stillborn in 2012, corresponding to 3.9 per 1,000 births (12). Despite the fact that maternal care in many high-income countries has improved, the incidence of intrauterine death has dropped only slightly or has remained constant over the last two decades (13). In Europe, Norway has the lowest rate of stillbirths, with 2.2 stillbirths per 1,000 births (14). Variations between countries indicate that a reduction of stillbirth rate is possible. The aim of this study was to investigate mothers' experiences of fetal movement before the confirmation of fetal death. Further, we wanted to investigate whether the experiences of fetal movements were different for women with stillbirths at term, as compared to women with stillbirths after gestational week 28 to gestational week 37.

METHODS

Women were self-recruited by answering a Web-based questionnaire on the Swedish National Infant Foundation Web site (15). The foundation is a member organization of the International Stillbirth Alliance, supporting parents who have experienced stillbirth. Information about the study was announced on Facebook, within the organization, and in newspapers. The questionnaire was made available on 1 September 2011. The data collection is ongoing and includes several questions with fixed answering alternatives and open questions for free text. Inclusion criteria for this study were women with a singleton pregnancy that ended with a stillbirth after 28 gestational weeks in 2009–2013 and who had answered the questionnaire before 1 September 2013. Approval for the study was obtained from the Regional Ethical Review Board in Stockholm (dnr 2011/330-31/3).

Participants

A total of 569 women had answered the questionnaire when the sample was taken from the database; 244 women fulfilled the inclusion criteria for the study, 170 (70%) had experienced a stillbirth at term and for 74 (30%) of the women, the stillbirth occurred after gestational week 28 but before gestational week 37 was completed.

Analysis

We analyzed the women's answers to the question "*How do you remember the fetal movement during the 48 hours that preceded the diagnosis of intrauterine death?*" by a modified content analysis (16). We focused on similarities and differences between the answers, the text analysis was performed in several steps. Initially all text, a total 13,986 words, was read and reread several times to gain a sense of content in the data. Information on the gestational week was blinded for two of the three readers; they did not know whether the woman gave birth after gestational week 37 or before. The content of the statement was labeled with codes that emerged during the process of analysis. Units with same code were divided into categories and subcategories. Twenty-nine statements were not able to be categorized: 5 (7%) among women with stillbirths before 37 gestational weeks and 24 (14%) among women with stillbirths at term. During the analysis, the descriptions were discussed continuously among all authors. Unadjusted risk ratios (ratio of proportions, RR) and 95 percent confidence intervals (CI) based on binominal distribution were calculated to estimate the differences between their descriptions of fetal movement by women with a stillbirth in gestational weeks 28–37 and women with stillbirths at term.

RESULTS

Three categories of fetal movement were identified: I. decreased, weak, and no fetal movement at all; II. fetal movement normal; III. extremely vigorous fetal activity followed by no movement at all.

Decreased, weak, and no fetal movement at all

The category *decreased, weak, and no fetal movement at all* includes statements from 154 (72%) of 215 women and comprises three subcategories: decreased and weak movement; no movement at all; contractions interpreted as fetal movement.

Decreased and weak movement

The subcategory *decreased and weak movement* comprises statements from 106 (69%) of the women in the category and 43 codes consisting of words such as *smaller, weaker, diffuse, slow, or fewer*. Some women also reported that they did not get any reaction from their unborn baby when they pushed on the uterus.

“My baby did not move nearly as much as usual.”

“Did not feel so much movement the last few days. Was hard to find movement.”

“Weak movement, but everyone around me told me it was normal at the end of pregnancy.”

No movement at all

The subcategory *no movement at all* comprises statements from 35 (23%) of the women in the category and 11 codes consisting of words such as *lifeless, still, sleeping, did*

not move. The women reported that they did not feel any fetal movement. Some women described the fetus as “lifeless”; others described the fetus as quiet and said it was as if the baby was sleeping.

“Two days before she moved as usual, but the day before she did not move at all.”

“Not at all, which I thought was normal.”

“She did not move. Had heard that it would be quieter in the womb at the end, so I thought she moved without me being able to feel or think about it.”

Contractions interpreted as movement

The subcategory *contractions interpreted as movement* includes 13 (8%) of the statements of the women in the category and 10 codes consisting of words such as *tense*, *protrudes*, *bellied out*, *rock hard*. The women had difficulty distinguishing the movement as being different from contractions. Some of the women said that their belly was hard and felt different. Some women said that they realized after the stillbirth what they had felt were contractions rather than fetal movement.

“Very little movement. Felt like a mix of the baby ‘pushing’ out its bottom and contraction of the uterus. Maybe it was just a contraction and she was lying in there dead...”

“Thought it was very still in my stomach. But I was unsure of the movement because I had a lot of contractions. Thought it was the baby’s bottom that stood out but it was probably contractions.”

“Few. Felt just on right side. Understand that the child was not alive; probably pulsations in my bowels. Lots of contractions.”

Fetal movement as normal

The category *fetal movement as normal* comprises statements from 39 (18%) of 215 women and 54 codes consisting of words such as *no change, equally lively, little as usual*. The women described fetal movement as normal. They had no indication that the fetus had changed its pattern of movement. However, some of the women said their baby usually was quiet, sleeping a lot, always calm, little movement as usual, or not so active during the entire pregnancy.

“The baby was moving normally until he died.”

“I thought everything was as usual.”

“I experienced no difference; I experienced my child as quiet throughout pregnancy in comparison with my previous child.”

Extremely vigorous fetal activity followed by no movement at all

The category *extremely vigorous fetal activity followed by no movement at all* comprises statements from 22 (10%) of 215 women and 36 codes with words such as: *very lively, the death-jerk, intense, cramped*. The women reported a period of abnormal or extremely vigorous activity. Fetal movement increased and was then followed by no movement or only limited movement. The fetus repeatedly kicked, felt as if he was trying to break out, or twitched a lot.

“As usual during the day, maybe a little quieter, then late on Friday evening, he kicked an awful lot, felt like he was trying to get out through my stomach. Think this was the last time I felt him, but I’m not quite a hundred [percent sure].”

“He moved hardly at all. I felt a movement the day before he died. The day he died I felt a flutter which I think was the ‘death-jerk’ when he died.”

“Everything was completely normal, or as it used to be. The night before he moved incredibly. He didn’t usually keep it up like that. The morning after it was completely quiet and still; got the news at 2 PM.”

We compared women with stillbirth in gestational weeks 28–37 with mothers of a stillborn baby at term in the different categories and subcategories we identified.

Contractions are more likely to be interpreted as fetal movement among women in gestational weeks 28–37 than among women with a stillbirth at term. Women reaching full-term pregnancy reported decreased and weak fetal movement more often than women at gestational weeks 28–38 (Table 1)

DISCUSSION

Uterine contractions can be interpreted as fetal movement. A single episode of extremely vigorous fetal activity can precede fetal death. The majority of the women in this study experienced decreased, weaker, or no fetal movement at all two days before the fetal death was diagnosed.

We found that women in gestational weeks 28–37 more often interpreted contractions as fetal movements as compared to women with stillbirths at term. The normal patterns of spontaneous uterine activity by definition are increased uterine pressure above the baseline tone, and it results from the coupling of actin. During the first 30 gestational weeks, uterine activity (Braxton Hicks contractions) is comparatively quiescent. Gradually after 30 gestational weeks, the uterine activity increases both in intensity and frequency (17). One

explanation to our finding could be that women at term have acquired a better frame of reference to be able to distinguish between fetal movement and contractions. The women stated that they felt “the baby pushing out its bottom”. After the baby’s birth, they understood that they must have felt contractions only”.

Some of the women reported extremely vigorous fetal activity followed by no movements at all, indicating that the baby died suddenly. This observation is supported by Stacey and colleagues, who reported that women who perceived a single episode of movement that was more vigorous than usual were almost seven times more likely to have a late stillbirth (4). Sadovsky and colleague discuss that sudden, strong, vigorous fetal movement with increased rate followed by cessation could be caused by a cord compression (18). Women in our study described the extremely vigorous fetal activity as “the death-jerk” and that they felt their baby died. In sheep, experimentally induced hypoxia may lead to epileptogenic activity. Thus, when an expecting mother feels sudden, frequent, and vigorous fetal movements, it may be observation of epilepsy-induced cramps secondary to hypoxia (19, 20). The epileptic cramps may be concomitant with the hypoxia, leading to cardiac failure and possibly also contributing to death.

Our observation that a stillbirth is preceded by decreased, weaker, or no fetal movements at all are consistent with previous studies (1, 5, 21). Women in our study stated that they had heard that the fetal movement normally decreases in late pregnancy, indicating that the women had identified symptoms of their unborn baby’s illness days before they contacted health care, but interpreted the signs as normal. Mothers-to-be who observe a decrease in the frequency of movements tend to wait a rather long time before they contact health-care professionals, and the signs of fetal distress can be normalized by the women (22). Further, maternal knowledge of fetal movement in late pregnancy depends on the

information they receive in antenatal care. Twenty percent of the women recalled that they had received information from their midwife that the baby's movements might decrease in late pregnancy (22). The Royal College of Obstetricians and Gynecologists (RCOG) (2) recommends that women should be advised to be aware of their baby's individual pattern of movements and that fetal movement should be assessed by subjective maternal perceptions of fetal movement. Further, RCOG suggest that if women are unsure whether movements are reduced after 28 +0 weeks of gestation, they should be advised to lie on their left side and focus on fetal movements for two hours. If they do not feel more than ten movements in two hours, they should contact health care provider (2). Health interventions such as kick count campaigns (23) could be used to strengthen pregnant women's awareness and be a useful tool to prevent fetal death. We found that women with stillbirths at term more often described the fetal movement as decreased and weak, as compared to women with stillbirths in gestational weeks 28–37. One explanation for this finding can be different causes of death for a child stillborn at term: umbilical cord complications and infection. Compared to a preterm birth, placenta abruption, and preeclampsia/hypertension, a stillborn child and the signs of the intrauterine illness can be different (24). The most likely explanation in our study could be that in early pregnancy, the percentage who misinterpret contractions of fetal movement is higher.

The strength of this study is that a large number of descriptions of fetal movement preceding a stillbirth have been collected. Another strength is that it was easy to categorize the statements. However, we cannot generalize about the frequencies of the categories of fetal movement we obtained to the Swedish population of pregnant women or to other groups of pregnant women; we studied a convenience sample of women self-recruited on a Web page. Thus, we have no reason to believe the association between gestational week and experiences of fetal movement significantly influenced the self-recruitment; that is, the

association probably would be found in other populations. One limitation is that the self-recruited approach may imply that the mothers who are especially interested in the topic tend to participate. Further, only those women who could understand Swedish and who had noticed the information about the study could provide information. Another limitation of this study is not being able to systematically interrogate similarities and differences between respondents' sociodemographic data or the parity of the women in relation to the open question that we analyzed. Also, we have no control group matched to the women in this study.

The mothers participating in the study had experienced a stillbirth in 2009–2013; thus the women might have had problems remembering how they perceived the fetal movement during the period we asked for. However, we have no reason to believe that mothers with a stillbirth at term have more difficulty remembering the fetal movements the two days before the baby's death in utero were confirmed, as compared to mothers with stillbirths in gestational weeks 28–37. Further, the women's report of decreased fetal movement preceding their unborn baby's death can be caused by a feeling of guilt for not seeking health-care—that is, the true figures of decrease and weak fetal movement may be higher than measured in this study.

CONCLUSIONS

Uterine contractions can be interpreted as fetal movement. A single episode of extremely vigorous fetal activity can precede fetal death. The majority of the women in this study experienced decreased, weaker, or no fetal movement at all two days before the fetal death was diagnosed. Based on our findings a fetal movement history should include questions to ensure that the pregnant woman do not interpret contractions as movements. Detailed

information from women about intensity, duration and frequency of fetal movement over time has the potential to identify a fetus at risk of death. If fetal movement information from the mothers-to-be systematically is asked for, and used by health care professionals to evaluate probability of fetal distress, it may save lives. A timely induction of delivery or caesarean section in the case of fetal compromise may prevent some stillbirths.

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Table1. Mother's experiences of fetal movements in gestational week 28-37 versus at term

Category	Gestational week 28 – 37 N = 69 (%)	Gestational week 37 + N = 146 (%)	RR (CI) 28-37/37+
Main category A. Decreased, weak and no fetal movements at all	53 (77 %)	101 (69 %)	1.10 (0.94-1.32)
Sub-category 1. Decreased and weak movements	30 (57 %)	76 (75 %)	0.75 (0.58-0.98)
2. No movements at all	15 (28 %)	20 (20 %)	1.43 (0.80-2.56)
3. Contractions interpreted as movements	8 (15 %)	5 (5 %)	3.05 (1.05-8.86)
Main category B. Fetal movements as normal	11 (16 %)	28 (19 %)	0.83 (0.44-1.57)
Main category C. Extreme vigorous fetal activity followed by no movements at all	5 (7 %)	17 (12 %)	0.62 (0.24-1.62)