Original Article

A Prospective Observational Study to Determine Perinatal Outcome of Second Twin According to Mode of Delivery in a Tertiary Care Hospital

Hetal Patel, Shelley Seth, Poulomi Roy, Chiranjit Ghosh, Shyamal Dasgupta, Pallabi Das, Shrabana Choudhuri, Jyoti Kumari, Debopriya Saha, Md Mehebub Alam

Department of Obstetrics and Gynaecology R.G. Kar Medical College and Hospital, Kolkata, West Bengal, India

Abstract

Introduction: The mode of delivery in twin pregnancy is a challenging decision for an obstetrician as the outcome of the 2nd twin is significantly affected by that. **Materials and Methods:** The prospective comparative observational study was conducted for the time span of March 2021–August 2022 in a tertiary care hospital in East India. Forty-four pregnant women with twin pregnancy with gestation age >32 weeks who underwent vaginal delivery (VD) were compared with 44 pregnant with twin pregnancy who underwent cesarean section (CS). Maternal socioeconomic and obstetric parameters were noted, and the perinatal outcome of the 2nd twin was observed and compared between both elective CS and VD groups. **Results:** Perinatal outcome of 2nd twin through CS showed significantly better Apgar score at 1 min and at 5 min. Umbilical artery pH > 7.2 was found more in the CS group than in the VD group. Intertwin delivery interval of ≥10 min was found to be significantly associated with low Apgar score. **Conclusion:** The strict vigilance during follow-up of the patient in the antenatal period and proper assessment of maternal and fetal state during VD might improve the outcome of the 2nd twin to prevent unnecessary CS and its complications following it.

Keywords: Apgar score, perinatal outcome, twin delivery

Introduction

Due to delay of planning and having children for social reasons,there has been an increased incidence of fertility preservation and assisted reproductive techniques.As a result of which there has been an significant increase in number of mutlifetal pregnancy worldwide.[1] As the twinning rate worldwide has increased by a third since the 1980s,[2] the high risk of perinatal complications associated with it remains a nightmare and challenges the management for the obstetricians.[3] The overall neonatal morbidity and mortality of 2nd twin depends on a combination of factors like gestational age,birth weight,intertwin delivery interval,birth weight discordancy and chorionicity.[4]

In spite of lack of substantial evidence, many obstetricians opt for cesarean delivery with the belief of avoiding intrapartum complications and medicolegal issues, but cesarean section (CS) also has its own sets of complications such as increased blood loss, increased risk of placental disorders like placenta accrete spectrum, subsequent uterine rupture, and neonatal adaptation disorders.[5] Whereas some studies have found planned vaginal delivery (VD) to be associated with an increased risk of perinatal mortality and morbidity of the 2nd twin compared with the first twin,[6] data from other series did not demonstrate any benefit if cesarean delivery was planned.[7] Hence, the optimal delivery mode for twins remains a subject to vigorous debates and controversies. The present study has been designed to determine the perinatal outcome of the 2nd twin according to the mode of delivery and to assess the contribution of various factors related to both modes of delivery.

Address for correspondence: Dr. Chiranjit Ghosh, Department of Obstetrics and Gynaecology R.G. Kar Medical College and Hospital, Kolkata, West Bengal, India.
E-mail: ghoshchiranjit597@gmail.com

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Materials and Methods

Study design

This was a prospective comparative observational study.

Study setting

The study was conducted among the pregnant women carrying twin pregnancy attending the antenatal clinic or emergency in the department of obstetrics and gynecology of a tertiary hospital, East India.

Study duration

The study duration was from March 2021 to August 2022.

Sample size and sampling method

The formula for the calculation of sample size in observational analytical study is as follows:

$$n1=\left[\sqrt{\overline{pq}\left(1+\frac{1}{k}\right)}z_{1-\frac{\alpha}{2}}+\sqrt{p_1q_1+\frac{p_2q_2}{k}}z_{1-\beta}\right]^2 f\ \Delta^2$$

$n2 = kn1$

where p_1, p_2 = projected true probabilities of success in two groups

$q_1q_2 = 1-p_1, 1-p_2$

$\Delta = p_2 - p_1$

$\overline{P} = \frac{p_1 + kp_2}{1+k}$

$\overline{q} = 1-\overline{p}$

$z_{1-\beta} = 0.84 \quad z_{1-\frac{\alpha}{2}} = 1.96$,

Based on the study done by Jhaveri and Nadkarni,[8] $p_1 = 0.66$

$p_2 = 0.37$

Putting this value in the above formula,

$n_1 = 44$

$n_2 = kn_1$

$n_2 = 44(k=1)$

Total sample size = 88

p_1, p_2 = proportion (incidence) of groups #1 and #2

$\Delta = p_2 - p_1$

= absolute difference between two proportions

n_1 = sample size of group 1

n_2 = sample size of group 2

α = probability of type I error (usually 0.05)

β = probability of type II error (usually 0.2)

z = critical Z value for a given α or β

k = ratio of sample size for group 2 to group 1

Inclusion criteria

Perinatal outcomes of the 2nd twin of consecutive 44 pregnant women with twin pregnancy of >32 weeks of gestation who delivered vaginally were compared with consecutive 44 pregnant women with the same criteria who underwent elective CS.

Exclusion criteria

Pregnancies with predetermined poor prognosis of the fetuses, i.e., fetuses with abnormal ultrasound Doppler study, congenital anomaly, estimated birth weight <1500 g, discordant growth, fetal growth restriction, and intrauterine fetal death were excluded from this study. Mothers undergoing emergency CS due to any maternal or fetal indication were also not included as it may affect the perinatal outcome of the fetuses.

Study technique and tools

A detailed history was taken from each participant, and two groups, i.e., mothers undergoing VD and mothers undergoing CS were compared according to their socio-demographic characteristics such as maternal age, antenatal checkup, socioeconomic status, gravida, and maternal comorbidities (i.e., hypertensive disorders in pregnancy, gestational diabetes mellitus, and anemia in pregnancy) for optimization. For socioeconomic status, the modified Kuppuswamy classification was used to categorize the subjects.[9]

Critical analysis of the mode of delivery in relation to different maternal obstetrics parameters was done. The mode of conception (spontaneous or assisted), gestational age and chorionicity (by early weeks' ultrasound [USG]), and presentation of both fetuses with estimated gestational weight (by late USG) were determined and evaluated with the mode of delivery. Monochorionic-monoamniotic (MCMA) twin pregnancies were primarily planned for CS, and VD was planned according to the criteria in the Twin Birth Study: monochorionic-diamniotic (MCDA) or dichorionic-diamniotic (DCDA) with the leading fetus in the vertex presentation, estimated weight of both fetus between 1500 and 4000 g and gestational age ≥32 weeks.[10]

The mean delivery interval between 1st and 2nd twin was observed in each case, and the perinatal outcome of the 2nd twin was recorded and analyzed in terms of Apgar score at 1 and 5 min, umbilical artery pH, neonatal morbidity, neonatal intensive care unit (NICU) admission, intubation required or not, and early neonatal death.

Ethical consideration

All procedures followed in this study were in accordance with the ethical standards of the institutional ethical committee conforming to the Declaration of Helsinki of 1975 (amended version of 2000). Written informed consent was taken from each participant regarding the scientific use of anonymized data, and data confidentiality was maintained. The study had approval from the institutional ethics committee.

Data analysis

Continuous variables were analyzed by independent Student's *t*-test or Mann–Whitney *U*-test depending on data distribution. Categorical data were analyzed by Chi-square or Fisher's exact test, as appropriate. The results were evaluated at $P < 0.05$ significance level. Statistical analysis was made by using the IBM SPSS version 26.0 (IBM SPSS Inc.; Chicago, IL, USA) program.

Results

A total of 88 twin pregnancies fulfilling the inclusion criteria were included in this study, of which 44 pregnant women underwent VD and the rest 44 underwent CS. Two groups were compared and critically analyzed regarding their detailed sociodemographic and obstetric profile and perinatal outcome of the 2nd twin.

Table 1 shows that the differences between the two groups in mean maternal age, number of antenatal visits, and socioeconomic status have no statistical significance. Comparison of VD with CS showed that mothers who delivered vaginally were significantly more likely to be multigravida (28 of 44, i.e., 63.63%), whereas the majority of mothers undergoing CS were primigravida (27 of 44, i.e., 61.36%) ($P < 0.05$). Common maternal comorbidities such as hypertensive disorders in pregnancy, gestational diabetes mellitus, and anemia in pregnancy were absent in the majority of the study population in both groups.

Table 2 depicts the obstetric characteristics of the study population in each group. The number of mothers conceiving by assisted reproductive techniques (ARTs) such as ovulation induction, intrauterine insemination, and *in vitro* fertilization was significantly high, i.e., almost 2.5 fold in the CS group ($P < 0.05$). There was no significant difference in mean gestational age at delivery between mothers delivering by VD or CS. In the VD group, the majority, i.e. 26 (59.1%) pregnancies were DCDA twin pregnancies, and there was no MCMA twin pregnancy as the preferred mode of delivery is CS in these cases.[11] Twenty-three (52.27%) mothers undergoing CS had MCDA twin pregnancy and only 2 mothers were found to have MCMA twin pregnancies. The most common presentation of fetuses in both groups was vertex presentation (35, i.e., 79.55% in the VD group and 26, i.e. 59.1% in the CS group). In mothers with no cephalic 1st twin ,ceaserean section was the safest option to offer after 32 weeks as per NICE guideline.[11] The incidence of low birth weight (weighing <2500 g) 2nd twin was high in both the VD group (84.09%) and in the CS group (70.45%), the difference having no statistical significance. The mean interval between delivery of the 1st and 2nd twin was much higher in VD (7.47 ± 4.8 min) than in CS (2.159 ± 1.274), giving a highly significant $P < 0.001$.

Table 1: Distribution of mode of delivery of the 2nd twin according to sociodemographic characteristics

Parameters	VD (*n*=44), *n* (%)	CS (*n*=44), *n* (%)	*P*
Mean age (years)±SD	24.5±3.93	25.59±5.64	0.2958
Number of antenatal visits			
<3	6 (13.6)	4 (9.1)	0.5017
≥3	38 (86.4)	40 (90.9)	
Socioeconomic status			
Lower	20 (45.5)	16 (36.4)	0.5493
Upper lower	22 (50)	24 (54.5)	
Lower middle	2 (4.5)	4 (9.1)	
Upper middle	0	0	
Upper	0	0	
Gravida			
Primigravida	16 (36.36)	27 (61.36)	0.0189
Multigravida	28 (63.63)	17 (38.63)	
Maternal comorbidities			
Present	7 (15.90)	11 (25)	0.2904
Absent	37 (84.09)	33 (75)	

P-value for continuous variables was calculated by independent Student's *t*-test and categorical variables by Chi-square test/Fisher's exact test. $P<0.05$ was considered significant and $P<0.001$ was considered highly significant. SD: Standard deviation, VD: Vaginal delivery, CS: Cesarean section

Table 3 compares various perinatal outcomes of the 2nd twin in respect to the mode of delivery. The mean interval between delivery of the 1st and 2nd twin was much higher in VD (7.47 ± 4.8 min) than in CS (2.159 ± 1.274), giving a highly significant $P < 0.001$. In terms of short-term adverse neonatal outcomes such as lower Apgar score at 1 min and 5 min and lower value of umbilical arterial pH, VD was a significant predictive factor ($P < 0.05$). Furthermore, while comparing vaginally delivered 2nd twins by 1 min Apgar score, a longer intertwin delivery interval of ≥10 min was found to be significantly associated with low Apgar score ($P < 0.05$). Although the incidence of negative outcomes such as requirement of NICU admission and intubation, early neonatal death, and neonatal morbidities such as sepsis, respiratory distress syndrome, neonatal asphyxia, hyperbilirubinemia, and refractory shock were higher in babies undergoing VD, no statistically significant difference could be yielded between two groups.

Discussion

The assisted reproductive techniques emerged as an excellent promising option for childless couples to achieve intended parenthood, but the increasing incidence of multifetal pregnancies[1] also brought forward the forever discussed and investigated topic of appropriate and safe delivery mode of twins. On top of twin pregnancies being burdened with a high risk of adverse perinatal outcomes,[3,12] the 2nd twin remains at a higher risk at all cases due to various intrapartum complications such as increased intertwin delivery interval, cord prolapse, placental abruption, prolonged second stage of labor, and fetal distress.[4] Several previous studies with conflicting results exist for the safest delivery method for twins. However, due to the high elective CS rate in twins worldwide,[13,14] although not supported by any literature, decision-making and optimal

Table 2: Distribution of mode of delivery of the 2nd twin according to maternal obstetric parameters

Parameters	VD (*n*=44), *n* (%)	CS (*n*=44), *n* (%)	*P*
Mode of conception			
Spontaneous	38 (86.36)	28 (63.64)	0.0138
Assisted	6 (13.64)	16 (36.36)	
Mean gestational age (weeks)±SD	34.86±1.322	35.18±1.298	0.2551
Chorionicity			
DCDA	26 (59.1)	19 (43.18)	
MCDA	18 (40.9)	23 (52.27)	
MCMA	0	2 (4.55)	
Presentation of both twins			
Both twin vertex	35 (79.55)	26 (59.1)	
1st twin vertex and 2nd twin breech	9 (20.45)	8 (18.2)	
Both twin breech	0	4 (9.1)	
1st twin breech and 2nd twin vertex	0	6 (13.6)	
Estimated fetal weight of 2nd twin (g)			
≥2500	7 (15.90)	13 (29.54)	0.12695
<2500	37 (84.09)	31 (70.45)	

P-value for continuous variables was calculated by independent Student's *t*-test and categorical variables by Chi-square test/Fisher's exact test. $P<0.05$ was considered significant and $P<0.001$ was considered highly significant. DCDA: Dichorionic-diamniotic, MCDA: Monochorionic-diamniotic, MCMA: Monochorionic-monoamniotic, SD: Standard deviation, VD: Vaginal delivery, CS: Cesarean section

Table 3: Distribution of mode of delivery of 2nd twin according to the perinatal outcome of the 2nd twin

Parameters	VD (*n*=44), *n* (%)	CS (*n*=44), *n* (%)	*P*
Delivery interval of 2nd twin in minutes	7.47±4.8	2.159±1.274	0.0001
Apgar score at 1 min			
<7	17 (38.63)	8 (18.18)	0.0334
≥7	27 (61.36)	36 (81.82)	
Intertwin delivery interval (min)			
<10	9 (52.94)	-	0.0433
≥10	8 (47.05)		
<10	22 (81.48)		
≥10	5 (18.51)		
Apgar score at 5 min			
<7	13 (29.54)	5 (11.36)	0.0344
≥7	31 (70.54)	39 (88.63)	
Umbilical arterial pH			
<7.2	13 (29.54)	3 (6.82)	0.0057
≥7.2	31 (70.54)	41 (93.28)	
NICU admission			
Present	12 (27.27)	9 (20.45)	0.4531
Absent	32 (72.72)	35 (79.55)	
Intubation required			
Yes	4 (9.1)	2 (4.55)	0.3976
No	40 (90.9)	42 (95.45)	
Neonatal morbidity			
Present	10 (22.73)	8 (18.18)	0.5971
Absent	34 (77.27)	36 (81.82)	
Early neonatal death			
Present	3 (6.81)	2 (4.55)	0.6451
Absent	41 (93.18)	42 (95.45)	

P-value for continuous variables was calculated by independent Student's *t*-test and categorical variables by Chi-square test/Fisher's exact test. $P<0.05$ was considered significant and $P<0.001$ was considered highly significant. VD: Vaginal delivery, CS: Cesarean section, NICU: Neonatal intensive care unit

planning regarding the best mode of delivery for better outcomes of the 2nd twin require detailed prospective analyses of the data for the safety of both mother and fetus.

In our study, mothers in the VD group and CS group were comparable in terms of maternal age, socioeconomic status, number of antenatal visits, and presence of maternal

comorbidities ruling out the possibility of these variables affecting the fetal outcome. The studies conducted by Florjański *et al*.,[15] Dathan-Stumpf *et al*.,[5] and Bogner *et al*.[16] also observed no significance influence of maternal age on the mode of delivery.

The statistically significant increased elective CS rate in primigravida patients (61.36%), and patients conceived by ART (16 of 22, i.e.,72.73%) in our study was also comparable to the observations of Florjański *et al*. (84.82% in primigravida)[15] and a study by Wang *et al*. (82.4% in ART twins),[17] while Turan *et al*.[18] found no association between gravida and the choice of mode of delivery of twins. This difference is probably attributed to the tendency of the patients and doctors to choose CS over VD to avoid potential risks to the fetus in a first and valuable pregnancy. Another reason may be different approaches of our hospital policy over the years with limited medical resources and skills.

Similar to the studies conducted by Turan *et al*.,[18] our study did not find any association between the birth weight of 2nd twin and mode of delivery at 33–36 weeks of gestational age. However, Bogner *et al*.[16] noticed a significant increase in the mean birth weight of the 2nd twin in mothers undergoing VD probably due to the gestational age also being significantly high at 34.5–38 weeks in the VD group of their study. Two MCMA twin pregnancies and two pregnancies with noncephalic first twins were planned for CS. The estimated birth weight of 2nd twin and chorionicity were not deciding factors in choosing the mode of delivery.

The mean intertwin delivery interval came out to be a major determining factor in the perinatal outcome of the vaginally delivered 2nd twin, especially the 1 min Apgar score. The 2nd twins delivered within 10 min of the first twin had significantly better Apgar scores than those delivered after 10 min. The interval being much shorter in cesarean delivery naturally improves the short-term neonatal outcome in babies delivered by CS which is reflected by higher Apgar score and umbilical artery pH in this group. Florjański *et al*.[15] and Hartley and Hitti[19] also reported VD as a negative predictive factor in terms of short-term outcomes of the 2nd twin. However, a study by Turan *et al*.[18] where the gestational age was also taken into consideration, the 2nd twins with term gestation showed higher Apgar score and umbilical artery pH when delivered vaginally in comparison to CS. This contradiction may indicate toward the fact that while in preterm twin pregnancies, CS seems to be the better choice for improving the outcome of the 2nd twin; in case of term twin pregnancies, VD might be the superior choice in the presence of skilled obstetrician and strict monitoring.

This study could not establish any relationship between the mode of delivery and serious neonatal complications such as NICU admission, requirement for intubation, and other neonatal morbidities such as sepsis, hyperbilirubinemia, respiratory distress syndrome, and refractory shock. In a study by Dathan-Stumpf *et al*.,[5] similar conclusion was drawn that planned VD is not a negative predictive factor in terms of neonatal morbidity. The perinatal loss of the 2nd twin was not influenced by the mode of delivery in this study in contrary to Konar *et al*.[20] where vaginally delivered 2nd twins were shown to be in significantly increased risk of early neonatal death.

Limitations of the study

A larger sample size and categorization of the study group according to gestational age would have yielded a better insight. Due to limitations of infrastructures, manpower, and logistics, long-term effects of difficult birth such as neurodevelopmental delay and growth stunting could not be observed. Although the place of study is a large tertiary medical center with a huge variety of patients and the study is inclusive of a great number of variables, it is anticipated to contribute towards the decision-making regarding the appropriate peripartum management of twin pregnancies keeping in mind the best outcome for both fetuses.

Conclusion

Twin pregnancy is considered as high risk pregnancy as perinatal mortality and morbidity is significantly higher than singleton pregnancy. This study assessed various factors associated with the mode of delivery that might influence the final well-being and outcome of the 2nd twin. Although initial outcomes such as Apgar score and umbilical artery pH were low in vaginally delivered 2nd twins, the correlation between serious neonatal morbidity and VD seems to be insignificant.

Strict vigilance during antenatal checkups with thorough 1st- and 2nd-trimester ultrasonography to assess chorionicity, amniocity, individual fetal growth, congenital malformations, and verification of presentation of each fetus when the mother presents at labor is extremely crucial. VD can be considered as a safe and reasonable alternative with intensive labor monitoring and skilled obstetrician in a tertiary center supported by advanced neonatal care facilities. By doing so, unnecessary CS and its complications might be reduced to a minimum while also bringing out the best possible outcome for both the mother and fetus.

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Conflicts of interest

There are no conflicts of interest.

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