



## MATERNAL PERCEPTION OF REDUCED FETAL MOVEMENTS AND ITS FETAL OUTCOME: A PROSPECTIVE OBSERVATIONAL STUDY

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### ABSTRACT

**Background:** Reduced fetal movements are an important antenatal warning sign associated with fetal compromise, stillbirth, growth restriction, and adverse perinatal outcomes, requiring prompt assessment and fetal surveillance to prevent avoidable morbidity. **Objectives:** To assess maternal perception of reduced fetal movements, determine associated fetal outcomes, and identify important maternal and pregnancy-related risk factors. **Methodology:** This cross-sectional observational study included 150 pregnant women beyond 28 weeks presenting with reduced fetal movements at a healthcare centre from June 2024 to May 2026. Maternal history, NST, ultrasonography, fetal biometry, liquor volume and umbilical artery Doppler were assessed. Participants were followed until delivery, and neonatal outcomes were recorded. **Results:** Among 150 women, 76.7% were primigravida, and 47.3% were at 37–40 weeks. Preeclampsia occurred in 22.7%. NST was reactive in 68.0% and non-reactive in 32.0%. Vaginal delivery occurred in 56.7% and LSCS in 43.3%; 45.3% delivered preterm and 34.7% neonates had low birth weight. Apgar scores  $\leq 6$  occurred in 40.7% at one minute and 25.3% at five minutes. Resuscitation was required in 38.0%, NICU admission in 35.3%, birth asphyxia in 10.7%, and stillbirth in 2.0%. Adverse neonatal outcomes occurred in 52.7%. Parity, gestational age, diabetes, preeclampsia, and movement count were associated with adverse outcomes, whereas placental location and maternal position were not associated. **Conclusion:** Maternal perception of reduced fetal movements is associated with adverse neonatal outcomes, particularly among pregnancies with lower gestational age, higher parity, diabetes, and preeclampsia, supporting prompt fetal surveillance and intervention.

**KEYWORDS :** Reduced Fetal Movements; Fetal Movement Count; Adverse Neonatal Outcomes; Non-stress Test; Preeclampsia

### INTRODUCTION

Fetal movement, first perceived by the pregnant woman as "quickenings" between 18 and 20 weeks of gestation, has long been recognized as a vital indicator of intrauterine fetal well-being<sup>(1)</sup>. Normal fetal activity includes diverse movement types — kicks, rolls, stretches, and hiccups — with a fetal sleep-wake cycle of typically 20 to 40 minutes that rarely exceeds 90 minutes in a healthy fetus. Reduced fetal movements (RFM) are defined as the subjective maternal perception of a significant decrease or cessation of fetal activity<sup>(2)</sup>.

Landmark work by Warrander et al. demonstrated that placentas from pregnancies complicated by RFM exhibited significantly greater areas of infarction, higher density of syncytial knots, reduced villous vascularity, diminished trophoblast area, and impaired system A amino acid transporter activity-structural and functional hallmarks of placental insufficiency-compared to uncomplicated controls<sup>(3)</sup>. The global context underscores the stakes: according to the World Health Organization, approximately 2 million stillbirths occur every year — one every 16 seconds — with the global stillbirth rate estimated at 23.0 per 1,000 total births. Critically, 30–55% of women who experience an episode of RFM within a week preceding delivery may face stillbirth, and the majority of stillbirths are reported to be preceded by a period of RFM lasting three to four days.<sup>(4)</sup> Beyond the immediate risk of stillbirth, RFM is associated with a spectrum of adverse perinatal outcomes. Multiple studies have demonstrated significant associations with fetal growth restriction (FGR), small for gestational age (SGA) infants, oligohydramnios, fetal distress, meconium-stained liquor, preterm birth, congenital anomalies, low Apgar scores, and NICU admissions<sup>(5)</sup>.

Established risk factors include advanced maternal age, increased BMI, anterior placenta, nulliparity, smoking, oligohydramnios, polyhydramnios, gestational diabetes, anaemia, and preeclampsia. Current guidelines from the

Royal College of Obstetricians and Gynaecologists (RCOG) recommend that all women presenting with RFM be assessed promptly with CTG, ultrasonography, and Doppler studies as indicated<sup>(6)</sup>. Despite this growing body of evidence, the application of standardized management protocols remains inconsistent, particularly in India, where tertiary care referral centres receive a disproportionately high burden of high-risk pregnancies<sup>(7)</sup>.

Reduced fetal movements (RFM) are a frequently encountered, clinically significant antenatal complaint associated with stillbirth, fetal growth restriction, and adverse perinatal outcomes, yet prospective evidence from Indian tertiary care settings remains limited. This study aims to assess maternal perception of RFM, determine associated fetal outcomes, and identify key risk factors — findings essential for developing evidence-based, context-specific antenatal surveillance guidelines.

### MATERIAL AND METHODS

The present Cross-sectional observational study was conducted at Dept. of Obstetrics and Gynecology, Tertiary health care center between June 2024 to May 2026. A total of 150 Pregnant women after 28 weeks of gestation presenting with reduced fetal movements, were included. Mothers with multi fetal pregnancy and patients not willing to participate were excluded. The study was started after getting approval from Institutional Ethical Committee. Informed consent was obtained from all patients and control after explanation of the study and its aim. Data was collected by interviewing the participants and detailed history in respect to menstrual cycles, gestational age was obtained. Obstetrics history, past medical, surgical history and demographic profile was noted down.

ST was done to exclude imminent fetal compromise, if suspicious or pathological fetal heart rate pattern is present, USG was done. USG to assess fetal heart activity, fetal

biometry, liquor volume & umbilical artery Doppler was done. If any abnormality was detected, the women was admitted for further management and perinatal outcomes was noted. If FHS was present on auscultation with handheld doppler and NST shows normal fetal heart rate pattern, her perception of RFM was resolved and there were no risk factors for FGR & still birth. Follow up was till delivery occurs.

Data was entered into Microsoft excel data sheet and was analyzed using SPSS 26 version software (IBM SPSS Statistics, Somers NY, USA). MS Excel and MS word were used to obtain various types of graphs such as bar diagram. Categorical data was represented in the form of Frequencies and proportions. Chi square test, Fisher Exact tests were used as test of significance for qualitative data continuous data was represented as mean and standard deviation. unpaired t test was used as test of significance to identify the mean difference between two quantitative variables for comparison. p value (Probability that the result is true) of 0.05 was considered as statistically significant after assuming all the rules of statistical tests.

## RESULTS:

**Table 1. Demographic Profile of the Mothers:**

| Demographic Variables     |          | Frequency | Percent |
|---------------------------|----------|-----------|---------|
| Age Group (Years)         | 20 to 25 | 78        | 52.0    |
|                           | 26 to 30 | 50        | 33.3    |
|                           | 31 to 35 | 22        | 14.7    |
| Registered                | Yes      | 139       | 92.7    |
|                           | No       | 11        | 7.3     |
| Parity                    | Para 1   | 115       | 76.7    |
|                           | Para 2   | 17        | 11.3    |
|                           | Para 3   | 11        | 7.3     |
|                           | Para 4   | 7         | 4.7     |
| Gestational Age (Weeks)   | 32 to 34 | 44        | 29.3    |
|                           | 34 to 37 | 35        | 23.3    |
|                           | 37 to 40 | 71        | 47.3    |
| Previous mode of delivery | FTVD     | 22        | 14.7    |
|                           | LSCS     | 13        | 8.7     |
|                           | NA       | 115       | 76.7    |
| History of IUD            |          | 6         | 4.0     |
| History of Abortion       |          | 3         | 2.0     |
| History of GDM            |          | 4         | 2.7     |
| K/c/o DM                  |          | 10        | 6.7     |
| K/c/o HTN                 |          | 4         | 2.7     |
| Total                     |          | 150       | 100     |

In this study of 150 pregnant women presenting with reduced fetal movements at a tertiary care hospital, the majority of mothers belonged to the age group of 20–25 years (52.0%), followed by 26–30 years (33.3%) and 31–35 years (14.7%). Most women were registered antenatal cases (92.7%). Primigravida mothers constituted 76.7% of the study population, while 11.3%, 7.3%, and 4.7% were para 2, para 3, and para 4 respectively. Regarding gestational age, 47.3% of women were between 37–40 weeks, 29.3% were between 32–34 weeks, and 23.3% were between 34–37 weeks.

Among previous obstetric histories, 14.7% had a previous full-term vaginal delivery and 8.7% had a previous LSCS, while 76.7% had no previous delivery history due to primigravida status. History of intrauterine death was present in 4.0% mothers, abortion in 2.0%, gestational diabetes mellitus in 2.7%, known diabetes mellitus in 6.7%, and hypertension in 2.7% mothers.

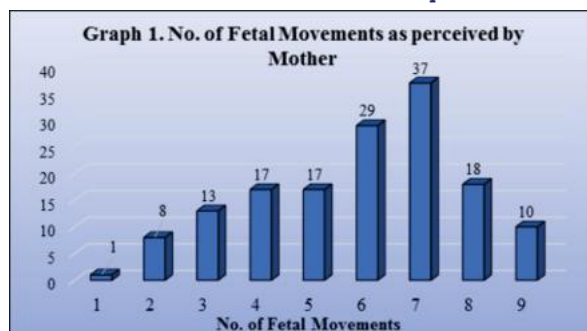
**Table 2. Details of Present Pregnancy**

| Details of Present Pregnancy |          | Frequency | Percent |
|------------------------------|----------|-----------|---------|
| Preeclampsia                 | Yes      | 34        | 22.7    |
|                              | No       | 116       | 77.3    |
| Placental Location           | Anterior | 75        | 50.0    |

|       |           |     |      |
|-------|-----------|-----|------|
|       | Posterior | 52  | 34.7 |
|       | Lateral   | 23  | 15.3 |
| Total |           | 150 | 100  |

Preeclampsia was observed in 22.7% of mothers, whereas 77.3% did not have preeclampsia. Nearly one-fourth of women with reduced fetal movements had associated preeclampsia, indicating its possible role in fetal compromise. Placental location on ultrasonography showed that 50.0% had an anterior placenta, 34.7% had posterior placenta, and 15.3% had lateral placentation.

**Number of Fetal Movements as Perceived by Mother**



Regarding maternal perception of fetal movements, the highest proportion of mothers perceived 7 fetal movements (24.7%), followed by 6 movements (19.3%). Smaller proportions perceived 8 movements (12.0%), 4 and 5 movements each (11.3%), while only 0.7% perceived a single movement.

**Table 3. Maternal Position During Decreased Foetal Movements:**

| Maternal Position | Frequency | Percent |
|-------------------|-----------|---------|
| Left Recumbent    | 60        | .7      |
| Right Recumbent   | 17        | 5.3     |
| Sitting           | 36        | 8.7     |
| Supine            | 37        | 11.3    |
| Total             | 150       | 100     |

With respect to maternal position during perception of decreased fetal movements, 40.0% were in the left recumbent position, 24.7% were supine, 24.0% were sitting, and 11.3% were in the right recumbent position.

**Table 4. Findings of NST (Non-Stress Test) of the Foetus:**

| NST Findings | Frequency | Percent |
|--------------|-----------|---------|
| Reactive     | 102       | 68.0    |
| Non-Reactive | 48        | 32.0    |
| Total        | 150       | 100     |

NST findings revealed that 68.0% fetuses had reactive NST, whereas 32.0% showed non-reactive NST patterns.

**Table 5. Details of Neonate**

| Details of Neonate  |                     | Frequency | Percent |
|---------------------|---------------------|-----------|---------|
| Mode of delivery    | Normal Vaginal      | 85        | 56.7    |
|                     | LSCS                | 65        | 43.3    |
| Term                | Pre-term            | 68        | 45.3    |
|                     | Full-term           | 82        | 54.7    |
| Fetal Weight (Kg)   | Normal Birth Weight | 98        | 65.3    |
|                     | Low Birth Weight    | 52        | 34.7    |
| Apgar score at 1min | ≤6                  | 61        | 40.7    |
|                     | ≥7                  | 89        | 59.3    |
| Apgar score at 5min | ≤6                  | 38        | 25.3    |
|                     | ≥7                  | 112       | 74.7    |
| Total               |                     | 150       | 100     |

Regarding delivery details, 56.7% mothers delivered vaginally while 43.3% underwent LSCS. Full-term delivery occurred in 54.7% cases, whereas 45.3% were preterm deliveries. Reduced fetal movements were associated with a

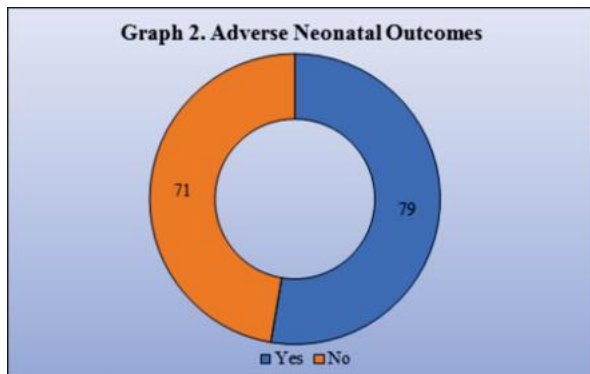
relatively high rate of cesarean section and preterm delivery. Among neonates, 65.3% had normal birth weight while 34.7% had low birth weight. Apgar score at 1 minute was  $\leq 6$  in 40.7% neonates and  $\geq 7$  in 59.3%. At 5 minutes, 25.3% had Apgar score  $\leq 6$  while 74.7% had scores  $\geq 7$ .

**Table 6. Neonatal Complications**

| Details of Neonate  |                     | Frequency | Percent |
|---------------------|---------------------|-----------|---------|
| Fetal Weight (Kg)   | Normal Birth Weight | 98        | 65.3    |
|                     | Low Birth Weight    | 52        | 34.7    |
| Fetal Resuscitation | Needed              | 57        | 38.0    |
|                     | Not Needed          | 93        | 62.0    |
| Birth Asphyxia      | Yes                 | 16        | 10.7    |
|                     | No                  | 134       | 89.3    |
| Need of NICU        | Yes                 | 53        | 35.3    |
|                     | No                  | 97        | 64.7    |
| Still Birth         | Yes                 | 3         | 2.0     |
|                     | No                  | 147       | 98.0    |
| Total               |                     | 150       | 100     |

Neonatal complications showed that fetal resuscitation was required in 38.0% neonates. Birth asphyxia was present in 10.7%, NICU admission was needed in 35.3%, and stillbirth occurred in 2.0% cases.

#### Adverse Neonatal Outcomes



Overall adverse neonatal outcomes were observed in 52.7% neonates, while 47.3% did not develop adverse outcomes. More than half of the pregnancies presenting with reduced fetal movements resulted in adverse neonatal outcomes.

**Table 7. Association between Demographic Profile of the Mothers and Adverse Neonatal Outcomes:**

| Demographic Variables   |          | Adverse Neonatal Outcomes |            | Total       | P value |
|-------------------------|----------|---------------------------|------------|-------------|---------|
|                         |          | Yes                       | No         |             |         |
| Age Group (Years)       | 20 to 25 | 37 (46.8%)                | 41 (57.7%) | 78 (52.0%)  | 0.408   |
|                         | 26 to 30 | 29 (36.7%)                | 21 (29.6%) | 50 (33.3%)  |         |
|                         | 31 to 35 | 13 (16.5%)                | 9 (12.7%)  | 22 (14.7%)  |         |
| Registered              | Yes      | 71 (89.9%)                | 68 (95.8%) | 139 (92.7%) | 0.142   |
|                         | No       | 8 (10.1%)                 | 3 (4.2%)   | 11 (7.3%)   |         |
| Parity                  | Para 1   | 56 (70.9%)                | 59 (83.1%) | 115 (76.7%) | 0.006   |
|                         | Para 2   | 10 (12.7%)                | 7 (9.9%)   | 17 (11.3%)  |         |
|                         | Para 3   | 11 (13.9%)                | 0 (0.0%)   | 11 (7.3%)   |         |
|                         | Para 4   | 2 (2.5%)                  | 5 (7.0%)   | 7 (4.7%)    |         |
|                         | Total    | 79 (100%)                 | 71 (100%)  | 150 (100%)  |         |
| Gestational Age (Weeks) | 32 to 34 | 44 (55.7%)                | 0 (0.0%)   | 44 (29.3%)  | <0.001  |
|                         | 34 to 37 | 28 (35.4%)                | 7 (9.9%)   | 35 (23.3%)  |         |
|                         | 37 to 40 | 7 (8.9%)                  | 64 (90.1%) | 71 (47.3%)  |         |
| Total                   |          | 79 (100%)                 | 71 (100%)  | 150 (100%)  |         |

Association analysis between demographic profile and adverse neonatal outcomes revealed that parity ( $p=0.006$ ) and gestational age ( $p<0.001$ ) were significantly associated with adverse outcomes. Adverse outcomes were more common among para 3 mothers and pregnancies between

32–34 weeks gestation. However, maternal age ( $p=0.408$ ) and registration status ( $p=0.142$ ) did not show statistically significant association.

**Table 8. Association between History of Previous Pregnancy and Adverse Neonatal Outcomes**

| History of Previous Pregnancy |            | Adverse Neonatal Outcomes |            | Total       | P value |
|-------------------------------|------------|---------------------------|------------|-------------|---------|
|                               |            | Yes                       | No         |             |         |
| Previous mode of delivery     | FTVD       | 14 (17.7%)                | 8 (11.3%)  | 22 (14.7%)  | 0.200   |
|                               | LSCS       | 9 (11.4%)                 | 4 (5.6%)   | 13 (8.7%)   |         |
|                               | NA         | 56 (70.9%)                | 59 (83.1%) | 115 (76.7%) |         |
| History of IUD                | 4 (5.1%)   | 2 (2.8%)                  | 6 (4.0%)   | 0.684       |         |
| History of Abortion           | 2 (2.5%)   | 1 (1.4%)                  | 3 (2.0%)   | 1.000       |         |
| History of GDM                | 4 (5.1%)   | 0 (0.0%)                  | 4 (2.7%)   | 0.055       |         |
| K/c/o DM                      | 10 (12.7%) | 0 (0.0%)                  | 10 (6.7%)  | 0.002       |         |
| K/c/o HTN                     | 4 (5.1%)   | 0 (0.0%)                  | 4 (2.7%)   | 0.055       |         |
| Total                         | 79 (100%)  | 71 (100%)                 | 150 (100%) |             |         |

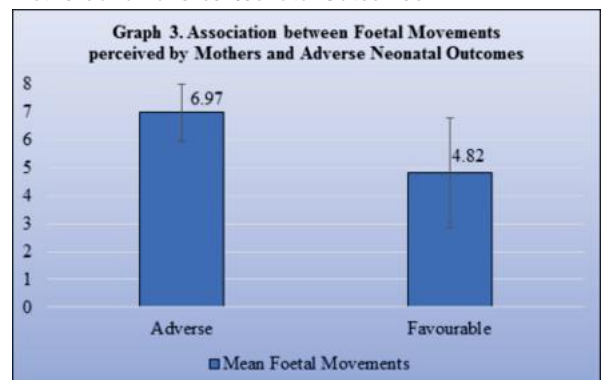
Analysis of previous pregnancy history showed that known diabetes mellitus had a statistically significant association with adverse neonatal outcomes (12.7% vs 0%,  $p=0.002$ ). History of GDM ( $p=0.055$ ) and hypertension ( $p=0.055$ ) showed borderline significance, while previous mode of delivery, history of IUD, and abortion were not significantly associated.

**Table 9. Association between Preeclampsia and Placental Location and Adverse Neonatal Outcomes:**

| Preeclampsia and Placental Location |           | Adverse Neonatal Outcomes |            | Total       | P value |
|-------------------------------------|-----------|---------------------------|------------|-------------|---------|
|                                     |           | Yes                       | No         |             |         |
| Preeclampsia                        | No        | 46 (58.2%)                | 70 (98.6%) | 116 (77.3%) | <0.001  |
|                                     | Yes       | 33 (41.8%)                | 1 (1.4%)   | 34 (22.7%)  |         |
| Placental Location                  | Anterior  | 42 (53.2%)                | 33 (46.5%) | 75 (50.0%)  | 0.175   |
|                                     | Posterior | 29 (36.7%)                | 23 (32.4%) | 52 (34.7%)  |         |
|                                     | Lateral   | 8 (10.1%)                 | 15 (21.1%) | 23 (15.3%)  |         |
| Total                               |           | 79 (100%)                 | 71 (100%)  | 150 (100%)  |         |

Preeclampsia showed a highly significant association with adverse neonatal outcomes (41.8% vs 1.4%,  $p<0.001$ ). Placental location did not demonstrate significant association with adverse outcomes ( $p=0.175$ ).

#### Association between Foetal Movements perceived by Mothers and Adverse Neonatal Outcomes



The mean fetal movement count among mothers with adverse neonatal outcomes was  $6.97 \pm 1.03$  compared to  $4.82 \pm 1.97$  among those without adverse outcomes, and this difference was statistically significant ( $p < 0.001$ ). Maternal perception of altered fetal movements showed significant association with neonatal outcome, indicating its usefulness as an important clinical predictor.

**Table 10. Association between Maternal Position during Decreased Foetal Movements and Adverse Neonatal Outcomes:**

| Maternal Position | Adverse Neonatal Outcomes |            | Total      | P value |
|-------------------|---------------------------|------------|------------|---------|
|                   | Yes                       | No         |            |         |
| Left Recumbent    | 29 (36.7%)                | 31 (43.7%) | 60 (40.0%) | 0.164   |
| Right Recumbent   | 13 (16.5%)                | 4 (5.6%)   | 17 (11.3%) |         |
| Sitting           | 20 (25.3%)                | 16 (22.5%) | 36 (24.0%) |         |
| Supine            | 17 (21.5%)                | 20 (28.2%) | 37 (24.7%) |         |
| Total             | 79 (100%)                 | 71 (100%)  | 150 (100%) |         |

Association between maternal position during decreased fetal movements and adverse neonatal outcomes was not statistically significant ( $p = 0.164$ ). However, adverse outcomes were relatively more frequent among mothers in the left recumbent and sitting positions.

## DISCUSSION:

### Demographic Profile of the Mothers

In the present study, the majority of mothers belonged to the age group of 20–25 years (52.0%), followed by 26–30 years (33.3%). Similar findings were reported by Nandi N et al. (2019)<sup>(8)</sup>, where 73% of women with reduced fetal movements were between 20–30 years of age. Majumdar A et al. (2023)<sup>(9)</sup> also observed that 60.24% mothers belonged to the 21–25 years age group. Singh A et al. (2023)<sup>(10)</sup> reported that most women presenting with reduced fetal movements were young antenatal mothers in the reproductive age group.

In the current study, 92.7% women were registered antenatal cases, indicating adequate antenatal follow-up and awareness about the significance of fetal movements. Primigravida women constituted 76.7% cases, which is comparable with Nandi N et al. (2019)<sup>(8)</sup>, who observed 80% primigravida mothers among women perceiving reduced fetal movements. Turner JM et al. (2021)<sup>(11)</sup> also found that 54.9% women presenting with decreased fetal movements were nulliparous.

In relation to gestational age, 47.3% women in the present study were between 37–40 weeks of gestation, while 29.3% belonged to 32–34 weeks. Similar observations were made by Majumdar A et al. (2023)<sup>(9)</sup>, where 87.95% women with decreased fetal movements were at term gestation. Monari F et al. (2023)<sup>(12)</sup> also conducted their study among term pregnancies and emphasized that altered maternal perception of fetal movements near term may be associated with adverse perinatal outcomes.

### History of Previous Pregnancy

Regarding previous obstetric history, 14.7% women had previous full-term vaginal delivery and 8.7% had previous LSCS, whereas history of intrauterine death was present in 4.0% mothers. Diabetes mellitus and hypertension were observed in 6.7% and 2.7% mothers respectively. Turner JM et al. (2021)<sup>(11)</sup> reported that women presenting with decreased fetal movements had higher rates of previous stillbirths compared to controls (2.1% versus 1.2%). Nandi N et al. (2019)<sup>(8)</sup> observed significantly increased antenatal risk factors among women with reduced fetal movements, including hypertensive disorders and fetal growth restriction. Similarly, Sahhaf F et al. (2023)<sup>(13)</sup> noted that maternal medical disorders and placental insufficiency contributed to adverse fetal surveillance parameters among women with reduced fetal movements.

### Preeclampsia in Present Pregnancy

Preeclampsia was identified in 22.7% women in the present study. This finding supports the established association between hypertensive disorders and reduced fetal movements. Nandi N et al. (2019)<sup>(8)</sup> reported that many women with decreased fetal movements had associated antenatal risk factors, including hypertensive disorders. Majumdar A et al. (2023)<sup>(9)</sup> also emphasized that reduced uteroplacental blood flow due to hypertensive disorders contribute to reduced fetal activity and adverse pregnancy outcomes.

### Placental Location on USG

Placental localization on ultrasonography revealed anterior placenta in 50.0% women, posterior placenta in 34.7%, and lateral placenta in 15.3%. Similar findings were observed by Nandi N et al. (2019)<sup>(8)</sup>, where 62% women with reduced fetal movements had anterior placentation. Monari F et al. (2023)<sup>(12)</sup> also highlighted that anterior placenta may reduce maternal perception of fetal movements despite normal fetal activity. Weller K et al. (2023)<sup>(14)</sup> stated that women frequently recognize alterations in fetal movement patterns instinctively; however, placental position can influence maternal perception and delay reporting.

### Number of Fetal Movements as Perceived by Mother

Assessment of maternal perception of fetal movements demonstrated that most women perceived moderate reduction rather than complete absence of movements. The highest proportion perceived seven fetal movements (24.7%), followed by six movements (19.3%). Only 0.7% mothers perceived a single movement. Similar observations were made by Monari F et al. (2023)<sup>(12)</sup>, who emphasized that subjective qualitative changes in fetal movement patterns may be more clinically significant than absolute movement counts. Weller K et al. (2023)<sup>(14)</sup> also found that women are generally aware of their baby's regular movement pattern and can recognize deviations effectively. Sahhaf F et al. (2023)<sup>(13)</sup> reported that perception of less than twelve movements in two hours was associated with abnormal fetal surveillance findings and adverse outcomes.

### Maternal Position During Decreased Foetal Movements

In the present study, reduced fetal movements were most commonly perceived in the left recumbent position (40.0%), followed by supine and sitting positions. Monari F et al. (2023)<sup>(12)</sup> observed that women with frequent positional changes during sleep had increased adverse perinatal outcomes. Maternal posture influences uteroplacental perfusion and maternal perception of fetal activity. Left lateral position improves venous return and uteroplacental circulation, thereby increasing awareness of fetal movements.

### Findings of NST (Non-Stress Test) of the Foetus

Non-stress test findings showed reactive NST in 68.0% fetuses and non-reactive NST in 32.0% cases. Similar findings were reported by Majumdar A et al. (2023)<sup>(9)</sup> found that 72.29% women had reactive NST, closely comparable with the present study. Sahhaf F et al. (2023)<sup>(13)</sup> reported that 99.1% women had normal NST, though abnormal tests correlated with adverse fetal outcomes. Nandi N et al. (2019)<sup>(8)</sup> emphasized the importance of CTG and NST monitoring in women with reduced fetal movements to identify fetal distress and initiate timely intervention. Non-reactive NST indicates altered autonomic regulation and fetal hypoxia requiring further fetal surveillance or delivery.

### Details of Neonates

In the present study, 34.7% neonates had low birth weight, while 40.7% and 25.3% neonates had Apgar scores  $\leq 6$  at 1 minute and 5 minutes respectively. These findings indicate substantial neonatal compromise among pregnancies presenting with reduced fetal movements. Our findings are comparable with the findings of study by Nandi N et al. (2019)

<sup>(8)</sup>, who observed low birth weight in 21.25% neonates and low Apgar scores among women perceiving decreased fetal movements in the third trimester. Similarly, Turner JM et al. (2021)<sup>(11)</sup> reported significantly increased odds of small for gestational age fetuses among mothers presenting with decreased fetal movements, emphasizing the association between placental insufficiency and impaired fetal growth. Majumdar A et al. (2023)<sup>(9)</sup> observed that 81.92% neonates had Apgar scores above 7, while the remaining neonates required active neonatal management because of compromised fetal condition.

### Neonatal Complications

In the present study, fetal resuscitation was required in 38.0% neonates, birth asphyxia occurred in 10.7%, NICU admission was required in 35.3%, and stillbirth occurred in 2.0% cases. These findings highlight the significant neonatal morbidity associated with maternal perception of reduced fetal movements. A study by Majumdar A et al. (2023)<sup>(9)</sup> reported NICU admission in 68.18% neonates, with meconium aspiration syndrome and respiratory distress being the major causes. Sahhaf F et al. (2023)<sup>(13)</sup> documented NICU admission in 6.3% neonates and one stillbirth among women presenting with reduced fetal movements. Similarly, Turner JM et al. (2021)<sup>(11)</sup> found that decreased fetal movements were significantly associated with composite adverse perinatal outcomes including NICU admission, severe acidosis, neonatal death, and stillbirth.

### Association between Demographic Profile of the Mothers and Adverse Neonatal Outcomes

In the present study, adverse neonatal outcomes were observed in 52.7% neonates. Parity and gestational age showed statistically significant association with adverse outcomes, whereas maternal age and antenatal registration status did not demonstrate significant association. Adverse outcomes were more common among para 3 mothers and pregnancies between 32–34 weeks gestation. Our findings are comparable with the findings of study by Turner JM et al. (2021)<sup>(11)</sup>, where nulliparous women constituted 54.9% of mothers presenting with decreased fetal movements and were more likely to require obstetric interventions. Nandi N et al. (2019)<sup>(8)</sup> also reported that primigravida women represented 80% of mothers perceiving decreased fetal movements and had increased fetal surveillance abnormalities.

### Association between History of Previous Pregnancy and Adverse Neonatal Outcomes

Known diabetes mellitus demonstrated a statistically significant association with adverse neonatal outcomes (12.7% versus 0%,  $p=0.002$ ), whereas previous mode of delivery, history of abortion, and intrauterine death did not show significant association. History of gestational diabetes mellitus and hypertension demonstrated borderline significance. Our findings are supported by the findings of study by Turner JM et al. (2021)<sup>(11)</sup>, who reported that women with previous adverse obstetric outcomes and history of medical disorders had higher risk of complications when presenting with decreased fetal movements. Sahhaf F et al. (2023)<sup>(13)</sup> also emphasized that history of maternal metabolic disorders contribute to placental dysfunction and adverse fetal surveillance findings among pregnancies complicated by reduced fetal movements.

### Association between Preeclampsia and Placental Location and Adverse Neonatal Outcomes

Placental location did not show statistically significant association. Among mothers with adverse neonatal outcomes, 41.8% had preeclampsia compared to only 1.4% among those without adverse outcomes. Our findings are comparable with the findings of study by Nandi N et al. (2019)<sup>(8)</sup>, who reported increased percentage of hypertensive disorders among women with reduced fetal movements. Similar findings were

reported by Monari F et al. (2023)<sup>(12)</sup>, who suggested that placental position mainly affects maternal perception of movements rather than actual fetal compromise.

### Association between Foetal Movements perceived by Mothers and Adverse Neonatal Outcomes

A statistically significant association was observed between fetal movement count and neonatal outcome ( $p<0.001$ ). Our findings are in line with the findings of Sahhaf F et al. (2023)<sup>(13)</sup> reported that perception of fewer than twelve fetal movements within two hours was associated with abnormal biophysical profile and lower neonatal Apgar scores. Similarly, Monari F et al. (2023)<sup>(12)</sup> concluded that qualitative maternal perception of altered fetal activity may be more clinically meaningful than absolute fetal movement counts.

### Association between Maternal Position during Decreased Foetal Movements and Adverse Neonatal Outcomes

In the present study, adverse neonatal outcomes were observed among mothers who perceived reduced fetal movements in left recumbent position (36.7%), sitting position (25.3%), supine position (21.5%), and right recumbent position (16.5%). However, the association between maternal position and adverse neonatal outcomes was not statistically significant ( $p=0.164$ ). Our findings are comparable with the findings of study by Monari F et al. (2023)<sup>(12)</sup>, who observed that maternal positional changes during sleep were associated with altered maternal perception of fetal activity, but did not independently predict adverse perinatal outcomes. Similarly, Weller K et al. (2023)<sup>(14)</sup> reported that maternal awareness of fetal movements varies according to maternal posture but women are generally capable of identifying abnormal fetal movement patterns regardless of position. The present findings indicate that maternal position mainly affects perception of fetal movements rather than the actual severity of fetal compromise or neonatal outcome.

### CONCLUSION

Maternal perception of reduced fetal movements identifies pregnancies with neonatal morbidity, with 52.7% experiencing adverse outcomes. Significant associations occur with parity, lower gestational age, diabetes mellitus, preeclampsia, and fetal movement count. Non-reactive NST, low birth weight, low Apgar scores, need for resuscitation, NICU admission, birth asphyxia, and stillbirth demonstrate important fetal and neonatal compromise.

Therefore, systematic evaluation of RFM using NST and ultrasonography, followed by surveillance and timely obstetric intervention, supports recognition and management of fetuses at increased risk. Standardize RFM assessment with NST and ultrasonography, strengthen routine antenatal surveillance, and educate mothers to report fetal movement changes promptly.

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