Effect of fetal movement counting on maternal and fetal outcomes among high-risk pregnant woman: A randomized controlled trial

Rania Mahmoud Abdel Ghani [(1)], Eman Mohamed Eraky [(1)]

(1) Assisstant professor of Maternal and Newborn Health Nursing, Faculty of Nursing, Cairo University, Cairo, EGYPT

Abstract

Background: Mother's fetal movement counting is a tool allows the mother to be confident of fetal wellbeing. This study aimed to evaluate the effect of fetal movement counting on maternal and fetal outcomes among high-risk pregnant women. **Methods**: A total sample of 100 risky pregnant women were assigned randomly to the study group (i.e., pregnant women who received instruction related to the daily fetal movement count), and the control group who received the routine hospital's antenatal follow up. Data was gathered utilizing; 1) a structured interview questionnaire, 2) follow up assessment schedule and 3) Daily fetal movement counting chart. **Findings**: There were statistically significant differences between both group's related to recurrent consultation and seeking medical advice (with χ^2= 5.19, and P≤0.02), while number of hospital admission for observing fetal movement was (χ^2=4.32, and P≤0.04). **Conclusion**: Antenatal standard information for fetal movements count may help in increasing mother's awareness for early reporting.

Key words: Fetal Movement, High Risk Pregnancy, Randomized Controlled Trial

Trial Registration Number: NCT04548102

Introduction

The maternal sensation of any distinct kick, flutter, or roll felt between the 16th and 20th weeks of gestation is described as perceived fetal movements (FM) (Cunningham et al.,2014). In general, FM can be divided into two categories: generalized and small movements. Generalized FM is usually perceived by the mother and includes movements such as stretching, kicking and rollovers. The small movements, which are not perceived by the mother, include activities such as grip movements, nonnutritive sucking, tongue protrusion, breathing movements flexing and stretching of fingers and toes (Daly et al., 2018). Perceived fetal activity in late gestation is related to the strength of the generalized movements. Vigorous or sustained activity results from combined lower limb and trunk motion and is commonly referred to as stretching, kicking, and rollovers (Matsubara et al., 2013). Babies' activities in the womb could be considerably, as some babies being very active and some not so active. A decrease in a baby's normal pattern of movements may be a sign that the baby is struggling for some reason, and it might be better for the baby to be born early (Sheikh etal., 2014). Mother's fetal movement counting is a tool allows the mother to be confident about the fetal wellbeing (Sheikh etal., 2014). The reason for counting fetal movement is that; 1) fetal deaths could be accompanied by a decrease in fetal activity; 2) fetal movement is decreased in fetal growth restriction pregnancies; 3) maternal experience is the most important source for detecting a decrease in fetal activity (Mangesi etal., 2015). Hence, it has been suggested that if the mother counts her babies' movements each day, and there are several ways of doing this, she may be able to identify a decrease in her baby's normal movement patterns. It is further suggested that if the mother informs caregivers of this, then the caregivers can do additional tests (Mangesi et al., 2015). But if the mothers diligently count fetal movement and report on time, early intervention will be preceded and perinatal morbidity and mortality will likely to be decrease (Mohr-Sasson et al., 2016).

Significance of the study

Regular counting of fetal movement may improve the capacity of the mother to be aware about the warning signs (Sharp et al., 2014). In all pregnant women, daily fetal movement counting can be used frequently or only in women who are deemed to be at elevated risk of adverse perinatal outcomes (Mangesi et al., 2015 & Delaram & Shams, 2016). Although several fetal movement counting protocols have been used, neither for the optimal number

of movements nor the ideal duration of counting them has been defined (Flenady et al., 2018). The method of counting three fetal movements in one hour could be the best way for mothers to determine the fetal condition since most mothers are able to feel the three fetal movements in a few minutes, as very little time is required (Flenady et al., 2018). Midwives, obstetricians, and other health care providers should frequently offer guidance and information to pregnant women on issues related to pregnancy, including fetal movements, and this subject should be revisited during the third trimester of pregnancy (Sterpu et al., 2020 & Freeman et al., 2012). Many studies analyze various methods for counting fetal movement among normal pregnant women (Delaram, Shams, 2016 & Olagbuji et al., 2014 & McArdle et al., 2015). But there is insufficient evidence to date that daily fetal movement counting is beneficial or not in terms of early detection and avoidance of adverse pregnancy outcomes for pregnant women who already have a history of risky pregnancy. The present study is aimed to evaluate the effect of fetal movement counting on maternal and fetal outcomes among high-risk pregnant women.

Aim of the study

The present study aimed to evaluate the effect of fetal movement counting on maternal and fetal outcomes among high-risk pregnant women.

Subjects and Method:

Research design:

The present study design utilizes the randomized controlled trial.

Setting

The study conducted at the antenatal outpatient clinics and delivery unit at El Kasr el Aini hospitals-Cairo University-Egypt.

Subjects:

A total number of 100 pregnant women were recruited and assigned randomly into two main groups, the study group (i.e. pregnant women who received instruction related to the daily fetal movement count), and the control group. The inclusion criteria were, pregnant women who was able to read and write, aged from18 to 40 years old, 2nd gravid, singleton, 28 weeks gestation, had prior history of; pregnancy-induced hypertension (PIH), premature membrane rupture (PROM), premature labour, gestational diabetes, antepartum hemorrhage, stillbirth, restricted fetal growth, normal pre-pregnancy body mass index [i.e. from 18.5 to 24.9kg/m^2], had not previously participate in any investigation of fetal movement counting and willingness to participate in the study. Pregnant women who had history of psychological problems, drugs abuse, experience any terrible life events during the past 6 months; oligohydramnios, multi-fetal pregnancy, fetal abnormalities, and maternal smoking were excluded from the study. In addition, women who have been subjected to extreme psychological or traumatic events during the study and who have not report fetal activity for more than 1 week were excluded from the study. The sample was divided into two groups of 50 women in each, a study, and a control group.

The sample size was calculated by equation based on the proposed intervention's effect size of 0.65, the standard normal deviation for $\alpha = Z\alpha = 1.96$, the standard normal deviation with power of 80.0 percent, the confidence interval of 95%, and the type I error probability on 0.05 level.

$$n=\frac{2(Z_{1-\alpha/2}+Z_{1-\beta})^2}{\Delta^2}+\frac{Z^2_{1-a/2}}{2}$$

$$n=2\frac{(1.96+1.28)^2}{0.65}+\frac{1.96^2}{2}=50$$

Statistical package for the social science (SPSS) was used for statistical analysis of data "version 20". An intention to treat analysis was utilized. Descriptive analyses were conducted on the characteristics of women in both intervention and control groups (means, standard deviations, and proportions). Further, the hypothesis was tested through Student's *t*-test (continuous data) to compare data of both groups and identify the statistical differences that presented in the form of mean and standard deviation, paired *t*-test to compare between both groups and identify the statistical differences before and after the interventions, and Chi-square tests to compare the statistical

differences between both groups for data represented in nominal and categorical way. Further, relative risk and confidence interval were calculated by the relative risk calculators. Statistical significance level was set to <0.05.

Data collection

Data was gathered through a structured interview questionnaire, follow up assessment schedule, and daily fetal movement counting chart. A structured interview questionnaire includes demographic data (i.e., name, age, address, educational level and occupation), previous obstetric history (i.e. woman's parity) & current pregnancy data (gestational age, baseline vital signs & abdominal examination) were included. Follow up assessment schedule was planned by the researchers to assess the fetal condition and any developed prenatal complications during pregnancy (i.e. liquor volume, intrauterine growth restriction, neonatal weight, PROM, gestational diabetes, PIH, antepartum hemorrhage, number of medical advices between visits, emergency hospital admission), and the outcome of the current pregnancy (i.e. mode of delivery, still birth, birth weight and NICU admission, ect…) last instrument (daily fetal movement counting chart) designed by the researchers, and used by a pregnant woman to monitor movements of her fetus in the form of timetable. It was split into weeks from 28 weeks of gestation till delivery. And each day in the week divided into three period of assessment, in order to assess the fetal movement through 12 hours/24hr.

The present study data collection took a period of eleven months started from September 2019 and ended in July 2020. This study was based on Orem's theory of self-care (Hartweg, 2015). To fulfill the needs of the individual, Orem defines three specific styles of nursing systems. The supportive educational scheme is one of them. It is a framework where the individual could learn to carry out the necessary measure of self-care. The pregnant woman learned in this study how to count her fetal movement and how to ask for support if her fetal activity is significantly decreased. For pregnant women, the five (A's) technique will be used (ask, assess, advise, assist, and arrange follow up). The researchers met the pregnant women in the antenatal clinics during their routine follow up. Woman who was eligible to be recruited in the study signed the consent after description of the study's purpose. The allocation of concealment was addressed by two competent trained researchers. In order to ensure randomization, two steps selection process were used. First was identifying the random sample, this step was achieved on admission to antenatal clinics. A pregnant woman who met the eligibility criteria and who had an odd number on her admission ticket or files was recruited in the study. After the written consent was signed, the second drawing was a random assignment of the sample into two groups: the study and the control. In separate opaque envelopes, numbers from one to one hundred and two were inserted, which were drawn in an ascending series. The ratio of intervention vs. standard antenatal follow up was one to one. Even numbers were assigned to the study group, while odd numbers were assigned to the control group who received standard hospital's care in form of routine pregnancy checkup. Single blindness was achieved; all pregnant
women were blinded in both groups (figure 1).

Participants were approached on 28 weeks of gestation during their regular ultrasound screening. Pregnant women in the study group received detailed information about typical fetal movements (i.e. explanation of fetal movements' pattern, normal sleep/wake cycles, and factors that could alter the interpretation of movement). In addition, each pregnant woman was trained to count the fetal movement (i.e. lie down on her left side after taking her meal and focus on fetal movements, measure it three times a day, half an hour/ one time and record it in the chart). As a rule, if fewer than 10 movements are felt in 2 hours, women can immediately contact their health care provider (Royal College of Obstetricians and Gynecologists, 2011). In order to ensure careful documentation; women were told that their subjective determination of a reduction in fetal activity was the most significant measure of reduced fetal movement. Fetal movements counting chart was issued and women telephoned once a week. Women informed that if they perceived a total absence of fetal activity or if they felt a substantial and

sustained decline, they should not wait until the next day. They also asked to bring the chart of fetal movements in each antenatal follow-up visit. In both groups, pregnant women followed according to their antenatal visits schedule till delivery. Women in the control group received routine hospital care for antenatal follow up and followed as the women in the study group every two weeks till the onset of delivery. In order to assess the maternal and neonatal outcomes, the researchers attended women's deliveries in both groups.

Primary outcome measure

Decreased fetal movement count, intrauterine fetal death, still birth, NICU admission

Secondary outcome measures

Pregnancy complications, delivery outcomes

Ethics approval and consent to participate

The present study had been approved by the ethical committee of Faculty of Nursing-Cairo University (no.2019-61). In addition, official approval to perform the study was obtained from the administrative authorities of the outpatient clinics and delivery unit of Maternity Teaching Hospital. In addition, the current randomized controlled trial (RCT) has been reported in the database of the governmental clinical trials. The purpose and the method of the analysis have been explained. Written consent was obtained from those who acknowledged the condition of the study. Participants informed that at any point they had the right of quitting from the research.

Statistical analysis

Statistical package of social science (SPSS) for data analysis, version 21 was utilized. An intention-to-treat analysis was considered.

Results

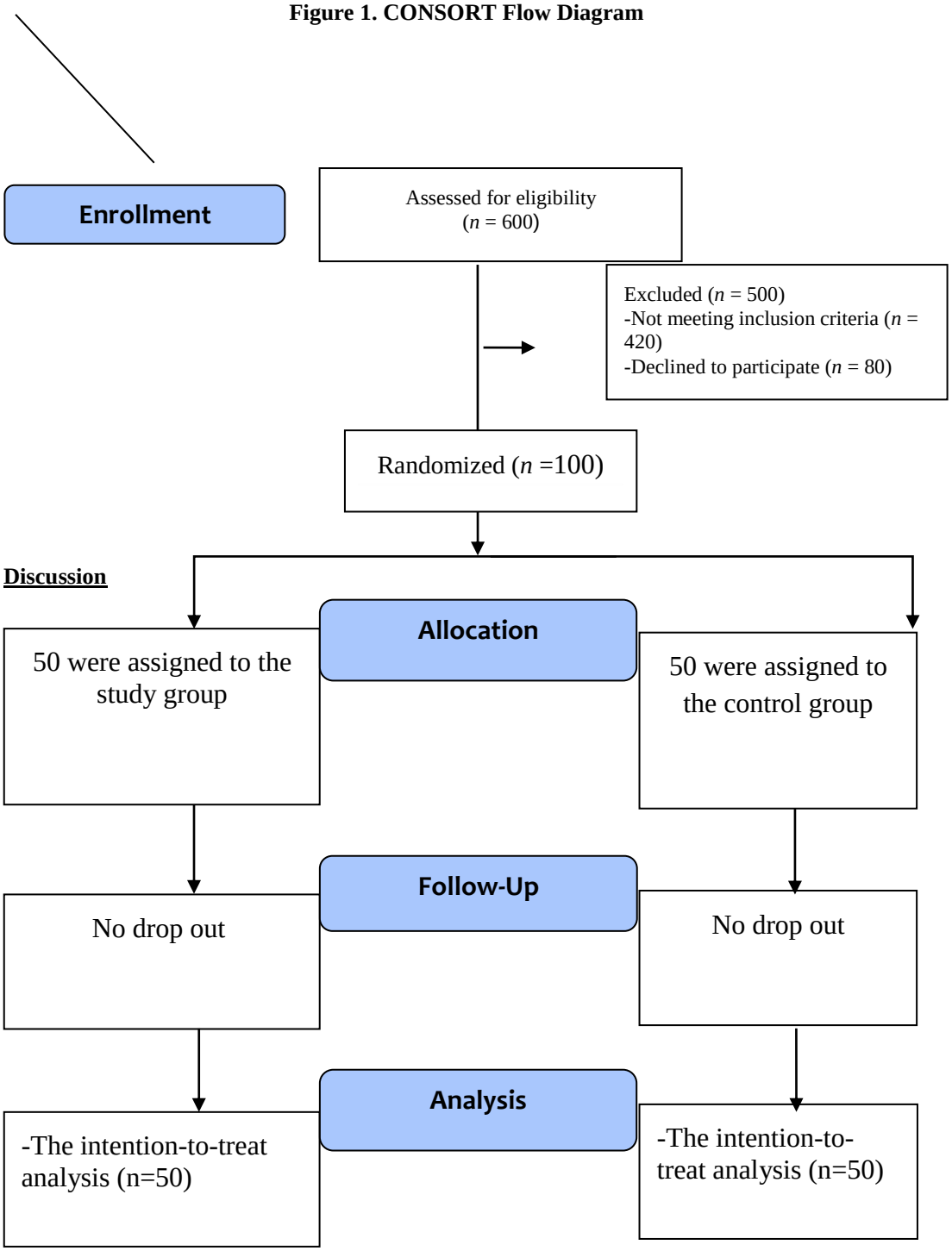
With respect to sample characteristics, data showed that there were no statistically significant differences between both groups; the study and the control groups in terms of age, gestational age at study entry, body mass index (BMI) on 20 weeks gestation, levels of education, occupation and unhealthy behavior with (P= 0.76, 0.53, 0.39, 0.83, 0.66, 0.50 respectively).Most pregnant women in both groups had higher level of education (i.e. university), employed and passive smokers (table, 1).

On comparison between both groups, the study and the control group related to their previous pregnancy complications, table (2) denoted that there were no statistical significant differences between both groups; in relation to exposure of gestational diabetes (6.0 % vs. 8.0%), gestational hypertension (32.0% vs. 30.0%), preterm labor (2.0 vs. 4.0), premature rupture of membrane (PROM) (30.0% vs. 24.0 %), intrauterine fetal death (2.0% vs. 0.0%), still birth, and birth weight in relation to gestational age (with P= 0.69, 0.82, 0.55, 0.49, 0.31, 0.36, 0.64 respectively).

On comparison between both groups, the study, and the control group in term of current pregnancy and delivery outcomes. Data revealed that, there were statistical significant differences between both groups in relation to the recurrent consultation and seeking medical advices 36.0% among the study groups vs. 16.0% among the control group, and hospital admission after decrease in fetal movement (34.0% vs. 16.0%) with (χ^2=5.19and P≤0.02, vs χ^2=4.32, and P≤0.04 respectively).On the other hand, there were no statistically significant differences regarding the complications of the current pregnancy and childbirth outcomes between the two groups with (P≥0.05). It was clear that most pregnant women in both groups had gestational hypertension, premature membrane rupture, and spontaneous vaginal deliveries (table, 3).

Regarding the fetal and neonatal outcomes, there were no statistical differences between both groups related to still birth, birth weight, and admission to neonatal intensive care unit with (P= 0.33, 0.43, 0.41 respectively). On the other hand there was a statistical significant difference between the two groups related to Apgar at the first minute ($\chi^{2=}$5.00, P≤0.04), (table, 4)

Figure 1. CONSORT Flow Diagram



Discussion

The findings of the current study showed that there were substantial statistical differences between the two groups; the study and the control linked to repeated consultation, medical advice, and hospital admission to track decreased fetal movement. While findings related to the fetal and neonatal outcomes denoted that, there were no statistical differences between both groups in relation to still birth, birth weight, and admission to neonatal intensive care unit. Actually, mothers who were counted the fetal movement daily were concerned when the fetal movement is diminished and contact their physician or health care provider for more assessments (Saastad et al., 2010). The mother's concern should be taken seriously because diminished fetal movements could be associated with adverse effects (Raynes-Greenow et al., 2013 & Smith et al., 2014). The present study findings go along the same lines with one study reported that maternal counting of fetal movements had been suggested as a method to increase mother's self-screening through document decrease in fetal counting movements (Heazell et al., 2017). A similar situation was documented in a study in which the researchers found women in counting the fetal movements they were concerned about diminished fetal movements and seek for early referral to the hospital (Saastad et al., 2010).Although the present study results did not show the effect of daily fetal movements count on still birth, the other two large stepped-wedge, cluster-randomized clusters that hypothesized that increase understanding of fetal movement among pregnant women and prompt timely reporting of decrease in fetal movement could reduce stillbirth rate (Heazell et al., 2017). On the other hand, another study reported that the frequency of consultation with mother concerning about decreased in fetal movement did not show significantly different between women who counted fetal movements and those who did not[8].Moreover, and with decreased fetal movements in most cases, pregnancy continues without complications (Kamalifard et al., 2013). While regarding neonatal outcomes, another study reported significant proportion when comparing between mothers with reduced fetal movement due to high risk pregnancy, with those who had high rates of stillbirth and poor biophysical profile at the time of admission (Poojari et al., 2018). Another study concluded that women presenting with reduced fetal movement were at increased risk of poor pregnancy outcomes including still birth, preterm birth, pulse, grimace, activity, with negative effect on respiration (APGAR) score and increased rate of cesarean section (Belay et al., 2020). Another study results confirmed that, women's presented with isolated reduced fetal movement at term showed higher rates of intrauterine fetal death (IUFD) at presentation and significant adverse outcomes at delivery (Levy et al., 2020). The findings of the current study showed that there were no statistically significant variations between pregnancy complications and delivery outcomes among the study and the control groups.It was evident that the majority of pregnant women had gestational hypertension, premature rupture membrane, and spontaneous vaginal deliveries among both groups. These results are congruent with study reported that there were no statistical differences between groups regarding the deliveries outcomes (Posthumus et al., 2016).

In addition, the present study demonstrated that there was a statistically significant difference between both groups in relation to the first-minute Apgar score. It showed that in the first minutes after birth, the fetus with an Apgar scores lower than or equal to 3 is at greater risk of impairment later in life (Nomura et al., 2013 & Imdad et al., 2011). But the present study results can't confirm that, due to the early reporting of decreased fetal movements or early admission to the hospital and continuous fetal monitoring. There were many interrelated factors during delivery that may affect the first minute Apgar score.

Women's follow-up during pregnancy period and delivery considered a challenge and that could not be preventing the drop out. In addition, the study did not represent all risky conditions during pregnancy. In order to generalize the current research findings, a large sample was needed. But on the other hand, it is growing to our knowledge that the present study was one of the few studies compared the fetal movement count with no fetal movement count.

Conclusion & recommendation

Antenatal standard information for fetal movements count may help in increasing mother's awareness for early reporting. Applying the clinical practice guidelines providing the women with the necessary

needed knowledge about the efficient method to detect a compromised fetus through counting fetal movement should be considered as highly recommended practice.

Key point:

1. Mother's fetal movement counting is a tool allows the mother to be confident of fetal wellbeing.
2. Regular counting of fetal movement may improve the capacity of the mother to be aware about the warning signs.
3. Applying the clinical practice guidelines for fetal movement counting should be considered generally as recommended practice.

Reflective questions:

1. Is there a relation between fetal movement count and increase incidence of cesarean section?
2. Is there a relation between fetal movement count and first minutes Apgar score?
3. Does fetal movement count improve pregnancy outcome among high-risk pregnancy women?
4. Is there a relation between fetal movement count and hospital admission rate?

Table 1. Characteristics of sample among the study and the control groups

Items	Study group (n=50)	Control group (n=50)	*t*	*P**
	Mean±SD	*Mean±SD*		
Age	30.86±3.49	30.66±3.28	0.29	0.76[c]
Gestational age (weeks)[a]	19.24±1.39	19.08±1.15	0.62	0.53[c]
BMI on 20 weeks pregnancykg/m^{2}[@a]	25.30±0.95	25.46±0.93	-0.84	0.39[c]
Education level				
Read &write[b]	4 (8.0)	3 (6.0)	0.15	0.69[d]
Primary school[b]	4 (8.0)	2 (4.0)	0.70	0.40[d]
Preparatory school[b]	5 (10.0)	6 (12.0)	0.10	0.74[d]
Secondary school[b]	7 (14.0)	8 (16.0)	0.07	0.77[d]
University[b]	30 (60.0)	31 (62.0)	0.04	0.83[d]
Occupation				
Housewife[b]	16 (32.0)	14 (28.0)	0.19	0.66[d]
Employee [b]	34 (68.0)	36 (72.0)	0.19	0.66[d]
Unhealthy habits				
Passive smoking[b]	44 (88.0)	46 (92.0)	0.44	0.50[d]

*Level of significance at p ≤0.05

[@]BMI=body mass index kg/m**, a** Data presented as mean± SD, **d**atapresented *as n* (%),**c***t*-test, **d** Chi-square test.**SD**: Standard deviation

Table 2. Comparisons between both groups related to previous pregnancy complications

Items	Study group (n=50)	Control group (n=50)	χ^2	*P**
No. (%)		*No.(%)*		
Gestational diabetes	3(6.0)	4(8.0)	0.15	0.69[d]
Gestational hypertension	16(32.0)	15(30.0)	0.04	0.82[d]
Preterm labor[b]	1(2.0)	2(4.0)	0.34	0.55[d]
Premature rupture of membrane (PROM)[b]	15(30.0)	12(24.0)	0.45	0.49[d]
Intrauterine fetal death[b]	1(2.0)	0(0.00)	1.01	0.31[d]
Small for gestational age (SGA)[**b]	11(22.0)	15(30.0)	0.83	0.36[d]
Large for gestational age(LGA) [#b]	3(6.0)	2(4.0)	0.21	0.64[d]

*Level of significance at p ≤0.05, **Small for Gestational Age (SGA) < 2.500g,# Large for Gestational Age (LGA) 4.000-4.500 g

a Data presented as mean± SD, **b**data presented as n (%),**c***t*-test, **d** Chi-square test.**SD**: Standard deviation

Table 3. Comparisons between both groups related to current pregnancy & delivery outcomes.

Items	Study group (n=50)	Control group (n=50)	RR (95% confidence interval)	χ^2	*P**
	No. (%)	*No.(%)*			
Antenatal follow up data					
Recurrent Consultation (28 weeks -up to delivery) [b]	18(36.0)	8(16.0)	0.76(0.59-0.96)[e]	5.19	0.02*[d]
Admission for observing decreasing fetal movement [b]	17(34.0)	8(16.0)	0.78(0.62-0.99)[e]	4.32	0.04*[d]
Pregnancy complications					
Gestational Diabetes	6(12.0)	8(16.0)	0.75(0.28-2.00)[e]	0.33	0.56[d]
Gestational Hypertension	19(38.0)	26(52.0)	0.73(0.46-1.13)[e]	1.98	0.16[d]
Placenta Previa[b]	2(4.0)	3(6.0)	0.66(0.11-3.82)[e]	0.21	0.64[d]
Abruptio Placenta [b]	5(10.0)	8(16.0)	0.62(0.21-1.77)[e]	0.79	0.37[d]
Placental Insufficiency [b]	4(8.0)	6(12.0)	0.66(0.20-2.21)[e]	0.44	0.50[d]
Oligohydraminos [b]	2(4.0)	3(6.0)	0.66(0.11-3.82)[e]	0.21	0.64[d]
Additional examinations					
Continuous Cardiotocograph Assessment [b]	8(16.0)	12(24.0)	0.66(0.29-1.48)[e]	1.00	0.32[d]
Fetal Biophysical Profile [b]	6(12.0)	10(20.0)	0.66(0.11-3.82)[e]	1.19	0.27[d]
Delivery Outcomes					
Spontaneous [b]	28(56.0)	25(50.0)	0.88(0.57-1.33)[e]	0.36	0.54[d]
Induced [b]	12(24.0)	8(16.0)	1.50(0.67-3.35)[e]	1.00	0.32[d]
Elective Caesarean Section [b]	7(14.0)	11(22.0)	0.63(0.26-1.50)[e]	1.08	0.30[d]
Emergency Caesarean Section [b]	3(6.0)	6(12.0)	0.50(0.13-1.88)[e]	1.09	0.30[d]
Induction on Fetal Indications [b]	10(20.0)	14(28.0)	0.71(0.35-1.45)[e]	0.87	0.35[d]
Premature Rupture Of Membrane (PROM)[b]	17(34.0)	12(24.0)	1.41(0.75-2.65)[e]	1.21	0.27[d]
Preterm Delivery	5(10.0)	2 (4.0)	2.50(0.50-12.28)[e]	1.38	0.24

* Level of significance at $p \leq 0.05$

a Data presented as mean± SD, **b** data presented as n (%),**c***t*-test, **d** Chi-square test.**SD**: Standard deviation

e relative risk and confidence interval

Table 4. Comparisons between both groups related to the fetal/neonatal outcomes.

Items	Study group (n=50)	Control group (n=50)	RR (95% confidence interval)	χ^2	P
No. (%)		*No.* (%)			
Fetal & Neonatal Outcomes					
Small for Gestational Age	6(12.0)	7(14.0)	0.85(0.30-2.37)	0.08	0.67*
Large for Gestational Age	3(6.0)	2(4.0)	1.50(0.26-8.59)	0.21	0.64*
Stillbirth	1(2.0)	3(6.0)	0.33(0.03-3.09)	1.04	0.33*
Admission to NICU[a]	2(4.0)	4(8.0)	0.50(0.09-2.60)	0.70	0.41*
Apgar <41st minute	2(4.0)	9(18.0)	0.22(0.05-0.97)	5.00	0.04*
Apgar <6 at 5th minutes	1(2.0)	2(4.0)	0.50(0.04-5.33)	0.34	0.56*
Neonatal Birth Weight/kg, mean (SD)	2.85 ±0.55	2.77±0.51	---------	0.79	0.43**

*Chi-square test, **t-test, **a:** Neonatal Intensive Care Unit

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