

Twin Birth weight Discordance and risk of preterm Birth

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ABSTRACT

Aim: To determine whether birth weight discordance is a risk factor for preterm birth of twins and further evaluation of the relationships involved.

Methods: This prospective study was carried out in Al-Batool-Maternity Teaching Hospital in Mosul-IRAQ from the 1 of May 2006 to the 30 of April 2007. The study comprised 200 pregnant women with live-born twins delivered at >24 completed weeks of gestation, and all were analyzed for gestational age at delivery, birth weight discordance rate, and it is the percentage. The risk of preterm birth was estimated, and comparison was made between the concordant and discordant groups regarding maternal variables and neonatal outcomes.

Results: The degree of discordance correlated strongly with the risk of live preterm birth, especially for discordance > 30% and gestational age < 32 weeks. Among 200 twin pregnancies with discordance 15-19%, 5% of emended in birth < 32 weeks gestation versus 40% of discordance, 470 ended in birth at <32 weeks, while 25% of those with Cordance 25-29%, were ended in birth at < 32 weeks, and 30% of OS discordance of > 30% was delivered at < 32 weeks of gestation, respectively y, and only 11.1% of later ended in the birth of > 37 weeks of gestation. There was a statistically significant association weight between twin birth weight discordance and preterm birth and was further strengthened by (final odd Ratio; $P < 0.001$) in a multivariate model containing other risk factors including maternal age, parity, education, smoking, either twin small for gestation age (SGA), chorionicity, and liked fetal sex. Also, the discordant twins had a high rate of the low Apgar score (<7) at one and five minutes for both pair of twin, also a high rate of admission to NICU, and a high rate of early neonatal death, as about 18.4%, 25.3% of first and second twins ended with early neonatal death, respectively.

Conclusions: Twin birth weight discordance has now clearly been demonstrated to be a risk factor for preterm birth, and discordance places Twins at increased risk for adverse neonatal outcomes.

Keywords: birth weight, discordance, preterm birth, twins

INTRODUCTION

Birth weight discordance (BWD) > 20 percent is remarkably common, affecting about 16 percent of twin pregnancies¹. several researchers studied neonatal morbidity, mortality beyond hospital discharge, and neurodevelopmental outcomes among preterm twins in relation to BWD²⁻³. Such studies had small sample sizes, used birth certificate data instead of medical charts, and failed to consider the impact⁴. Weight is affected by environmental factors that differ from one person to another in addition to the inherited characteristics, such as eating and exercise and others⁵. Exposure to these influencing factors may start while the twins are present in the womb of the mother. One of the twin children may get more nutrition through the placenta and start to increase in weight compared to his twin⁶. Data on the neonatal outcomes of discordant twins are primarily based on hospital statistics, and there is scarce data on the outcome of premature discordant twins followed in the post-surfactant neonatal intensive care unit (NICU)⁴. maybe a more significant threat to the newborn than the birth weight discordance. The uncertainty about the significance of birth weight difference among twins and lack of any reported study in Pakistani national literature led the author to undertake this study. The aim was to study twins with > 20% weight difference and their associated factors.

PATIENTS AND METHODS

A cross-sectional study was carried out in Al-Batool-Maternity Teaching Hospital in Mosul city from the 1 of May

2018 to the 30 of April 2020 and was approved by the committee of obstetrics and gynecology of Iraq commission for medical specialization. Our sample of study composed of two hundred pregnant women with twin gestation, all were seen at the labor and delivery ward where they were admitted in this hospital for having established labor or admitted for induction of labor or elective Caesarean section.

Patient's characteristics: All pregnant women in this study with live-born twins delivered at 24 completed weeks of gestation. One day of accurate last menstrual period (LMP) or ultrasonographic assessment performed in the first trimester were used to estimate gestational age.

Criteria for selection: Only pregnancies containing live born of both infants were included in the present study. Any twin set with one fetal death was excluded; in addition, those with significant congenital abnormalities, which affected the infant's birth weight, mainly anencephaly, hydrocephalus, were also excluded.

A total of 200 women with a twin pregnancy who met the inclusion and exclusion criteria were recruited and interviewed, and general information was taken from them regarding the Maternal age which was assessed by patient's birth date or their identity, Maternal education in completed years of schooling (primary school, secondary school, college, and uneducated). Obstetric history details about the past obstetric history were taken to clarify gravidity, parity, and disorders complicating pregnancy, including chronic hypertension (including pregnancy-induced hypertension) and family history of twins.

The data regarding characteristics of labor and delivery regarding the mode of delivery whether spontaneous or induced and an indication of induction of labor, also route of delivery, vaginal or Caesarean section whether, elective or emergency cesarean section, The presentation of each twin at labor and specific characteristic of twins were also evaluated, including, mode of conception (spontaneous or by ovulation induction), antepartum ultrasonography, gestational age at delivery in weeks based on either 1st day of accurate last menstrual period (LMP) and/or ultrasonographic assessment performed in prenatal period After delivery birth weight in grams, sex, and Apgar score of each twin at one and five minutes were observed, admission to neonatal intensive care unit (NICU) if needed and its indication and duration of stay were recorded. Any minor congenital abnormality was looked for, and early neonatal death was also recorded. All newborn admitted to NICU were followed up daily, and those who were discharged, their health was followed up by interviewing their mother either by direct contact or by phoning them for one week after delivery, and then the final outcome was recorded. In each case, the placenta and the membrane separating the amniotic sac examined whether it was monochorionic or dichorionic. The following equation calculated birth weight discordance:

"The percentage difference was then categorized into five levels (15%, 15-19%, 20-24%, 25-29%, and 30% or more) These levels were chosen based on the implications of their potential clinical relevance to the neonatal outcome, and growth restriction from previous studies". Twin birth

weight difference of less than 15% was considered nondiscordant (concordant). "The parameter of small for gestational age (SGA) and large for gestational age (LGA) was defined by respective. Birth weight at <10 percentile and > 90th percentile for gestational age among study cases with birth weight discordance and the appropriate for gestational age (AGA) is the birth weight between the 10th and 90th percentile". The comparison was made between discordant and concordant twins regarding the risk of preterm birth. Also, the comparison was made between discordance and concordant twins with regard to various characteristics to evaluate possible associated factors, maternal age, parity, education, history of ovulation smoking, other medical problems during pregnancy, fetal sex, and chorionicity, and the adverse perinatal outcomes between them.

Statistical analysis: Social package for social sciences (SPSS,25) was used for the data analysis of the data. Standard statistical methods were used to determine the number and percentage. A Chi-square test was used to find the relationships between birth weight discordance and other measured parameters of the neonatal. Fisher Freeman Halton test was used to find the relationships between birth weight discordance and other measured parameters of the neonatal when the Chi-square test cannot be applied. Stepwise forward logistic regression was used for multivariate analysis of the data. Differences between observations were considered significant at $p=0.05$ or less.

RESULTS

Table 1: Relationship between twin birth weight discordance percentage and maternal factors

GA (Week)	24-32		33-36		≥37		P-value
Discordance (%)	No	%	No	%	No	%	
15-19	1	5.0	21	42.9	9	50.0	<0.001
20-24	8	40.0	15	30.6	6	33.3	
25-29	5	25.0	8	16.3	1	5.6	
≥30	6	30.0	5	10.2	2	11.1	
Total	20	100	49	100	18	100	
maternity age (years)	Discordant		Concordant				P-value
	No	%	No	%			
18-35	77	88.5	92	81.4			0.17 (NS)
>35	10	11.5	21	18.6			
Total	87	100	113	100			
Parity							
0	33	37.9	39	34.5			0.0012
1	29	33.3	74	65.5			
≥2	25	28.8	63	55.8			
Total	87	100	113	100			
Using Assistant AS							
Yes	50	57.5	39	34.5			0.0012
No	37	42.5	74	65.5			
Total	87	100	113	100			
Risk factors		Discordant		Concordant		P-value	
		No	%	No	%		
Smoking	Yes	16	18.4	8	7.1	0.015	
	No	71	81.6	105	92.9		
Total		87	100	113	100		
Hypertension	Yes	31	35.6	21	18.8	P-value	
	No	56	64.4	91	81.3		
Total		87	100	113	100	0.007	

Table 2: Relationship between twin birth weight discordance percentage and child factors

Sex	Discordant		Concordant		P-value
	No	%	No	%	
Both male	24	27.6	37	32.7	0.36 (NS)
Both female	32	36.8	31	27.4	
Male-female	31	35.6	45	39.9	
Total	87	100	113	100	
Weight sequence normality					
AGA-AGA	32	36.8	85	75.2	<0.001
SGA-AGA or LGA	18	20.7	7	6.2	
SGA-AGA	7	8.0	10	8.8	
AGA or LGA-SGA	19	21.8	9	8.0	
AGA-LGA	11	12.6	2	1.8	
Total	87	100	113	100	
Chronicity					
Monochromic	45	51.7	24	21.2	<0.001
Dichroitic	42	48.3	89	78.8	
Total	87	100	113	100	
Twin presentation					
Cephalic- Cephalic	27	31.0	32	28.3	0.018(NS)
Cephalic- Breech	41	47.1	42	37.2	
Breech- Cephalic	4	4.6	13	11.5	
Breech- Breech	15	17.3	26	23.0	
Total	87	100	111	100	

Table 3: Relationship between each mode of delivery, route of delivery, and an indication of C/S with twin birth weight discordance.

			Discordant		Concordant		P-value		
			No	%	No	%			
Mode of delivery	Spontaneous labor		81	93.1	85	75.2	0.001		
	Induced		6	6.9	28	24.8			
	Total		87	100	113	100			
Route of delivery	Vaginal delivery		66	93.1	72	63.7	0.07(NS)		
	C/S		21	6.9	41	36.3			
	Total		87	100	113	100			
Indication of C/S	Elective		2	9.5	15	36.6	0.024		
	Emergency		19	90.5	26	63.4			
	Total		21	100	41	100			
Order	Time (Min)	APGAR SCORE	Discordant		Concordant		P-value		
			No	%	No	%			
1 st	1	≥7	15	17.2	33	29.2	0.02		
		<7	72	82.8	80	70.8			
		Total		87	100	113		100	
1 st	5	≥7	45	51.7	84	74.3	<0.001		
		<7	42	48.3	29	25.7			
		Total		87	100	113		100	
2 st	1	≥7	26	29.9	55	48.7	0.007		
		<7	61	70.1	58	51.3			
		Total		87	100	113		100	
2 st	5	≥7	46	52.9	80	70.8	0.009		
		<7	41	47.1	33	29.2			
		Total		87	100	113		100	
Twin Order			NICUA		Discordant		Concordant		P-value
			No	%	No	%			
1 st	Yes		55	63.2	40	35.4	<0.001		
	No		32	36.8	73	64.6			
	Total		87	100	113	100			
2 st	Yes		52	59.8	34	30.1	<0.001		
	No		35	40.2	79	69.9			
	Total		87	100	113	100			
RDS									
1 st	Yes		39	44.8	17	15.0	<0.001		
	No		48	55.2	96	85.0			
	Total		87	100	113	100			
2 st	Yes		33	37.9	17	15.0	<0.001		
	no		54	62.1	96	85.0			
	Total		87	100	113	100			

Total		87	100	113	100	
Early neonatal death						
1 st	Yes	16	18.4	3	2.7	<0.001
	No	71	81.6	110	97.3	
Total		87	100	113	100	
2 nd	Yes	22	25.3	2	1.8	<0.001
	no	65	74.7	111	98.2	
Total		87	100	113	100	

Table 4: Results of stepwise forward logistic regression of gestational age of twins with another variable

Variable	B	P-value	OR	C.I.
Discordance	1.366	<0.001	3.92	2.27-6.77
Parity	-0.40	0.027	0.67	0.47-0.95
Presentation	0.076	0.015	1.08	1.02-1.15
Chronicity	-1.227	<0.001	0.29	0.16-0.53

B= Coefficient of each variable in the model, + sign represent direct effect – sign represent inverse effect OR= odd Ratio, the value of less than 1 indicates protective effect while values more than 1 represent risk effect. C.I = 95% Confidence interval.

DISCUSSION

Intra-twin birth weight discordance is widespread in twin pregnancies. The frequency of birth weight discordance varies by definition, ranging from ten percent if birth weight difference 25 percent were defined as discordance) to thirty percent (if birth weight difference 15 percent was defined as discordance⁷. A total of 200 eligible twins were included in this analysis, the gestational age distribution in our study was 120 (60%) < 37 weeks and 80 (40%) >37 weeks, and the mean gestational age for the twin sets were 35.4 + 2.8 weeks during the study period, as shown in Table 1. While a study conducted by Wen S.W. et al⁸ from ANZJ obstetric and gynecology in October 2006, reported that the twin preterm birth rate was 64.3% and compared to the study done by Pongdanich W. and Dittakran et al⁹, 2006 that the mean gestational age of twin birth at delivery was 35.9 +2.6 weeks. The number of twins with birth weight discordance was 87(43.5%), while the number of concordant twins 113 (56.5%), as shown in Table 1. Several studies had evaluated potential associated factors for fetal growth discordance, and some of them incidentally noted an association between birth weight discordance and preterm birth. In contrast, in the current study, the data were used to explain the magnitude of the association, the degree of discordance needed, and the gestational age affected with greater precision. The present study demonstrated a statistically significant inverse relationship between twin birth weight discordance and gestational age, the greater birth weight discordance, the more risk of preterm delivery, as shown in Table 2. Delivery rates between 24-32 weeks of gestation, was 5%, 40%, 25%, and 30% in discordant twins subsequently. According to the level of discordance related (15-19%, 20-24%, 25-29% and 30%) respectively. While delivery rates between (33-36) weeks of gestation, was 42.9%, 30.6%, 16.3%, and 10.2% among the discordant group subsequently. The same Table also showed that the delivery rates at >37 weeks, was 50%, 33.3%, 5.6%, and 11.1% among discordant twins Subsequently. Victoria A. et al¹⁰ also observed a similar finding, as they observed that approximately one-fifth of all twin birth delivered preterm < 32 weeks of gestation) and risk increase significantly with birth weight discordance of > 20%-%30). The relation between twin birth weight discordance and maternal age was reported in this study

as shown in Table 3 that the discordance percentage was more in the age group (18-35) years (88.5%) while those > 35 years had only (11.5%) of the discordant rate. However, there was no difference concerning the concordant twins. This result was agreed with the study conducted by Yinon Y. et al¹¹, in 2005, stated that maternal age did not show a significant risk factor for twin birth weight discordance, while another study showed that maternal age had the least effect on the intra twin birth weight discordance by Tan H. et al¹². The relation between birth weight discordance and parity had been evaluated in the current study, which demonstrates that there is a significant relationship between twin birth weight discordance and parity as shown in Table 4, as a higher rate of discordance was in nulliparous than multiparous women this also confirmed by the hypothesis that based on the notion that the uteri of multiparous are more efficient promotes of twin growth than those of primiparous. This also confirmed by a study done in 2007 by¹³, that nulliparity was significantly associated with birth weight discordance. This study also demonstrates that the use of ovulation induction was associated with a statistically significant relationship with the birth discordance weight as 57.5% of women with twin birth weight discordance had a history of ovulation induction while 34.5% of those with concordant twin with history of ovulation induction. This risk factor is also confirmed by Audibert F. et al¹⁴. In 2002, that ovulation induction is a significant risk factor for twin birth weight discordance same result was also obtained by Zadori J. et al¹⁵ in October 2004. Wen S.W. et al¹² on 2006 analyzed the database of twin birth in the university of Ottawa-Canda for the period 1995-1997, the authors showed that maternal smoking and maternal hypertension have a significant risk factor of twin birth weight discordance, similar to the current study, which demonstrates there was a significant relationship between maternal hypertension including pregnancy-induced hypertension, and twin birth weight discordance, also there is a strong association between maternal smoking and rate of discordance as 18.4% of women with discordant twin had a history of smoking in contrast to only 7.1% of concordant twins. The result of the current study demonstrates that there was no statistically significant relationship between twin birth weight discordance and the gender of twin pair, although about 36.8%, discordant twins were female-female pair, 35.6% in

male-female pair and 27.6% of male-male pair respectively, this did not reach the statistical significant. As compared to finding stated by Ananth C.V. et al¹⁶, they found twin birth weight discordance more in liked-sex twins as compared to unlike-sex twins (31). Regarding the fetal factors that influence twin birth weight discordance, this study shows the closely intertwined relationship between fetal growth of the individual twin and birth weight discordance of the pair, smaller twins of highly discordant pairs to high rate of (SGA) in one of the twins as the rate of SGA in one pair was (20.7%) and (21.8 %) among discordant twins while (62 %) and (8.0 %) among concordant twins, respectively. Similar to the finding of this study, Branum A.M. et al¹⁷, found the same association between fetal growth and twin birth weight discordance and also agreed by Cooperstock M. S. et al¹⁸. nother factor has been evaluated in our study, is the distribution of discordance according to twin order. About 60.5% of discordance was attributed to the second twin, this fact also had been proved by Blickesti I et al., in July 1987¹⁹ and then this fact also supported recently by Hacking D. et al., study²⁰. This analysis also showed a clear and significant relation between chorionicity and birth weight discordance, about (21.2%) of concordant twins were monochorionic. In comparison (51.7%) of discordant twins were monochorionic, so the discordance rate was more in monochorionic twins than the dichorionic one Pongpanich W. et al⁹, and Victoria A. et al¹⁰, found that severe discordance occurs. significantly more often in monochorionic twins than dichorionic twins. The twin presentation in the current study was the higher percentage of the discordant twin is with the cephalic-breech presentation (47.1%) of discordant twins were cephalic-breech presentation while (37.2%) of the concordant twin was with the cephalic-breech presentation. Hollier L. M. et al²¹ concluded that twin fetal presentation was significantly related to twin birth weight discordance specifically. Presentations other than cephalic-cephalic were more frequent as discordance increased. The current study found about (93.1%) of discordant twins were admitted to labor ward with spontaneous labor, and only 6.9% of them had induced labor contrast to concordant twins, this result support the higher rate of preterm delivery among discordant twins¹³, and about 75.9% of discordant twins were delivered while (24.1%) of them had cesarean section compared to (72%) and (41%) of their counter part of twins with no discordant significant relation between rout of delivery and discordance. Kontopoulos et al²² also concluded this finding, on January 2005. While Amaru R.C. et al²³ found that discordant twins were more likely to have a caesarean delivery. The study demonstrates that both pair of the discordant twin had low Apgar score (<7) at both one and five minutes as compared to concordant twins, this consistent with the result conducted by Hartley K. et al²⁴ and Victoria A., et al³⁰, that frequency of low Apgar score (7) were more in discordant twin birth. With regard to neonatal outcomes among discordant twins, the study demonstrates that twin birth weight discordance was a significant predictor of adverse neonatal outcomes with regard to Apgar score of twin pair, neonatal intensive care unit (NICU) admission, respiratory distress and early neonatal death. The rate of NICU admission rate was higher (63.2%) among discordant twins as compared to

35.4% in concordant twins, this agreed by the study done by Kilic M., et al²⁵, on May 2006 and also Amarue RC. et al that more NICU admission among discordant twins than concordant one. In addition the rate of respiratory the rate of respiratory distress syndrome (RDS) was high between both members of discordant twin in comparison to concordant twins; this result was similar with Hacking D et.al study. The important significant relationship was demonstrated in this study between twin birth weight discordance and early neonatal death. The rate of early neonatal death was 18.4% among the 1st twin of discordant pair and 25.3% in the 2nd twin as compared to concordant twins (2.7%) and (1.8%) respectively.

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