MED-PHOENIX: JOURNAL OF NATIONAL MEDICAL COLLEGE

ORIGINAL ARTICLE

STUDY OF PERINATAL OUTCOMES IN MULTIFETAL GESTATION ON THE BASIS OF CHORIONICITY

Sana Ansari[1]*, Ravi Shah[1], Rehana Mushtaq[1], Pravin Shah[1], Jagat Prasad Deep[1], Ruby Shrestha[1]

[1] Department of Obstetrics and Gynaecology, National Medical College and Teaching Hospital, Birgunj, Parsa, Nepal

Date of Submission : May 16, 2022
Date of Acceptance : Aug 7, 2022
Date of Publication : Aug 19, 2022

Correspondence to:
Sana Ansari, Department of Obstetrics and Gynaecology, National Medical College and Teaching Hospital, Birgunj, Parsa, Nepal.
Email: docsana1112@gmail.com
Phone: +977 9866691385

Citation:
Ansari S, Shah R, Mushtaq R, Shah P, Deep JP, Shrestha R. Study of perinatal outcomes in multifetal gestation on the basis of chorionicity. Medphoenix. 2022;7(1):7-13.

DOI: *10.3126/medphoenix.v7i1.47349*

Conflict of interest: None, ***Funding:*** None

Publisher: *National Medical College Pvt. Ltd.*
MedPhoenix - Journal of National Medical College (JNMC); 2022,7(1), available at www.jnmc.com.np

ISSN:2631-1992 (Online); ISSN:2392-425X (Print)

ABSTRACT

Introduction: *Multiple pregnancy is simultaneous development of more than one fetus in uterus. Multifetal gestations are found to be associated with significantly higher maternal morbidity and associated health care service costs. Women with multifetal gestation are nearly six times more likely to be hospitalized with complications, including preterm labor, preeclampsia, preterm premature rupture of membrane, placental abruption, hydramnios and postpartum haemorrhage. The term multifetal gestation includes twins, triplets and high order multiples.*

Objectives: *To evaluate maternal and neonatal complications and pregnancy outcomes of multifetal gestation on the basis of chorionicity.*

Materials and Methods: *This was a hospital based cross-sectional study conducted at tertiary care hospital for a period of one year from August 2020 to September 2021. A total of 58 twin pregnancies and 2 triplet pregnancies with meeting the inclusion criteria were enrolled in the study after taking consent.*

Result: *The most common maternal complication among twin pregnancy was preterm delivery (41.37%). Other maternal complication was premature rupture of membrane (32.75%), primary postpartum haemorrhage (24.13%), anemia (8.62%), Pregnancy induced hypertension (8.62%), Preeclampsia (8.62%), Placental Abruption (5.10%). Most common neonatal complication was low birth weight (63.79%). Among the two-triplet pregnancy both were Trichorionic Triamniotic with preterm delivery via lower segment caesarean section at 32 weeks. Both of these triplet pregnancies had IUGR babies.*

Conclusion: *Multifetal gestation is a high-risk pregnancy associated with adverse maternal and fetal outcomes. Early diagnosis of chorionicity and proper follow up throughout the gestation improves the perinatal outcome.*

Keywords: *Multifetal pregnancy; Ovulation induction; Preterm delivery; Triplets; Twins.*

INTRODUCTION

Some naturally, or spontaneously, occurring multiple pregnancies (with twins the most frequent, then triplets and the much rare quadruplets or even higher) many physicians underestimate the negative consequences of multiple pregnancies, even of twins.[1,2] Twin gestation can differ in zygosity and chorionicity. Zygosity reflects the genetic makeup of the pregnancy and as such determined whether the fetus share the same risk for genetic abnormalities.[3,4]

Dizygotic twins result from the fertilization of two separate ova by sperm, creating two zygotes. They are also known as fraternal twins and may be of the same or different sex. The incidence of dizygotic twins is influenced by many factors including maternal age, the use of fertility drugs and family history. Each fetus has an independent risk of aneuploidy.[3,4]

Chorionicity refers to the placentation of the pregnancy. Dizygotic twins will develop as dichorionic- diamniotic (DCDA) pregnancies as a result of the fertilization of two ova, which creates two separate placentas. Monozygotic twins may be Monochorionic (MC) or Dichorionic (DC) depending upon the stage at which the single zygote splits.[5,6]

Overall, 80 % of monozygotic twins are DC and 20 % are MC.Triplets and other higher order multiple gestations are associated with significantly increased risks of maternal and neonatal morbidity compared with twin and singleton gestations. Trichorionic triamniotic (TCTA), Dichorionic triamniotic (DCTA) and monochorionic tiamniotic (MCTA) triplets are the most common types of triplet pregnancies.[7] Monochorionic diamniotic (MCDA) and Dichorionic diamniotic (DCDA) triplet pregnancies are extremely rare. This study was carried out to determine the various maternal and fetal complications associated with Multifetal gestation as early diagnosis of chorionicity will improve the perinatal outcome with proper follow up.

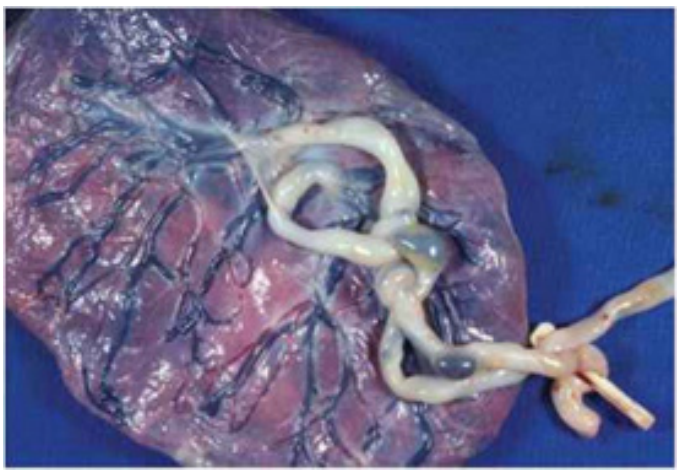

Fig:1 Monochorionic Monoamniotic

Fig:2 Monochorionic Diamniotic Placenta

Fig:3 Dichorionic Diamniotic Placenta

Fig:4 Trichorionic Triamniotic Placenta

METHOD AND MATERIALS

This study was a hospital based cross-sectional study. The study was conducted at National Medical College and Teaching Hospital Birgunj, Nepal. This is a tertiary level hospital. The study period was twelve months from (31st August 2020 to 1st September 2021). Ethical clearance was obtained from the Institutional Review Committee of National Medical College (No-NMC/424/075/076).

All patients with multiple pregnancies delivered at our hospital were included in the study. Patients were grouped on the basis of chorionicity as Monochorionic and dichorionic. A thorough history of patients with chief complaints was recorded. Detailed menstrual history, obstetric history was noted down along with family history of multiple pregnancies if any was recorded. General physical examination and systemic examination was done. Obstetric complication like PIH, Anemia, preterm labour, IUGR, PROM was noted. All the patients presented in labour with gestation of more than 28 weeks were included in the study. Outcome was recorded as number of patients who delivered spontaneously vaginally, requiring instrumentation and also those who required caesarean section.

Data was collected and noted on a structured proforma. On receiving a case fulfilling the inclusion criteria, she was explained about the study in detail. She was assured of confidentiality and an informed written consent was taken. All the complications related to multiple pregnancies were noted down. Fetal outcome in view of gestational age at birth, weight at birth, APGAR score at 1 minute, requirement for NICU admission was analysed. Among the first coming fetus was labelled as Twin 1 and the second coming fetus was labelled Twin 2. As for triplets the fetuses are labelled as fetus 1, fetus 2, fetus 3 for consecutive deliveries of triplet fetuses. Special emphasis was given to the second baby of the twin regarding presentation, time required for delivery, mode of delivery and neonatal morbidity. Maternal parameters studied were Age, Parity, Family history of multiple pregnancies, history of infertility treatment or ovulation induction, Antenatal registration and referred cases, antenatal high-risk factors, maternal complications, ultrasound reports fetal parameters studied, Gestational age at birth, weight at birth, mode of delivery, NICU admission (morbidity).

The data collected were entered daily. Analysis of the data was done by using SPSS software. The findings were then presented in the form of tables, graphs and diagrams using Microsoft Excel 2007. SPSS version 20 was the software used for calculation and tabulation of data. The final results were discussed and the conclusion was derived.

RESULTS

There were 60 multifetal gestation deliveries amongst 3344 total deliveries in the specified time period out of which 58 were twin pregnancies and 2 were triplet pregnancies. The incidence in our hospital is 1.79%. The following results were analysed at the end of the study.

Table 1: Showing distribution of 58 twin deliveries with relation to Sociodemographic and Obstetric factors

CHARACTERISTICS	MCMA +MCDA n (28)	%	DCDA n (30)	%
GRAVIDA				
Primigravida	8	28.57	7	23.33
Multigravida	20	71.42	23	76.66
MATERNAL AGE IN YEARS				
<20	2	7.14	2	6.66
21-24	8	28.57	7	23.33
25-29	13	46.42	17	56.66
30-34	4	14.28	4	13.33
35-39	1	3.57	0	0
MODE OF CONCEPTION				
Spontaneous	21	75	28	93.33
Induced by Drugs	4	14.28	1	3.33
Induced by IUI	2	7.14	1	3.33
IVF	1	3.57	0	0
FAMILY H/O TWINNING				
Present	6	21.42	4	13.33
Absent	22	78.57	26	86.66

Out of the 58 twin pregnancies, primigravidas constituted for 25.86% of pregnancies and multigravidas constituted for 74.13%. Among the two triplet pregnancies both were multigravidas. The most common age group for the incidence of twins according to our study was 25 to 29 years. In both mono and dichorionic pregnancies the common age group was 25-29 years. Among the two triplet pregnancies one was 28 years and another was 29 years. Out of the 58 twin pregnancies, 84.48% were out of spontaneous conception,8.62% induced by drugs, 5.17% were induced by IUI and 1.72% were by IVF. Among the two triplet pregnancies both were by spontaneous conception. There was a positive family history of twinning in only 17.84% of twin pregnancies and it was absent in 82.75% of twins. In triplet there was absence of family history of multiple gestation.

Table 2: Showing the different Maternal and Fetal risk factors complicating Multifetal Pregnancy

CHARACTERISTICS	MCMA + MCDA n (28)	%	DCDA n (30)	%
MATERNAL RISK FACTORS				
Gestational hypertension	4	14.28	1	3.33
Preeclampsia	2	7.14	3	10
GDM	2	7.14	1	3.33
Abruption	2	7.14	1	3.33
Placenta Previa	2	7.14	1	3.33
Anemia	4	14.28	1	3.33
Hydramnios	1	3.57	0	0

TERM/PRETERM/PROM/PPROM				
Term	3	10.71	12	40
Preterm	16	57.14	8	26.66
Preterm PROM	8	28.57	3	10
PROM	1	3.57	7	23.33
GESTATIONAL AGE IN WEEKS				
28-30	7	25	1	3.33
31-33	12	42.85	1	3.33
34-36	8	28.57	15	50
>37	1	3.57	13	43.33
MODE OF DELIVERY				
LSCS	15	53.57	8	26.66
Vaginal	13	46.42	22	73.33
LSCS INDICATIONS				
Preterm PROM	3	10.71	2	6.66
PROM	2	7.14	1	3.33
Malpresentations	4	14.28	3	10
APH	3	10.71	1	3.33
Fetal distress	2	7.14	1	3.33
Repeat LSCS	1	3.57	0	0
TYPE OF PRESENTATION				
Vx Vx	9	32.14	13	43.33
Vx Breech	4	14.28	4	13.33
Breech Vx	4	14.28	5	16.66
Vx Transverse	4	14.28	0	0
Breech Transverse	0	0	1	3.33
Transverse Breech	1	3.57	0	0
Breech Breech	6	21.42	7	23.33
PPH				
Present	4	14.28	10	33.33
Absent	24	85.71	20	66.66
IUD				
Present	3	10.71	0	0
Absent	25	89.28	30	100
STILL BIRTH				
Present	2	7.14	3	10
Absent	26	92.85	27	90

Among the 58 twin pregnancies, 51.72% were dichorionic diamniotic, 44.82% were monochorionic diamniotic and 3.44% were monochorionic and monoamniotic. Among the two triplet pregnancies both were Trichorionic triamniotic. Gestational hypertension was present in 8.6%, preeclampsia was present in 8.6%, anaemia was present in 8.6%, GDM was present in 5.17% and abruptio placenta in 5.17%, placenta previa in 5.17%, hypothyroidism in 3.44% and hydramnios in 1.72% of pregnancies. Among the two triplet pregnancies one had severe preeclampsia and other was Anaemic. Pre term complicating twin pregnancies was present in 41.37%, preterm PPROM in 18.96% and PROM in 13.79%. Out of the 28 monochorionic pregnancies, preterm was present in 64%, preterm PPROM was present in 28.57%, PROM was present in 3.57%. Out of the 30 dichorionic pregnancies, preterm was present in 26.66%, preterm PPROM was present in 10%, PROM was present in 23.33%. Out of the 58 twin deliveries, 39.65% took place around 34 – 36 weeks, 24.13% took place at a gestational age more than 37 weeks, 22.41% around 31- 33 weeks, and 13.79% in 28 – 30 weeks. Among the monochorionic pregnancies, 20.68% delivered at a gestational age of 31 -33 weeks, 13.79% delivered at 34 – 36 weeks, 1.72% delivered at more than 37 weeks and 12.06% delivered at 28 – 30 weeks. Among the dichorionic pregnancies, 1.72% delivered at a gestational age of 31 - 33 weeks, 25.86% delivered at 34 – 36 weeks, 22.41% delivered at more than 37 weeks and 1.72% delivered at 28 – 30 weeks. Both triplet pregnancies which was Trichorionic-Triamniotic was delivered at 31-33 weeks. Out of the 28 monochorionic pregnancies, 53.57% was delivered by LSCS, 46.42% was delivered by vaginal route. Out of the 30 dichorionic pregnancies, 26.66% was delivered by LSCS, 73.33% was delivered by vaginal. Both triplet pregnancies were delivered by LSCS. The most common indication for LSCS was fetal malpresentation in both Monochorionic and Dichorionic pregnancies, followed by Preterm PROM, APH, Fetal distress and repeat LSCS. The indication for LSCS in both triplet pregnancies was Preterm PROM. Out of the 58 twin deliveries, 37.93% was of both vertex presentation, 13.79 % of Vx breech, 15.51% breech Vx, 22.41% of both breech, 6.89% Vx transverse, transverse Breech and Breech transverse 1.72% each. Among the two triplet one case has Vertex Vertex Breech and the other one had Vertex Vertex Transverse. Out of the 28 monochorionic pregnancies, PPH was present in 6.89% and out of 30 Dichorionic it was in 17.24%. One case among the two triplet pregnancies was complicated by PPH. Out of 58 twin deliveries, IUD complicated 5.17% of monochorionicity and no any case of IUD was seen in Dichorionic. No fetus among the two triplet pregnancies was complicated with IUD. Out of 58 twin deliveries,

still birth was found in 7.14% of 28 monochorionic pregnancies and 10% of 30 dichorionic pregnancies. Out of 2 triplet pregnancies Still Birth was not present in any.

Table 3: Showing relation between different Neonatal Outcome on the basis of Chorionicity

CHARACTERISTICS	MCMA + MCDA n (28)	%	DCDA n (30)	%
BIRTH WEIGHT IN KG				
<1.5	10	35.71	1	3.33
1.5-2.5	14	50	12	40
>2.5	4	14.28	17	56.66
CONGENITAL ANOMALIES				
Present	0	0	1	3.33
Absent	28	100	29	96.66
SELECTIVE IUGR				
Present	4	14.28	1	3.33
Absent	24	85.71	29	96.66
5 MIN APGAR				
0-5	7	25	2	6.66
6-7	18	64.28	23	76.66
8-10	3	10.71	5	16.66
DISCORDANT GROWTH				
Present	4	14.28	1	3.33
Absent	24	85.71	29	96.66
NEONATAL MORBIDITY				
RDS	5	17.85	5	16.66
LBW	3	10.71	2	6.66
Birth Asphyxia	2	7.14	0	0
VLBW	4	14.28	1	3.33
Hyperbilirubinemia	4	14.28	4	13.33
Hypoglycemia	3	10.71	1	3.33
NEONATAL DEATH				
Present	5	17.85	2	6.66
Absent	23	82.14	28	93.33
CAUSE OF DEATH				
RDS and Sepsis	1	3.57	0	0
Sepsis	1	3.57	0	0
Birth Asphyxia	1	3.57	1	3.33
Seizures	1	3.57	0	0
NEC	0	0	1	3.33
IVH	1	3.57	0	0
PERINATAL OUTCOMES OF TWIN B				
IUD	3	10.71	0	0
Still Birth	2	7.14	3	10
LBW	3	10.71	2	6.66
VLBW	4	14.28	1	3.33
NICU admission	21	75	13	43.33
Congenital Anomalies	0	0	1	3.33
IUGR	4	14.28	1	3.33
Discordant Growth	4	14.28	1	3.33
Neonatal Death	5	17.85	2	6.66
ALIVE BABIES ON DISCHARGE				
Present	23	82.14	28	93.33
Absent	5	17.85	2	6.66

Out of 58 twin deliveries, 35.71% in monochorionic pregnancies and 3.33% in dichorionic pregnancies were found to have a birth weight of less than 1.5 kg, 50% in MC and 40% in DC had a birth weight between 1.5 – 2.5 kgs, 14.28% in MC and 56.66% in DC had a birth weight more than 2.5 kgs. Out of two triplet pregnancies, 3 fetuses had birth weight between 1.5-2.5 kgs and 3 fetuses had birth weight less than 1.5 kgs. Out of the monochorionic pregnancies, congenital anomalies were not present but it was present in 3.33% of dichorionic pregnancies. Among the two triplet pregnancies congenital Anomaly was not present in any of the fetuses. Out of the monochorionic pregnancies, IUGR was present in 14.28% and in 3.33% of DC pregnancies. Among the two triplet pregnancies IUGR was present in one. Out of MC pregnancies, a 5-minute Apgar score of less than 8 was found in 89.28% and 83.33% of DC pregnancies. Out of MC pregnancies, discordant growth was found in 14.28% and 3 . 3 3 % of DC pregnancies. Among the two triplet pregnancies Discordant growth was not present in any. Causes for neonatal morbidity like RDS was present in 17.85% of MC and 16.66% of DC, LBW was present in 10.71% of MC and 6.66% of DC, VLBW in 14.28% of MC and 3.33% of DC,birth asphyxia in 7.14% of MC and 0% of DC, hyperbilirubinemia in 14.28% of MC and 13.33% of DC and hypoglycaemia in 10.71% of MC and 3.33% of DC pregnancies. Among the two triplet pregnancies all the 6 fetuses were LBW, 4 fetuses had RDS and 2 had birth asphyxia. Out of MC pregnancies, neonatal mortality was found in 17.85% and 6.66% of DC pregnancies. Among the triplet pregnancies, neonatal mortality was not present. Out of 5 neonatal deaths in MC & 2 deaths in DC, RDS, sepsis, Birth Asphyxia, Seizures, IVH constituted for 20% each in MC and for DC 50% for Birth Asphyxia and

50% for NEC. Out of 28 MC pregnancies, 93.33% required NICU Admission where as in 30 DC pregnancies,43.33% required NICU Admission. Among the two triplet pregnancies, five fetuses required NICU Admission. IUD, LBW, VLBW, NICU admission, IUGR, discordant growth and neonatal death were higher in MC twin B than DC twin B. Out of 28 MC pregnancies, 82.14% of babies were discharged alive and in 30 DC pregnancies, 93.33% of babies were discharged alive. Among the two Triplet pregnancies, all babies were discharged alive.

DISCUSSION

The frequency of multiple pregnancies in the past hundred years has been 1.4% - 1.5%.[8] In our hospital out of 3344 deliveries 58 were twin pregnancies and 2 were triplet pregnancies, in our hospital, the twin and triplet pregnancy rate were 1.73% and 0.05 % respectively, the twin pregnancy rate is comparable with Smits J et al who had twin pregnancy rate of 1.31%, while the triplet pregnancy rate is comparable to the study by Erdemoglu et al of 0.29%.[9,10] The age distribution among multiple pregnancies had the maximum number of patients in the age group of 20-30 years (78.33%) which is comparable with Yuel et al (87.5%) and least number of pregnancies in age more than 35 years (1.6%) which is comparable with Kauppila et al (1.1%).[11,12]While a study by Satija et al, found a strong association of maternal age with a twinning rate; the twinning rate of mothers between 30 and 34 years of age was about 10 times higher than the rate for mothers younger than 20 years.[13] The distribution of multiple pregnancies with parity, it can be determined that maximum number of patients had conceived as multiples for the first time which is comparable to Yuel et al whereas Satija et al found that the twinning rate was highest at gestational order 4 or higher.[11,13]

Most of the patients had conceived spontaneously in maximum number of our patients (85%) which is comparable with Erdemoglu et al (89.75%).[10] According to the type of placentation, which was correlated with antenatal usg and inspection of placenta and membranes after birth, the comparisons were made. Thus, Dichorionic placentation were the majority (51.72%) in our study which is comparable with Erdemoglu et al (69.3%) and Panwala et al (63.8%).[10,14] Among the triplet pregnancy both were trichorionic triamniotic. As compared to various authors, the average weeks of gestation are very similar and comparable with our study i.e., 35 weeks as the average weeks of gestation among twins being 36weeks by Kauppila et al[12] and 33 weeks by Erdemoglu et al and 34 weeks by Yuel et al.[10,11] So was the comparison with triplets and their average weeks of gestation in our study was 32 weeks, which is similar to Erdemoglu et al.[10]

Vertex-Vertex presentation is most commonly seen in twins as in our study 37.93% that are low while comparing with Panwala et al 51.4%.[14] The presentation of the fetuses during labour determined the route of delivery. It is determined in our study that among the twin pregnancies in labour 60.34% delivered vaginally and 39.65% required caesarean section which is comparable with other studies Yuel et al had 55% vaginal deliveries and 45% Caesarean sections.[11] In study by Erdemoglu et al 50.5% had vaginal deliveries and 45% required Caesarean sections.[10] In our study since there were only 2 triplet pregnancy both sets required caesarean showing high rates of LSCS is due to small sample size. It is also mentioned in literature that birth with caesarean section is safer in non-vertex-vertex and non-vertex-non vertex presentation cases. It is also known that fetal mortality is high in locked twin cases. Premature births are very common in multiple pregnancy. Our study determined 60.34% of premature births which is comparable to the findings by Yuel et al (57.5%) and by Kauppila et al (42%).[11,12] All the 6 triplet babies were premature (100%), as compared to the series by Erdemoglu et al 90.9%.[10] Our study clearly shows that premature delivery is the main cause of fetal complication, like NICU admission for twins and triplets which finding is consistent with finding of other studies. The percentage of congenital anomalies was found to be 1.6% in our study, 0.5% in Yuel et al study and 10.6% in Erdemoglu et al.[10,11]

Multiple pregnancy is associated with an increase in Obstetric complications such as premature birth, early rupture of membranes, anemia, PIH, antepartum and postpartum haemorrhage. The most frequently seen obstetric problem in multifetal gestation in our study are determined as preterm birth 43.33%, Preterm PROM is 21.66%. Anemia in 8.33%, PPH in 23.33% and

other complications which are higher in comparison with Erdemoglu et al (PROM 14.36%, PPH 0.6%) while the incidence of PIH (16.66%) are comparable to Yuel et al (PIH 19%).[11] In comparison with the indications of LSCS for multiple pregnancy malpresentation (15%) is the commonest indication in our study which is low in comparison with Erdemoglu et al (46.3%).[10]

Due to the limited duration and number of samples, the projected result cannot be conclusively applied to large population, so multicentric study is recommended.

CONCLUSION

Multifetal gestation is a high-risk pregnancy for both mother and the fetus, majority of the risk factors are preventable for a better maternal and perinatal outcome. In our settings the common maternal complications were preterm delivery, PROM, Preeclampsia, PPH and the common fetal complications include Low birth weight, IUGR and discordant Growth. The most common complications in the Neonates that our study revealed were Respiratory Distress Syndrome, Birth Asphyxia, hyperbilirubinemia and Hypoglycemia. As the antenatal complications seen in multiple gestation are more common in higher order pregnancies, antenatal management is directed at reducing their incidence.

REFERENCES

1. American College of Obstetricians and Gynecologists. Multifetal gestations: twin, triplet, and higher-order multifetal pregnancies: ACOG Practice Bulletin, Number 231. Obstetrics and gynecology. 2021 Jun 1;137(6): e145-62. [DOI]

2. Chaabane S, Sheehy O, Monnier P, Bissonnette F, Trasler JM, Fraser W, Bérard A. Association between ovarian stimulators with or without intrauterine insemination, and assisted reproductive technologies on multiple births. American Journal of Obstetrics and Gynecology. 2015 Oct 1;213(4):511-e1. [DOI]

3. Song B, Wei ZL, Xu XF, Wang X, He XJ, Wu H, Zhou P, Cao YX. Prevalence and risk factors of monochorionic diamniotic twinning after assisted reproduction: a six-year experience base on a large cohort of pregnancies. PLoS One. 2017 Nov 6;12(11): e0186813. [DOI]

4. Haas J, Hourvitz A, Dor J, Yinon Y, Elizur S, Mazaki-Tovi S, Barzilay E, Shulman A. Pregnancy outcome of early multifetal pregnancy reduction: triplets to twins versus triplets to singletons. Reproductive biomedicine online. 2014 Dec 1;29(6):717-21. [DOI]

5. Zemet R, Haas J, Bart Y, Barzilay E, Zloto K, Argaman N, Schwartz N, Weisz B, Yinon Y, Mazaki-Tovi S, Lipitz S. Pregnancy outcome after multifetal pregnancy reduction of triplets to twins versus reduction to singletons. Reproductive biomedicine online. 2020 Mar 1;40(3):445-52. [DOI]

6. Pandey MR, Kshetri BJ, Dhakal D. Maternal and perinatal outcome in multifetal pregnancy: a study at a teaching hospital. American Journal of Public Health Research. 2015 Oct 28;3(5A):135-8. [Full Text]

7. Wei J, Wu QJ, Zhang TN, Shen ZQ, Liu H, Zheng DM, Cui H. Complications in multiple gestation pregnancy: a cross-sectional study of ten maternal-fetal medicine centres in China. Oncotarget. 2016 May 24;7(21):30797. [DOI]

8. Blickstein I, Keith LG, editors. Multiple pregnancy: epidemiology, gestation, and perinatal outcome. CRC Press; 2005 Mar 8. [DOI]

9. Smits J, Monden C. Twinning across the developing world. PloS one. 2011 Sep 28;6(9): e25239. [DOI]

10. Erdemoglu M, Kale A, Akdeniz N, Yalinkaya A, Ozcan Y, Yayla M. Retrospective analysis of multiple pregnancies. Perinatal journal. 2005;13(4):213-17. [Full Text]

11. Irene YV, Vaneet K. An analytical study of pregnancy outcome in multifetal gestation. J Obstet Gynecol India. 2007 Nov;57(6):509-12.

12. Kauppila A, Jaupilla P, Koivisto M, Moilanen I, Ylikorkala O Twin pregnancy. A clinical study of 335 cases. Acta scand Eng. 1973;13(64):5-12. [DOI]

13. Satija M, Sharma S, Soni RK, Sachar RK, Singh GP. Twinning and its correlates: community-based study in a rural area of India. Human Biology. 2008 Dec;80(6):611-21. [DOI]

14. Panwala NM, Mondkar AM, Ranade VR, Purandare VN. Multiple pregnancy. A review of 116 cases Journal of postgraduate medicine. 1972 Jul;18(3):108-14.