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Original Research Article

Fetal Outcome in Pregnant Women with Reduced Fetal Movements

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ABSTRACT

Objectives: To analyse the fetal outcome following reduced fetal movements monitored by cardiotocogram and Biophysical Profile Score (BPP) at onset of complaints and before delivery.
Material and Methods: Present study was a prospective observational study conducted in the Department of Obstetrics and Gynaecology St. Martha's Hospital over a period of 13 months from 01/03/2009 to 31/03/2010 It included 50 pregnant women after 32 weeks of gestation and singleton pregnancies with < 12 fetal movements in 24 hours. They underwent a cardiotocogram(CTG) or a non stress test(NST) and biophysical profile test(BPP) and results were analysed statistically.
Results: A non -reactive CTG on admission was encountered in 2/50(04%) vs 21/50(42%);($p<0.001$) of women with reduced fetal movements at delivery. Majority 20/50(40%) of the caesarean sections were emergency due to non reassuring CTG. Neonatal birth weight <2500 grams was recorded in 25/50(50%) and 10/26(38.46%) had meconium staining of liquor indicating an unfavorable intra uterine environment. When birth weight <2500 and >2500 grams, NRCTG (non reactive CTG) at the time of delivery was 42.30% vs 37.50%;(p value 0.393) respectively and was not significantly related. The number of loops of cord and the placental gross morphology were not statistically significant (masked due to small sample size).
Conclusions: Although, daily fetal movement counting is subjective, with onset of maternal perception of reduced fetal movements. It is prudent to advocate close fetal monitoring even in the presence of a reactive admission CTG as it is less predictive of adverse fetal outcome than CTG performed before delivery. Hence a non reassuring CTG at delivery is associated with low birth weight, meconium staining of liquor and need for timely obstetric intervention for optimum maternal and fetal outcome.
Key words: Biophysical Profile Score, Cardiotocogram, Emergency Caesarean Section, Fetal Growth Retardation, Reduced Fetal Movements.

INTRODUCTION

Among the many methods of fetal monitoring ranging from the simplest (daily fetal kick count) to the most complex (fetal echocardiography and color flow mapping), maternal perception of fetal movements is the oldest method to assess fetal well being. In most communities today, it is performed as an unstructured screening to which almost all pregnant women adhere [1]

The challenging questions are what constitute a normal fetal movement? How

do we define reduced fetal movements? And what measures do we take? Due to paucity of robust epidemiological studies pertaining to patterns of fetal activity and standardization of maternal fetal perceptions which is very subjective, there is currently no universal consensus on the definition of "Reduced Fetal Movements."[2] Observational studies have reported a wide variety of factors that may influence the fetal activity. Better perception of fetal movements when the mother is lying down and in a quiet atmosphere rather than when grossly engaged at work. [3] Before 28 weeks an anteriorly placed placenta and possibly anteriorly placed fetal spine has been associated with reduced fetal movements. [4, 5] Sedating drugs which cross the placenta such as alcohol, methadone, benzodiazepines and other opioids can have a transient reduction in movements. [6, 7] Foetuses with major malformations may have decreased fetal movements, however anencephalic fetuses may have decreased or increased activities. [8-10] Possibilities of abnormalities of the central nervous system, muscular dysfunction or skeletal abnormalities may have to be considered because fetal activity provides an indication of the integrity of the central nervous and musculoskeletal systems. [11] The normal fetus is active and capable of physical movement, and goes through periods of both rest and sleep. A significant reduction or sudden alteration in fetal movement is a potentially an important clinical sign. It has been suggested that reduced or absent fetal movements may be a warning sign of impending fetal death. Studies of fetal physiology using ultrasound have demonstrated an association between RFM and poor perinatal outcome. [12, 13]

The idea to constitute a pilot study pertaining to the neonatal outcome in women with reduced fetal movements evolved when we encountered, in our day to day practice and during our monthly perinatal meeting sessions that fetal morbidity and the neonatal outcomes were not satisfactory when the pregnant women complained of reduced fetal movements and hence, we undertook the present study.

MATERIAL AND METHODS:

Objectives:

- Analyse the fetal outcome following maternal complaints of Reduced Fetal Movements (RFM) monitored by cardiotocogram (CTG)and Biophysical Profile Score+Amniotic Fluid Index(BPP+AFI) at onset of complaints and before delivery.

Material and Methods

Present study was a prospective observational study conducted in the Department of Obstetrics and Gynaecology, along with professional support from Department of Radiology St. Martha's Hospital, over a period of 13 months from 01/03/2009 to 31/03/2010 which included 50 pregnant women. The study was approved by the Institutional ethical committee. Informed written consents were obtained from all the women.

Inclusion criteria:

- Reduced Fetal Movements was defined as" less than 12 maternal perceived fetal movements over 24 hours".
- Pregnant women beyond 32 completed weeks of gestation upto 40 weeks.
- Primigravida or multigravida.
- Singleton pregnancy.

Exclusion criteria:

- <32 weeks of gestation.
- Multiple Pregnancy.
- Presence of Polyhydramnios.

Protocol for women complaining of Reduced Fetal Movements(RFM).

Step 1: An initial history which suggests of reduced fetal movements defined as <12 fetal movements over a period of 24 hours would be included , taking care of the exclusion criteria and she would be admitted.

Step 2: once admitted a through relevant history pertaining to the duration of amenorrhoea, past obstetric history of reduced fetal movements and neonatal deaths , medical problems in the index and previous pregnancies, use of medications , smoking , pan chewing, use of haematinics and calcium ,diet history were recorded. A thorough general physical and Obstetric examination was performed. Routine antenatal blood and serum, urine for proteinuria were performed if not done earlier.

Step 3: A cardiotocogram would be applied to the women and a trace obtained following counselling the women about the position she would be lying and the need to press the remote switch when she would appreciate a fetal movement. The recording period was over 20 minutes and the observations on the CTG trace would be interpreted as per NICE (National Institute for Health and clinical Excellence) guidelines [14] as depicted on table A and B.

Table A: Definition of normal, suspicious and pathological FHR traces[14]

Category	Definition
Normal	An FHR trace in which all four features are classified as reassuring
Suspicious.	An FHR trace with one feature classified as non-reassuring and the remaining features classified as reassuring
Pathological	An FHR trace with two or more features classified as non-reassuring or one or more classified as abnormal

Table B.Classification of FHR trace features [14]

Feature	Baseline (bpm)	Variability (bpm)	Decelerations	Accelerations
Reassuring	110–160	≥ 5	None	Present
Non -reassuring	100–109 161–180	< 5 for 40–90 minutes	Typical variable decelerations with over 50% of contractions, occurring for over 90 minutes Single prolonged deceleration for up to 3 minutes	The absence of accelerations with otherwise normal trace is of uncertain significance
Abnormal	< 100 > 180 Sinusoidal pattern ≥ 10 minutes	< 5 for 90 minutes	Either atypical variable decelerations with over 50% of contractions or late decelerations, both for over 30 minutes Single prolonged deceleration for more than 3 minutes	

Further information about classifying FHR traces is given below.

- If repeated accelerations are present with reduced variability, the FHR trace should be regarded as reassuring.
- True early uniform decelerations are rare and benign, and therefore they are not significant.
- Most decelerations in labour are variable.
- If a bradycardia occurs in the baby for more than 3 minutes, urgent medical aid should be sought and preparations should be made to urgently expedite the birth of the baby, classified as a category 1 birth. This could include moving the woman to theatre if the fetal heart has not recovered by 9 minutes. If the fetal heart recovers within 9 minutes the decision to deliver should be reconsidered in conjunction with the woman if reasonable.
- A tachycardia in the baby of 160–180 bpm, where accelerations are present and no other adverse features appear, should not be regarded as suspicious. However, an increase in the baseline heart rate, even within the normal range, with other non-reassuring or abnormal features should increase concern.

Step 4: An ultrasound was performed to rule out gross congenital anomaly, fetal biometry especially the abdominal curve, estimated fetal birth weight to rule out small for gestational age

fetus. [15] Fetal biophysical profile score and amniotic fluid index (indicator of chronic hypoxia) would be recorded as suggested by Manning et al 1999, [16] Table C.

Table C

Biophysical variable	Normal (score=2)	Abnormal (score=0)
Fetal breathing movements (FBM)	1 or more episodes of ≥20 s within 30 min	Absent or no episode of ≥20 s within 30 min
Gross body movements (GBM)	2 or more discrete body/ limb movements within 30 min (episodes of active continuous movement considered as a single movement)	< 2 episodes of body/limb movements within 30 min
Fetal tone (FT)	1 or more episodes of active extension with return to flexion of fetal limb(s) or trunk (opening and closing of hand considered normal tone)	Slow extension with return to partial flexion, movement of limb in full extension, absent fetal movement, or partially open fetal hand
[a]Reactive FHR	2 or more episodes of acceleration of ≥15 bpm[a] and of >15 s associated with fetal movement within 20 min	1 or more episodes of acceleration of fetal heart rate or acceleration of < 15 bpm within 20 min
Amniotic Fluid Index(Phelan et al 1987)[b] four quadrant technique [17]	>5 cms	≤5 cms.

[a]beats per minute, used to confirm in case of fetal demise . present study a separate score was not given as NST was performed.
If all the three parameters-FBM,GBM,FT were normal a score of 6 would be the maximum.
[b] Amniotic fluid index. The largest pocket of fluid is measured in each quadrant of the maternal abdomen in the vertical dimension. Then, each value is added to yield the amniotic fluid index. A score of zero would be allotted if ≤5 cms.

Step 5: Fetal demise: counsel the family and decide about termination of pregnancy.

Non reassuring or pathological CTG and abnormal BPP+≤5 cms – emergency intervention and follow departmental protocol.

Normal observations: following the CTG and BPP+AFI- normal – keep under observation for 24 hours recounsell regarding the importance and maintainence of the fetal kick chart, by writing the number of fetal movements felt one hour each after food.(Morning. Noon, Night). Repeat CTG after 24 hours and if reactive can be discharged from hospital and under review

Once a week-perform CTG,

Once in two weeks-fetal biometry, BPP and AFI.

If CTG non reactive or BPP+AFI abnormal admit the women and if need be intervention to be decided.

If fetal biometry indicative of FGR follow departmental protocol (termination of pregnancy at 37-38 completed weeks of gestation or earlier if indicated.)

Post dates were allowed to progress until reactive CTG and normal BPP+AFI were recorded.

Statistical Methods [18, 19, 20]:

Descriptive statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean ± SD (Min-Max) and results on categorical measurements are presented in Number (%). Significance is assessed at 5 % level of significance Chi-square/ Fisher Exact test has been used to find the significance of study parameters on categorical scale between two or more groups. 95% Confidence Interval has been computed to find the significant features. Confidence Interval with lower limit more than 50% is associated with statistical significance.

- Suggestive significance (P value: $0.05<P<0.10$)
- Moderately significant (P value:$0.01<P \leq 0.05$)

** Strongly significant (P value: $P \leq 0.01$)

Statistical software: The Statistical software namely SPSS 15.0, Stata 8.0, MedCalc 9.0.1 and Systat 11.0 were used for

the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc.

RESULTS

Study Design: A Prospective Clinical study of 50 women who met the inclusion criteria and complained of decreased fetal movements was undertaken to study the correlation of non stress test (NST)or cardiotocogram(CTG), Biophysical Profile Score(BPP) at the time of complaint and at the time of admission for (final) delivery was performed. Analysis of Women characteristics, mode of delivery, features of the cord, placenta and the amniotic fluid was performed. Details pertaining to the new born, the birth weight, APGAR score at one minute and 5 minutes were recorded.

Age ranged from 19-30 years, 90% of the women were between 21-30 years. Majority (32/50)64% were primigravidas. 24% had a past history of LSCS done. Indication in majority (10/12) of cases was for fetal distress, 4% had severe PET with FGR, 4% had previous neonatal death- 1 meconium aspiration, 1- primary pulmonary haemorrhage. 8% of women required medications other than haematinics, calcium and folic acid, 2% of women had overt diabetes on Insulin, 2% had childhood epilepsy which was well controlled on carbamezepine, 2% each were on methyldopa and Nifidipine respectively for control of gestational hypertension. 8% of women developed medical problems viz 6% developed severe pre-eclampsia, 2% developed gestational diabetes.

Period of Gestation in weeks at the first Presentation.

Women presenting beyond 32 weeks and upto 40 completed weeks of gestation were included. 54% of women had these complaints between 32-36 weeks of gestation.

First Admission CTG or NST performed for Reduced Fetal Movement (RFM).

Fetal demise was recorded in 6%, NR-CTG-4%, reactive CTG in 90%.

Ultrasonography -96% of women had AFI>5 cms,4% had ≤5 cms.

Period of Gestation (Weeks)at admission for Delivery. Periods of delivery ranged from 32 weeks to 41^{+3} weeks. 6% had preterm delivery. Majority 84% deliverd at term. 10% delivered postdate. *- 27/50 had presented with RFM between 32-36 weeks and 24/27(88.88%) were on follow up with daily fetal count record and delivered at term.

Mode of Delivery. 22/50(44%) of women had LSCS, 4% had vacuum assisted delivery for non reassuring CTG.

Indications for Lower Segment Cesarean Section(LSCS). 40% had an emergency LSCS for non reassuring or pathological CTG. 4% had elective LSCS,1 for previous neonatal death and another for term breech.

Induction of Labour. 46% of women had spontaneous onset of labour. 54% had induction of labour.24/27(88.88%) were induced with [c]PGE(prostaglandin E) and 3/27(06.0%) labor was accelerated with Oxytocin.

Birth weight:Table 1.

Apgar Score at 1 minute and 5 minutes: 8% were fresh still born, 4% new born had an APGAR≤7 at one minute and they recovered (except the still born) and all 92% of the new born had APGAR>7 at 5 minutes.

Table 1: Birth weight.

Birth weight (kg)	Number of patients (n=50)	%
<1.5	02	04.0
1.5-2.50[d]	23	46.0
2.50-3.50	22	44.0
>3.50	03	06.0
Mean ±SD:2.56±0.50		
Total	50	100.0
25/50(50%)of the new born had weight ≤2500 grams.		

Meconium Staining of Amniotic Fluid(MSL): 14/50(28%) had MSL and 10/14(71.42%) were new born with birth weight ≤2500 grams.

Characteristics of the Umbilical Cord: There was no preponderance of looping of cord around neck in these fetuses.

Table 2. Characteristics of the Umbilical Cord.

Umbilical Cord	Number of patients (n=50)	%
Grossly normal and no loops around the neck of the baby.	37	74.0
Abnormal looping around the neck of the baby	13	26.0
1 loop	08	16.0
2 loops	03	06.0
3 loops	01	02.0
4 loops	01	02.0
There was no preponderance of looping of cord around neck in these fetuses .		

Table 3: Characteristics of the Placenta.

PLACENTA	Number of patients (n=50)	%
Grossly Normal	43	86.0
Abnormal	07	14.0
Stained with meconium	05	10.0
Abruption	02	04.0
Majority(86%) had grossly normal placenta. 4% had evidence of abruption and both the women were hypertensives . 10% had stained with meconium.		

Table 4: Performance of CTG/NST at Admission and at final admission to delivery.

Results	NST at admission	NST at Final	% change
Absent FHR	03(6.0%)	03(6.0%)	00.0%
Non Reactive-CTG	02(4.0%)	21(42.0%)	+38.0%
Reactive-CTG	45(90.0%)	26(52.0%)	-38.0%
Total	50(100.0%)	50(100.0%)	-
Inference	Non-reactive CTG is significantly more at final NST (42.0%) when compared to 4.0% at admission with P<0.001** (Paired proportion test)		

Table 5: Fetal Outcome.

Fetal outcome	Number of patients (n=50)	%	95%CI
Low Birth weight (<2.5 kg)	25	50.0	36.6-63.4
Apgar score <7.0	06	12.0	05.9-24.2
Abnormal Cord	13	26.0	15.9-39.6
Abnormal Placenta	07	14.0	06.9-26.2
50% of the baby had evidence of fetal growth retardation confirmed after birth(30% were identified ante-natally. With prompt and timely obstetric intervention these babies can have an optimal outcome. Presence of loop of cord around neck, number of loops of cord around the neck, meconium staining of placenta may have had effect on intrauterine environment but may be masked due to small size of the sample studied.			

Table 6: Prediction potential of CTG/NST at final admission for delivery on fetal outcome.

Fetal Outcome	NST Final		P value
	Reactive CTG (n=30)	Non-Reactive CTG(n=20)	
Birth weight (kg)			
<1.5	02(6.7%)	00	0.861
1.5-2.50	13(43.3%)	10(50.0%)	
2.50-3.50	13(43.3%)	9(45.0%)	
>3.50	02(6.7%)	01(5.0%)	
CORD			
Normal	22(73.3%)	15(75.0%)	1.000
Abnormal	08(26.7%)	05(16.7%)	
Placenta			
Normal	27(90.0%)	16(80.0%)	0.416
Abnormal	03(10.0%)	04(13.3%)	
Overall 20/50(40%) had non reactive CTG at the final onset of delivery. Hence it is important not to be complacent if the CTG is reactive as it cannot predict the fetal outcome, but it warrants a closer antepartum and intrapartum monitoring.			

Table 7: Maternal and Fetal outcome in women who delivered babies with birth weight>1500≤2500grams.

Parameters	n=23 (birth weight>1500≤2500 grams.)	Comments
Term FGR	21/23(91.305)	Women complaining RFM are candidates to have FGR babies and hence need close monitoring(weekly CTG and BPP+AFI along with fetal biometry every 15 days or earlier if indicated.)
Preterm FGR	02(08.69%)	
Non reassuring CTG at initial complaints of RFM	01(04.34%)	(p<0.05) CTG on admission is not reliable and hence they should have follow up monitoring.
Non reassuring or pathological CTG at final on admission for delivery	11(47.82%)	
Emergency LSCS	10/23(43.47%)	All were performed for non reassuring or pathological CTG.
Vacuum assisted delivery	01(04.34%)	
Induction of labour-TOTAL Prostaglandin E Oxytocin	12/23(52.17%) 10/12(83.33%) 01/12(08.33%)	Induction of labor had to be performed to deliver the babies at risk.
Meconium stained amniotic fluid	07/23(30.43%)	May be an evidence for detrimental intrauterine environment.
Placental abruption	01/23(04.34%)	Sudden abruption and baby died.
Fresh still birth	02/23(08.69%)	Sudden abruption and RFM with fetal demise in utero
Inference: Women with complaints of RFM are at a high risk of FGR, abruption placentae and prone for fresh still birth. Admission followed by careful fetal monitoring, with timely and prompt obstetric intervention we can achieve optimum fetal outcomes in women who complain of Reduced Fetal Movements.		

Table 8: Comparision between the birth weights and the need for emergency delivery.

Parameters	Birth weight>1500≤2500 grams. n=23	Birth weight>2500 grams. n =25
Non reassuring or pathological CTG at initial RFM	01(04.34%)	0
Non reassuring or pathological CTG at final admission for delivery	11(47.82%)	11(44%)
Emergency LSCS	10(43.47%)	10(40%)
Vacuum assisted delivery	01(04.34%)	01(04%)
Induction of labor-TOTAL Prostaglandin E Oxytocin	12(52.17%) 10(43.47%) 01(4.34%)	12(48%) 10(43.47%) 02(8%)
MSL	07(30.43%)	05(20%)
Abruptio placentae	01(4.34%)	01(4%)
Fresh still birth	01(4.34%)	01(4%)
Both the groups were comparable. It implies maternal perception of reduced fetal movements cannot differentiate an FGR baby from a normally grown baby, but identify “at risk baby”, however FGR is more prevalent(50%) compared to the hospital data of FGR in the range of 18-22%,average of 20%; 20% vs 50%, p<0.05.		

DISCUSSION:

Maternal perception of fetal movements is a very subjective phenomenon. Ever since Sadovsky et al (1973) reported seven cases reports of pregnancies with decreased fetal activity that preceded fetal death, there has been utilization of various methods to quantify fetal movement that could prognosticate fetal well being or need for intervention. [21] To date there are no robust epidemiological studies which serve this purpose, neither are there studies to determine whether intervention (e.g. delivery or further investigation) alters perinatal morbidity or mortality in women presenting with recurrent RFM. [2]

We conducted this as a pilot study to comprehend if this problem of “Reduced Fetal Movements” put across many times to the physicians by the pregnant women could have a bearing on the fetal out come. Pertaining to the women characteristics age and parity did not have much influence unless the woman was unable to understand the concept of fetal movements and once the quickening was attained they were comparable with the literature. [22, 23] It was interesting to note that a CTG /NST or Biophysical profile and amniotic fluid Index performed at the time of the presenting complaint of reduced fetal movement, could identify only 4% of the fetuses which could be at risk. However, these women

underwent emergency LSCS and one baby could be saved and another was a fresh still born (maternal severe PET and abruption placentae). Both the babies were preterm and had fetal growth retardation with birth weight of 1900(36 weeks of gestation) and 1250(32 weeks of gestation) grams respectively.

Further, when these women with complaints of RFM were followed up closely according to the protocol mentioned above, it was interesting to notice the non reassuring or pathological CTG were prevalent in 42% of the women who had been admitted for delivery(4%vs 42%, p value <0.001**table 6). Similarly an observational study reported women with reduced fetal movements who had an initial CTG and an ultrasound scan, 21% had an abnormality detected that required action and 4.4% were admitted for immediate delivery. [24]

Hence, as clinicians it is important to give heed to the mother's complaint of reduced fetal movement and keep her pregnancy under observation, similar opinion has been shared by few authors. [2, 25] It was also astonishing to find 50% of the neonates had a birth weight below 2500 grams. 2 babies had birth weight below 1500 grams and were born to mothers who had severe pre- eclampsia and on treatment. Among the 23/50(46%) new born with birth weight less than 2500 grams, there was higher incidence of term fetal growth retardation (21/23, 91.30%) compared to the hospital data which ranged from 18-22% and a median of 20%, (20% vs 50%, p<0.05). FGR was significantly prevalent when women complained of reduced fetal movements supporting the observations made by other authors. [26- 28] On comparing the occurrence of events between the <2500 grams and > 2500 grams bay weight as shown in table10 we found they were comparable. Therefore, the importance of antenatal monitoring and follow up was to identify "at risk babies" and with timely and prompt obstetric intervention viz Induction of labour in 54%, emergency LSCS 40%, Vacuum assisted delivery 4% of women and normal vaginal delivery in 52%. We could salvage 92% of the babies, except for the 6% fresh still births which presented with absent fetal heart rate patterns and 2% of the still birth occurred in a class A2 GDM patient who was on surveillance, supporting the observations by many authors who had evidence of FGR or SGA, higher incidence of intrauterine deaths and poor perinatal outcomes almost 22.1% [29, 30] There is inflow of consistent evidence that reduced fetal movements may be associated with abnormal placental morphology and placental insufficiency. This suggests that women presenting with RFM require further investigation to identify those with placental insufficiency. [31] In the present study there were no significant contributions from placental gross morphology or length of the cord. This effect could be masked due to small sample size. A recent multi-centric study also reported the maternal ability to detect clinically important changes in fetal activity seemed to be improved by fetal movement counting; there was an increased identification of fetal growth restriction and improved perinatal outcome, without inducing more consultations or obstetric interventions. [30]

CONCLUSION

The foremost need in a pregnant woman complaining of reduced fetal movement is to exclude a fetal demise. Although the performance of CTG and BPP+AFI may indicate a normal finding, it is prudent to follow up these women with diligent maternal and fetal surveillance. It is worth noting there is a higher association of none reassuring or a pathological CTG, higher incidence of operative interventions

and higher incidence of fetal growth retardation in these women. More emphasis on placental morphology and ultramicroscopic details needs to be researched, for better understanding of the clinical implications they pose. Therefore, a daily fetal kick count needs to be reemphasized during antenatal checkups and the women with RMF should be considered as high risk and kept under close antepartum, intrapartum monitoring and timely obstetric intervention to have an optimum maternal and fetal outcome.

Conflicts of Interest: none

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