A comparison of maternal and perinatal outcomes and mode of delivery of twin and singleton gestations in a tertiary government hospital during a 10-year period*

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ABSTRACT

Background: Multiple gestations, including twin gestations are commonly associated with adverse maternal, perinatal and neonatal outcomes compared with singleton pregnancies. Its incidence has shown a significant increase over the last decades.

A retrospective cohort study was made at the Department of Obstetrics and Gynecology by review of medical records of twin pregnancies and their neonates.

Objective: The purpose of this study is to describe and compare the outcomes of twin gestation against singleton pregnancies, in terms of the following: the presentation of the twin gestation, chorionicity, the mode and timing of delivery and fetomaternal complications. This study aimed to determine whether an association exists between the twin gestation and adverse perinatal outcomes.

Methodology: The study included singletons and twin gestations admitted at a tertiary government hospital admitting section within a ten-year period, 2006-2015. Confirmation of diagnosis of multiple pregnancies was obtained by ultrasound.

This retrospective cohort study conducted at a tertiary government hospital included 228 singletons and 110 twin gestations in a ten-year period.

Results: Results showed women with twin pregnancies had a higher incidence of preterm labor and delivery. Compared to singleton pregnancies, complications of prematurity are not uncommon in twin gestations. This should encourage prenatal and antenatal care in women who have twin gestations.

Conclusion: The incidence of preterm labor and delivery for twin gestation, relative to singletons, was high in the study. Twin gestations are 3-4 times more likely to present with preterm labor relative to singletons.

Keywords: multiple gestation, twin gestation, mode of delivery, maternal morbidity, neonatal morbidity

INTRODUCTION

Multiple gestations, most common of which are twin gestations, have increased incidence in the last decade due to availability of assisted reproductive technology and proper documentation. It contributes disproportionately to maternal and perinatal morbidity and mortality, well in excess of that due to multiplication of singleton risks by fetal number.

Ultrasound examination is a safe and reliable method for definitive diagnosis of twin gestation.[1] Early ultrasound assessment also provides accurate estimation of gestational age, which is important in all pregnancies. This accurate estimation of gestational age is particularly important in management of twin pregnancies because of the higher risks for preterm delivery and growth restriction.

Evaluation of fetal growth is particularly important in twin pregnancy because growth restriction and prematurity are again the major causes of the higher morbidity and mortality rates in twin compared with singleton gestations[2].

The purpose of this study was to determine the course of twin pregnancies and describe it in detail. The study aimed to compare the outcomes of twin gestations with that of singleton gestations. Multifetal pregnancy, most common of which are twin gestations, is associated with higher rates of almost every potential complication of pregnancy.[3] The most common and serious risk is spontaneous preterm delivery, which plays a major role in the increased perinatal mortality and short-term and long-term morbidity observed in these infants.[4]

It is uncertain if complications, are a result of prematurity, or arise due to biological or

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sociodemographic factors, such as advance maternal age (>35 years old) is believed to be associated with numerous feto-maternal complications as well.[5] This paper investigated if this is more pronounced in twin gestation than in singleton gestations.

Extreme prematurity (birth at less than 28 weeks of gestation) also occurs more frequently in twin and triplet pregnancies, thus the higher adverse neonatal and infant outcomes among twins and triplets compared to singletons, including higher levels of long-term neurodevelopmental problems.[6] Determining its magnitutde with complications, identifying the risk factors are crucial for possible prevention and better interventions.

There are special circumstances in which the management plan of vaginal delivery in a vertex-vertex presentation are inappropriate.[14] Two examples include monochorionic-monoamniotic pregnancies and conjoined twins. In the former instance, there is the risk for cord entanglement before delivery. In the latter, depending on the size of the conjoined pair, vaginal delivery may result to an inordinate risk of maternal trauma. Other circumstances may also indicate the need for a cesarean section, such as the presence of growth restriction, which would render a stressful environment for one of the twins.

OBJECTIVES

A. General Objectives

To compare the maternal and neonatal outcomes between singleton and twin gestations in a 10-year period in a tertiary government hospital

B. Specific Objectives

1. To describe the sociodemographic profile of the patients with twin pregnancy and singleton pregnancy during the study period
2. To describe the clinical profile of the patients with twin pregnancy and singleton pregnancy during the study period
3. To determine and compare the outcome of singleton and twin pregnancy included in the study:
   a. Mode of delivery
   b. Timing of delivery
   c. Presentation at delivery
   d. Obstetric complications
   e. Prevalence of preterm birth
   f. Prevalence of preterm labor
   g. Prevalence of congenital anomalies
   h. Prevalence of fetal weight abnormalities
   i. Incidence of neonatal morbidity and mortality
4. To determine types of chorionicity among twin gestation
5. To determine whether an association exists between twin gestation and neonatal morbidity and mortality

MATERIALS AND METHODS

A. Setting of the Study

The study was conducted at the Department of Obstetrics and Gynecology of a tertiary government training hospital

B. Study Design

This is a retrospective cohort study.

C. Selection of subjects

Filipino pregnant women, married to Filipino men, with singleton or twin gestations, confirmed by ultrasound, admitted at the OB Admitting section and delivered within the period of January 1, 2006 to December 31, 2015, at a tertiary government hospital will be included in the study.

D. Inclusion / Exclusion Criteria

Filipino women with singleton or twin gestations confirmed by ultrasound delivered at a tertiary hospital from January 1, 2006 to December 31, 2015 were included in the study.

Excluded in both singleton and twin gestation study group are:

1. Pregnancies with indications for abdominal delivery, such as placenta previa, abruption placenta, cephalopelvic disproportion.
2. Pregnancies that had a history of in-vitro-fertilization (IVF) prior to the current pregnancy
3. Pregnancies that are complicated by severe maternal illness such as those gravidocardiac functional class III-IV, in thyroid storm, preeclampsia with severe features.

E. Sample size

The study is a retrospective cohort study design with a distribution of two singleton pregnancies for every multiple gestation participant included. According to the World Health Organization (WHO) Statistics, the prevalence of preterm delivery among singleton women in the Western Pacific region is 11.9%, in contrast prior literature mentioned that 24.7% of deliveries among women who have multiple gestations were preterm[13]. Hence, we needed to study 110 twin gestations and 228 singleton pregnancies to be able to reject the null

hypothesis, that there is no difference in the outcomes between singleton and twin gestations, using a power of 80% and a confidence level at 0.05. A continuity-corrected chi-squared statistic or Fisher's exact test to evaluate this null hypothesis was utilized. An additional 10% of the participants will be included to adjust for the possibility of incomplete data.

F. Sampling Methods

i. The EPI INFO 6 registry at the Section of Perinatology of this hospital contains the list of pregnant women who were seen at the institution. The researcher identified and derived the list of possible subjects from this database. Twin pregnancies delivered within the 10-year duration were assigned reference number. A computer-generated random numbers will be produced. Participants to be included in the study group (twin gestation group) will be selected using the computer-generated table of random numbers. To eliminate the effects of differences in clinical management per year, we decided to equally distribute the sample size of twin gestation group per year. The sample size of the study population (twin gestation), 110 will be divided by 10 (corresponding the 10 years study), equaling ten to twelve twin gestations per year.

ii. For each twin pregnancy, two matched controls will be selected from the database. They will be matched as to maternal age, gravidity and parity, and year of delivery, and age of gestation within ± 1 week age of gestation). The selection process with the random number generation will be continuously done until the target sample size is obtained.

iii. Each subject will be scrutinized for inclusion and exclusion criteria.

iv. Maternal-neonatal medical records (Ward report, Logbook of admissions/Masterlist of the Obstetrics Gynecology Department, Neonatal admissions and outcome logbook) will be retrieved from the Department of Obstetrics and Gynecology, Pediatrics and Neonatology Medical Records Section. The data will include demographic details, complaint leading to admission, past medical and family medical history. Antepartum, intrapartum, and postpartum complications, neonatal outcomes and complications and perinatal morbidity and mortality will be recorded

G. Data Analysis

Once the data have been extracted from the maternal and neonatal charts and records, all the information will be manually entered into an electronic Excel spreadsheet file; and data processing and analysis will then be carried out using the software, Stata 13.

Descriptive statistics such as mean, standard deviation, frequency and percentage will be used to provide an overview of the study population. Frequency and percentage will also be used to describe the different presentations and chorionicity among the study participants.

A Chi-square test of association for categorical data or an independent t-test for numerical data, whichever is applicable, will be conducted to determine if there is a significant difference in the characteristics or rates of the maternal and neonatal outcomes between the groups (singleton versus multiple gestation).

Logistic regression will be used to determine the association of having a twin gestation and the occurrence of select neonatal outcomes. Crude odds ratios will be computed comparing the occurrence of the neonatal outcomes, and select clinic-demographic variables. Adjusted odds ratios will be produced by controlling for possible confounders found in the literature using the backward elimination process.

The level of significance for all sets of analysis was set at $p<0.05$ using two-tailed comparisons. A cut-off for the change in the estimation criterion of more than or equal to 10% will be used for inclusion in the final model, otherwise it will be considered a non-significant confounder. Significance levels will be adjusted for multiple comparisons performed.

RESULTS

In Table 1, we show the different characteristics of those who had deliveries, specifically the age category of those who delivered twin pregnancies. The reproductive age group, 19-34 years old contributed majority of the deliveries (72%). Twin gestations majority deliver preterm (68.2%) vs. preterm deliveries in singleton (8.8%). Randomization of twin gestations in the ten years collected show multiparity in 42.7%. Chief complaints usually comprise of labor pains, watery discharge, vaginal bleeding, bloody mucoid discharge and elevated BP in decreasing frequency. For BMI during time of admission most are in the bracket range 24.0-29.9 kg/m^2, the average of which is 25 +/- 3.96 kg/m^2. This is not an actual picture of the BMI of a pregnant patient since data on pre-pregnancy weight is not available. For the preterm deliveries 64.6% percent had steroid administration, for which 28.2% was given tocolytics. For the ten-year review, no twin pregnancies used progesterone nor underwent cervical cerclage or laminaria insertion.

Ten percent of twin gestations had a family history

Table 1. Baseline demographic and obstetric characteristics of study subjects

Characteristics	*Single gestation (n=228)*	*Twin gestation (n=110)*	*p-value*
Age, years <18 y/o 19 – 34 y/o > 35 y/o	 16 (7.02%) 170 (74.56%) 42 (18.42%)	 11 (10%) 79 (71.82%) 20 (18.18%)	0.64
Gestational age, weeks 24- 27 6/7 weeks 28- 36 6/7 weeks 37 – 40 weeks 40 – 42 weeks 42 and above weeks	 - 20 (8.77%) 164 (71.93%) 42 (18.42%) 2 (0.88%)	 6 (5.45%) 69 (62.73%) 34 (30.91%) 1 (0.91%) -	0.01**

Characteristics	*Single gestation (n=228)*	*Twin gestation (n=110)*	*p-value*
Parity Primiparous Multiparous	 159 (69.74%) 69 (30.26%)	 63 (57.27%) 47 (42.73%)	0.02*
Previous preterm delivery	5 (2.21%)	6 (5.45%)	0.18
Fundic height in cm	31 ± 2.28	35 ± 4.47	0.01**
Body mass index in kg/m2	25 ± 3.96	26 ± 4.24	0.03*
Antenatal corticosteroids	19 (8.33%)	71 (64.55%)	0.01**
Use of tocolytics	13 (5.70%)	31 (28.18%)	0.01**

of multiple gestation, No use of ovulation inducing agents were noted in this study. In seventeen of the singleton pregnancies and 8 of twin gestations, OCPs were used. (Table 2)

Table 2. Distribution of patients by probable etiologic factors

Parameters	*Single gestation (n=228)*	*Twin gestation (n=110)*	*p-value*
Family history of multiple gestation			
High Order Twinning	-	10 (9.09%)	0.01**
Maternal	-	5 (4.55%)	0.01**
Paternal	-	5 (4.55%)	0.01**
Use of pills within 3 months	17 (7.45%)	8 (7.27%)	0.57

Table 3 shows 66.4% of twin gestations underwent abdominal delivery, while the rest had vaginal birth. Three point six percent (3.6%) of twin gestations had vaginal delivery for the first of twin while the second of twin was delivered abdominally due to failure in descent of the second of twin or non-reassuring fetal status. In singletons, only 7% underwent abdominal delivery.

The most common complication of twin gestation was preterm labor (54.6%) followed by anemia (19.1%)

Table 3. Mode of delivery

Mode of delivery	*Single gestation (n=228)*	*Twin gestation (n=110)*	*p-value*
Vaginal delivery	211 (92.54%)	33 (30%)	0.01**
Abdominal delivery	16 (7.02%)	73 (66.36%)	
Others	1 (0.44%)	4 (3.64%)	

(Table 4). More uncommon were hypertension with or without preeclampsia, preterm prelabor rupture of membranes, hyperemesis gravidarum, amniotic fluid abnormalities, in that order. For singletons the most common complications encountered by mothers is again firstly preterm labor (7.9%) followed by preeclampsia (7.0%) then anemia (4.8%). Eighty percent of singleton pregancies did not encounter any complications.

Table 5 shows more NICU admission in twin gestations than singletons (50.9% vs. 14.0%). This may relate to the increased incidence of preterm labor and delivery, as shown from the previous table. From the 56 NICU admissions, 5 had early neonatal death.

Table 6 shows causes of neonatal morbidity and mortality, respectively. Out of the 110 twin gestations, 44.5% were premature, 34.6% had IUGR, while 15.5% had septicemia. Others included transcient tachypnea of the newborn. 29 were intubated while 4 had acute

Table 4. Complications encountered by mothers

Complications	*Single gestation (n=228)*	*Twin gestation (n=110)*	*p-value*
Anemia	11 (4.82%)	21 (19.09%)	0.01**
Hyperemesis gravidarum	-	3 (2.73%)	0.03*
Preeclampsia	16 (7.02%)	20 (18.18%)	0.01**
Preterm labor	18 (7.93%)	60 (54.55%)	0.01**
Polyhdramnios	-	5 (4.55%)	0.01**
Postpartum hemorrhage	-	2 (1.82%)	0.11
PPROM	3 (1.32%)	11 (10%)	0.01**
Operative complications	1 (0.44%)	-	0.68
No complications	183 (80.26%)	27 (24.55%)	0.01**

Table 5. Perinatal and neonatal morbidity and mortality

Outcomes	*Single gestation (n=228)*	*Twin gestation (n=110)*	*p-value*
Direct rooming in	196 (85.96%)	54 (49.09%)	0.01**
NICU admission	32 (14.04%)	56 (50.91%)	
Fresh neonatal death Early Late	-	15 (13.64%) 10 (66.67%) 5 (33.33%)	0.01**

Table 6. Causes of perinatal mortality

Causes	*Single gestation (n=228)*	*Twin gestation (n=110)*	*p-value*
Prematurity	10 (4.39%)	49 (44.55%)	0.01**
IUGR	13 (5.70%)	38 (34.55%)	0.01**
Septicemia	15 (6.58%)	17 (15.45%)	0.02*
Others	1 (0.44%)	4 (3.64%)	0.04*

respiratory distress syndrome. From the chart review, these complications were usually seen in those born severely premature. Others which were 3.6% included intraventricular hemorrhage (IVH) or necrotizing enterocolitis (NEC). Of the fifteen neonatal mortality (13.4%), causes included severe prematurity and septicemia.

Presentation of the twin gestation serves as hallmark for decision making in mode of delivery of twin gestations. In the sample included, the most common presentation was cephalic-cephalic (31.8%), followed by cephalic-breech (24.6%) and breech-breech (18.2%), breech-cephalic (15.5%) cephalic-transverse and breech-cephalic, both at 4.6%. Others included only one presentation, transverse-transverse, 0.01%. (Table 7)

Table 7. Fetal presentation of twin gestation at time of delivery

Presentation	*Number*	*Percentage (%)*
Cephalic-Cephalic	35	31.82
Cephalic-Breech	27	24.55
Breech-Cephalic	17	15.45
Breech-Breech	20	18.18
Transverse-Cephalic	5	4.55
Transverse-Breech	5	4.55
Others	1	0.01

Table 8 shows chorionicity of twin gestations. Most common chorionicity was monochorionic-diamnionic placentation to be more common (67.3%) relative to diamnionic-dichorionic placentation (31.8%). Only one was observed to be of monochorionic monoamnionic placentation.

Table 8. Chorionicity of twin gestation

Chorionicity	*Number*	*Percentage (%)*
Monochorionic-Monoamnionic	1	0.91
Monochorionic- Diamnionic	74	67.27
Diamnionic-Diamnionic	35	31.82

DISCUSSION

Multifetal gestation accounts for approximately 4% of live births; 97% of which are twin gestations.[7] Dizygotic twins are more common than monozygotic twins, approximately 70 and 30 percent of twins, respectively.[8] Monochorionicity (MC) suggests an increase in morbidity compared to dichorionic (DC) twinning. In the study, Hack et al.[4] conducted the largest cohort study in the Netherlands and they concluded that current prenatal care still cannot predict and prevent the excess morbidity attributable to monochorionicity. In this study, most of the twin gestations delivered were monochorionic-dichorionic.

Major factors influencing the increasing prevalence of multifetal gestation include: use of fertility stimulating drugs, maternal age, parity, family history, maternal weight and height. Reddy et al. suggest that increased body mass index (BMI) (> 30 kg/m^2) was associated with a higher prevalence of twinning than those with lower BMIs and shorter statures.[9] In this study the

mean BMI of those having twin pregnancies were 26 ± 4.2 kg/m^2. The study of Reddy did not correspond to the increased BMI at risk for twin pregnancies, which may be due to the widespread malnutrition of Filipinos.

Fetal growth evaluation is very important especially in twin pregnancy, as again, prematurity and growth restriction are the most common causes of morbidity and mortality in twin gestations compared to singletons.[10] Alexander et al [11] using singleton weight standards of singletons show that in twin pregnancies, the incidence of small for gestational age (SGA) fetuses range from 10 to 15% until 30 weeks and higher thereafter. By singleton standards of growth rate, more than 50% of twins are considered SGA at 38 weeks. In this study, it was noted that thirty-five percent of the twin pregnancies had intrauterine fetal growth relative to the single gestation which only had 5.7%. This should be noted during their prenatal visits to be able to watch out for small for gestational age babies. Physicians can support the growth by adding supplementation such as amino acid to their medications. In addition, twin gestations should be measured anthropometrically and discordance noted in the sonology reports. In the results of the study, however, The mean fundic height and average body mass index were significantly higher among women with twin gestation than otherwise.

Generally in singletons at extremes of age are associated with more maternal and neonatal morbidity and mortality[5], such as preeclampsia and eclampsia, preterm labor and delivery with the associated complications of prematurity (RDS, NEC, IVH, Sepsis). This study did not observe an increased incidence of twin gestation in advanced maternal age. On the contrary, most twin gestation belonged to the middle reproductive age group, 19-35 years old. Since preterm labor were observed in twin gestations more, this study observed that there are more women with multiple gestation who were given antenatal corticosteroids and tocolytic agents than otherwise.

In terms of maternal complications, there are significantly more women with multiple gestation who experienced anemia, hyperemesis gravidarum, pre-eclampsia, preterm labor, polyhydramnios, and premature rupture of membranes. Incidence of hypertensive disorders of pregnancy, including preeclampsia or gestational hypertension was higher. In a study by Gary et al in 2005, the incidence of hypertension was 14% compared to the singleton, which was half of this, 7%.[12] In this study, for twin gestations, 18.8% was noted to have a hypertensive disorder of pregnancy compared to 7.9% of singletons. This is explained by the exposure to superabundant chorionic villi in twin gestations relative to singletons.[4]

Higher rates of complications in twin gestations are observed, including fetal growth restriction and congenital anomalies.[13] Extreme prematurity (birth at less than 28 weeks of gestation) also occurs more frequently in twin and triplet pregnancies, thus higher adverse neonatal and infant outcomes among twins and triplets compared to singletons. This study strengthened the observation that preterm labor truly has higher incidence in twin gestations compared to singletons. In addition to the higher risk of infections of pregnant women in general, twin pregnancies have higher rate of preterm labor. This may be related, at least in part, to differences in myometrial contractility related to increased myometrial distension. This study did not observe any conjoined twins nor congenital anomalies.

Preparing for the delivery of twins should be done in advance. Vaginal delivery is the rule as the mode of delivery in vertex-vertex combinations[8] unless specific obstetric conditions preclude vaginal delivery. The mode of delivery for the remaining combinations of fetal positions depends greatly on the circumstances of the individual case, the delivery skill and experience of the operator, and the skill of the team of assistants. In the study, the most common presentation was cephalic-cephalic, accounting for 31.8% of the twin gestations. Vaginal delivery is the choice of mode of delivery, however, 66.4% underwent abdominal delivery.[4] of the twin gestations underwent vaginal for the first of twin and abdominal delivery for the 2nd of twin. To prevent abdominal delivery even when vaginal delivery is permissible, it must be emphasized that frequent and earlier prenatal follow-ups should be accomplished. This allows in proper planning, preparation through couselling and discussion as to mode of delivery.

There is still no absolute rule on the mode of delivery of twins. Indications for delivery for singleton gestation serve as guides for the mode of delivery of twins. In this study, the most common presentation of twin gestations observed is still cephalic-cephalic. It is recommended that for these vertex-vertex presentations be delivered vaginally, since large studies show no increase in neonatal morbidity and mortality.[15] Abdominal delivery should be performed for the same obstetric indications as in singleton gestations. This study observed abdominal delivery to be twice as commmon for twin gestations as vaginal delivery (30% vs. 66.4%). In singleton gestations, vaginal delivery was observed to be more common (92.5% vs 7%).

CONCLUSION

The incidence of preterm labor and delivery for twin gestation, relative to singletons, was high in the study. Twin gestations are 3-4 times more likely to present with preterm labor relative to singletons. Consequently, NICU admission was increased for twin gestations. Complications of severe prematurity, such as necrotizing enterocolitis or intraventricular hemorrhage, was observed. Close antenatal care and follow-ups should be enforced and encouraged to decrease incidence of preterm labor and delivery hence decreasing complications of prematurity.

LIMITATIONS

Since the database from the Section of Perinatology is only completed by the submission of the residents' daily duty at the labor room, there is a possibility of it being incomplete. However, it is the only database that is most complete, in relation to singleton and twin pregnancies' comparison. The medical records section only has three persons manning the chart retrieval. It has been quite difficult to obtain charts for the study.

This study was done retrospectively. Retrospective data are somehow very prone to incompleteness mainly handling charts at the hospital medical records.

RECOMMENDATIONS

For the future researchers on twin gestation, it is advisable to first ask for the availability of the charts of the certain years prior to making a sample frame work. Once the charts are stored outside of the hospital due to the multitude of charts, it is difficult to retrieve them.

A prospective study involving twin gestation is recommended. It is also recommended that a registry of twin gestations be created to better observe maternal and neonatal morbidity and mortality. ■

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