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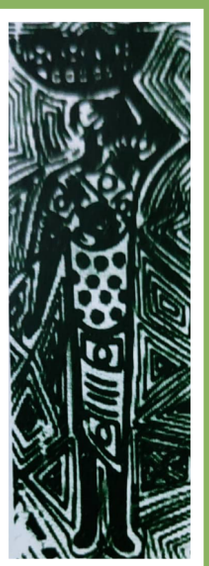

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Birthweight Discordance Among Twins Born in Lagos, Nigeria

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Abstract

Background: Significant differences in twin birth weights may influence the perinatal outcome in twin pregnancies. **Objective:** To assess the factors associated with twin birth weight discordance in Lagos, Nigeria.

Methods: A descriptive, cross-sectional study was conducted among women and their twins delivered in three health facilities in Lagos State between July and December 2023. Discordance was calculated for each pair as a percentage of the heavier twin [discordance (%) = 100 (birth weight difference/ birth weight of the heavier twin)]. A twin pair was designated discordant if one of the pair's weights was smaller by 15% or more.

Results: One hundred and fifty-eight women and their 316 babies were recruited for this study. Of these, 96 (60.8%) mothers were under 35 years of age, 110 (69.6%) had been booked for antenatal care, 90 (57.0%) were primiparous, 52 (32.9%) had tertiary education, and 48 (30.4%) experienced various complications during pregnancy. The frequency of birth weight discordance was 38.0%. Hypertensive disorders of pregnancy (aOR = 4.99, 95%CI = 2.05 – 11.62, p<0.001), primiparity (aOR = 3.31, 95%CI = 1.53 – 7.16, p = 0.002), secondary level of education and below (aOR = 2.69, 95%CI = 1.14 – 6.24, p = 0.024) and same-sex twins (aOR = 2.51, 95%CI = 1.17 – 5.36, p = 0.018) were associated with birth weight discordance among twins.

Conclusion: The birth weight discordance rate was high in Lagos, Nigeria. There is a need to monitor pregnant women for antenatal care closely to avoid pregnancy-related complications.

Keywords: Birth weight, Discordance, Multiple gestation, sub-Saharan Africa, Twinning.

Introduction

Due to genetic tendencies, multiple pregnancies and deliveries make up a significant number of births in Nigeria.[1] Twining rates ranged from 28/1000 deliveries in northern Nigeria to 54/1000 deliveries in the west.[1] In twin pregnancies, apart from preterm deliveries with low birth weight, the fetuses may experience significant differences in their birth weight, which may influence the perinatal outcome.[2] Birth weight is the single important cause of perinatal morbidity and mortality.[3] Intrauterine growth is a function of intrinsic and extrinsic factors. Intrinsic factors include the fetal genetic makeup, which is

inherited from the parents. In contrast, extrinsic ones include maternal factors like nutritional status, chronic metabolic disorders like diabetes mellitus, pregnancy-induced hypertension (PIH) and anaemia. These significantly impact the growth of fetuses and perinatal outcomes.[2]

Variations in the size of twin infants could be innocuous due to genetic variations and differences in placental function, especially in dichorionic twins. However, it could also be an ominous sign of abnormal growth in one of the fetuses, particularly when there is selective growth restriction in the presence of a chromosomal abnormality. Some variations in birth weight are acceptable, even among twins who share the same intrauterine environment. However, such variation in birth weight is considered discordant when there is a difference of more than 15%, using the larger twin as the reference.[4,5]

The causes of birth weight discordance differ in both monochorionic and dichorionic twins. In monochorionic twins, it is likely due to vascular complications of the placenta or twin-twin transfusion, while in dichorionic twins, genetic differences and uteroplacental insufficiency are more likely culprits or causes.[6,7] The resultant growth disparity or discordance affects the eventual outcome.[8,9] With increasing differences in weight for twin pairs, there is a corresponding increase in morbidity and mortality.[6,8] Male infants have been shown to weigh more than their female counterparts at birth, whether single or twin gestation.[10,11] Therefore, birth weight discordance is common among twin pairs of different genders.[12] This study assessed the prevalence and factors associated with twin birth weight discordance in Lagos, Nigeria.

Methods

Study design

A descriptive, cross-sectional study was conducted between July and December 2023 among twins delivered in three health facilities across Lagos city.

Study sites, sample size and participant selection

Lagos State is one of the southwestern states of Nigeria, with an estimated population of 21 million. It is divided into 20 local government areas for administrative purposes. The state has one state-owned tertiary hospital, 30 secondary health facilities, and 360 primary healthcare centres. The study was conducted in the state-owned tertiary and two secondary health facilities. Facilities were selected based on their annual delivery volume. The selected facilities were the Lagos State University Teaching Hospital (LASUTH), the Lagos Island Maternity Hospital and Alimosho General Hospital.

A sample size of 158 mothers was calculated using a sample size formula for a cross-sectional study, a non-response rate of 15% and a 9% prevalence rate for birth weight discordance (giving a total sample size of 316 babies).[13] All twin deliveries within the study period were recruited into the study. Mothers with antepartum haemorrhage, mothers who had assisted conception and babies with congenital anomalies were excluded from the study.

Measurements and definition of terms

Birth weights were measured within 30 minutes of birth using an Omron HN289 electronic weighing scale (Japan, 2019); the same scale was used in all centres. The scale was standardised before use and calibrated to the nearest 50g. The reliability and accuracy of the scale were assessed by periodically using known weights and checking for zero error on a daily basis. An ultrasound scan in early pregnancy was used to confirm the expected gestational age of the baby. This study defined LBW as a birth weight of less than 2500 g, regardless of gestational age. A small-for-gestational-age (SGA) infant had a

birthweight below the tenth percentile for twins.[14] An infant who was delivered before 37 completed weeks of gestation was accepted as preterm. This study classified a woman as nulliparous if her parity was zero, primiparous if her parity was one, multiparous if her parity was two to four, and grand multiparous for women with parity greater than four. Birthweight discordance was calculated for each pair as a percentage of the heavier twin [discordance (%) = 100 (birth weight difference/ birth weight of the heavier twin)]. A twin pair was designated discordant if one of the pair's weights was smaller by 15% or more.[4,5] Maternal comorbidity, which includes pregnancy-induced hypertension (PIH), chronic hypertension, sepsis, diabetes mellitus and hypothyroidism, was reclassified into those with hypertensive disorder of pregnancy (consisting of those with PIH and chronic hypertension) and those without hypertensive disorders of pregnancy (which consist of those without any comorbidity or any other comorbidity apart from PIH and chronic hypertension).

Data collection

Data was collected using a proforma. Information such as the mother's age, antenatal care booking status, parity, last menstrual period, maternal and paternal educational statuses, occupation, birth weight of twins, APGAR scores at 1 and 5 minutes and perinatal outcome were obtained.

Ethical approval

The Health Research and Ethics Committee of the Lagos State University Teaching Hospital (LASUTH) granted ethical approval for the study. Written informed consent was obtained from the participants before enrolment in the study. They were assured of the strict confidentiality of the data received.

Statistical analysis

IBM Statistics version 26 (Statistical Package for Social Sciences) was used to analyse data. Categorical variables such as booking status, parity, and maternal educational status were presented as percentages. Continuous variables such as birth weight were presented as mean and standard deviation. The Chi-Squared test was used to compare the proportions of two or more categorical variables. Logistic regression was used to identify the factors associated with discordance. Variables with $p < 0.05$ during univariate analyses were entered into the regression model simultaneously. For all statistical analyses, a p-value <0.05 was considered significant.

Results

A total of 158 women and their 316 babies were recruited into this study. Of the women recruited, 96 (60.8%) were aged below 35 years, 110 (69.6%) were booked for antenatal care, 90 (57.0%) were primiparous, 52 (32.9%) had tertiary education, and 48 (30.4%) had complications during pregnancy (Table I). The frequency of same-sex pairs was higher (59.5% vs 40.5%) than that of different-sex pairs. Of the same-sex pairs (94), close to two-thirds (58; 61.7%) were female-female pairs. There were more babies with normal weight among the second twin (26.6%) than the first twin (24.1%). More babies were appropriate for gestational age by weight among the first twins than among the second twins (94.9% vs. 89.9%), as shown in Table II.

There was no significant difference in the mean combined weight of twins and discordance (3.7 ± 1.3 vs 4.1 ± 1.2, $p = 0.074$) and parity status (3.9 ± 1.3 vs 4.0 ± 1.1, $p = 0.626$). The mean combined birth weight among different-sex pairs was higher (4.3 ± 1.2) than among same-sex pairs (3.7 ± 1.2), $p = 0.009$, as shown in Table III.

The factors associated with birth weight discordance are shown in Table IV. The proportion of discordance in birth weight was

higher among twins of the same sex (44.7% vs 28.1%, p = 0.035), mothers with secondary school education and below (45.3% vs 23.2%, p = 0.007), mothers who had hypertensive disorders of pregnancy (64.9% vs 29.8%, p<0.001) and primiparous women (48.9% vs 23.55, p = 0.001) compared to their counterparts. The regression analysis of factors significantly related to birth weight discordance is presented in Table V. Women with hypertensive disorders of pregnancy had a 4.9-fold higher likelihood of experiencing birth weight discordance compared with those with no pregnancy complications (aOR = 4.88, 95% CI = 2.05–11.62, p < 0.001). The odds of discordance in birth weight were 3.3-fold higher among primiparous women (aOR = 3.31, 95%CI = 1.53–7.16, p = 0.002) compared to multiparous women. Additionally, twins born to women with a secondary school education had a 2.7-fold higher chance of discordance in weight compared to twins born to women with tertiary education (aOR = 2.69, 95% CI = 1.14–6.24, p = 0.024). The odds for birth weight discordance were 2.5-fold more among mothers with same-sex twins (aOR = 2.51, 95%CI = 1.17–5.36, p = 0.018) compared with their counterparts.

Table I: Sociodemographic parameters of families

Variables		Frequency	Percentage
Age group (years)	< 35	96	60.8
	≥35	62	39.2
Booking status	Unbooked	48	30.4
	Booked	110	69.6
Parity	Primiparity	90	57.0
	Multiparity	68	43.0
Maternal education	Tertiary	52	32.9
	Secondary	106	67.1
Paternal education	Tertiary	116	73.4
	Secondary	42	26.6
Maternal complications	Absent	110	69.6
	Present	48	30.4
Types of complication (n = 48)	PIH	33	68.8
	Diabetes mellitus	6	12.5
	Chronic hypertension	4	8.3
	Sepsis	4	8.3
	Thyroid disease	1	2.1

Discussion

This study assessed the factors associated with weight discordance in twin deliveries in Lagos, Nigeria. Approximately two-fifths (38.0%) of twin deliveries exhibited weight discordance when a 15% cutoff was used, and 8.9% when a 25% cutoff was used. Primiparity, low education, hypertensive disorder of pregnancy and same-sex twins were significantly associated with weight discordance.

Table II: Demographic and clinical characteristics of the infants

Variable		Frequency	Percentage
Sex of twins	Same sex	94	59.5
	Different sex	64	40.5
Type of sex pair	Male-Male	36	22.8
	Female-Female	58	36.7
	Male-Female	64	40.5
Twin-1 Sex	Male	76	48.1
	Female	82	51.9
Twin-2 Sex	Male	60	38.0
	Female	98	62.0
Birthweight class (Twin-1)	ELBW	6	3.8
	VLBW	32	20.3
	LBW	82	51.9
	NBW	38	24.1
Birthweight class (Twin-2)	ELBW	12	7.6
	VLBW	26	16.5
	LBW	78	49.4
	NBW	42	26.6
Weight Appropriateness for Age (Twin-1)	Small	8	5.1
	Appropriate	150	94.9
Weight Appropriateness for Age (Twin-2)	Small	14	8.9
	Large	2	1.3
	Appropriate	142	89.9
Maturity of pregnancy	Extremely preterm	4	2.5
	Very preterm	37	23.4
	Moderate/Late preterm	81	51.3
	Term	36	22.8
Outcome of Twin-1	Discharged	118	74.7
	Died	16	10.1
	DAMA	2	1.3
	Not admitted	22	13.9
Outcome of Twin-2	Discharged	126	79.7
	Died	12	7.6
	DAMA	2	1.3
	Not admitted	18	11.4

ELBW – Extremely Low Birth Weight; VLBW – Very Low Birth Weight; LBW – Low Birth Weight; NBW – Normal Birth Weight; DAMA – Discharged Against Medical Advice

Similar to previous studies, the prevalence of weight discordance in twin gestation varies depending on the definition.[5, 15] In this study, the proportion of weight discordance was 38% when a 15% cutoff was used, higher than the 28.8% reported in a Nigerian study.[10] A study from Pakistan reported a weight discordance of 19%, with a cutoff of 20%.[16] Birth weight discordance of >20% is common; however, the mechanism of weight discordance is unclear.[17,18] It has been associated with low combined twin birth weights.[19]

The high prevalence may be related to the high prevalence of malnutrition in pregnancy in developing countries like Nigeria, which may result in a lower combined birthweight among twins.[11]

Table III: Mean difference of combined weight of twins and discordance, parity and sex-pairs

Variable	n = (158 pairs)	Mean weight	*p*
Discordance			
Yes	60	3.7 ±1.3	0.074
No	98	4.1±1.2	
Parity			
Primiparous	90	3.9±1.3	0.626
Multiparous	68	4.0±1.1	
Sex-pair			
Same-sex pair	94	3.7±1.2	0.009
Different-sex pairs	64	4.3±1.2	

In this study, hypertensive disorders of pregnancy were associated with birth weight discordance. The odds of having weight discordance were 4.8-fold higher among participants with hypertensive disorders of pregnancy than their counterparts, similar to the findings from a Canadian study where birth weight discordance was higher among twins born to mothers with hypertensive disorders of pregnancy.[20] A retrospective study from China involving a large population of twin pregnancies also reported an association between hypertensive disorder of pregnancy and birth weight discordance.[21] Another retrospective study from the United Kingdom established the presence of birthweight discordance as an independent risk factor for hypertensive disorders of pregnancy.[22] The reason for the association between birthweight discordance and hypertensive disorders of pregnancy is not yet fully understood; the increased demand imposed by twin gestation and placental hypoxia leads to a chain of events resulting in vasoconstriction and increased blood pressure, which may be responsible for the growth difference between twins.[23,24]

Birth weight discordance was more common among primiparous women compared to multiparous women in this study, consistent with findings from an Italian study.[25] However, our finding was contrary to what was reported from Benin City, Nigeria.[4] Studies from Pakistan illustrated that a higher proportion of birth weight discordance was found among multiparous women.[16,26] Multiparous women are more likely to deliver larger twins with a higher combined weight than primiparous women because of a more efficient uterus.[4] In this study, the combined weight of the twins was higher among multiparous women compared to primiparous women; the difference was insignificant. Other studies have shown that a higher combined twin birth weight is less likely to result in discordant twins.[27,28]

In the present study, pairs of different sexes weighed more than pairs of the same sex, a finding consistent with previous studies.[11,12] This is because male fetuses are usually heavier than female fetuses at birth due to their greater lean body mass and lower body fat content compared to females, a possible effect of fetal testosterone.[29] The odds of birthweight discordance were 2.4-fold higher among same-sex twins than different-sex twins in our study. This finding is consistent with those in other studies.[5,12,30] The higher combined birth weight found in different-sex pairs compared to same-sex pairs may be responsible for this observation. Studies have shown a correlation between pregnancy loss (which is twice as high in same-sex twins compared to different-sex pairs) and birth weight discordance.[31,32]

Strengths and limitations.

The placental chorionicity was not determined. Second, temporal association could not be established due to the cross-sectional study design. Despite these limitations, the study's strength lies in the multi-centre data collection, which ensured diversity in participants' demographics.

Table IV: Factors associated with discordance in birth weight

Variable	Discordance		
	None	Discordant	*p values*
	n = 98 (%)	n = 60 (%)	
Gender of Twins			
Same gender	52 (55.3)	42 (44.7)	**0.035**
Different gender	46 (71.9)	18 (28.1)	
Type of Gender			
Male: Male	20 (55.6)	16 (44.4)	0.109
Female: Female	32 (55.2)	26 (44.8)	
Male: female	46 (71.9)	18 (28.1)	
Antenatal Booking Status			
Unbooked	28 (58.3)	20 (41.7)	0.528
Booked	70 (63.6)	40 (36.4)	
Parity			
Primiparous	46 (51.1)	44 (48.9)	**0.001**
Multiparous	52 (76.5)	16 (23.5)	
Maternal educational status			
Secondary and below	58 (54.7)	48 (45.3)	**0.007**
Tertiary	40 (76.9)	12 (23.1)	
Paternal educational status			
Tertiary	70 (60.3)	46 (39.7)	0.469
Others	28 (66.7)	14 (33.3)	
Maternal complications			
Hypertensive disorder of pregnancy	13 (35.1)	24 (64.9)	**<0.001**
None	85 (70.2)	36 (29.8)	
Maternal age grade (years)			
20 – 35	62 (64.6)	34 (35.4)	0.41
≥35	36 (58.1)	26 (41.9)	
Maturity			
Preterm	74 (60.7)	48 (39.3)	0.514
Term	24 (66.7)	12 (33.3)	

Conclusion

Birth weight discordance is common in twin gestation in Lagos State, especially among primiparous women and those with hypertensive disorders of pregnancy. There is a need to monitor antenatal clinic-booked pregnant women closely to avoid pregnancy-related complications.

Table V: Regression analysis of discordance in weight

Variable	Attributes	aOR	95%CI	*p*-values
Parity	Primiparous	3.31	1.53 – 7.16	**0.002**
Multiparous		*Reference*		
Maternal education	Secondary and below	2.69	1.14 – 6.24	**0.024**
	Tertiary	*Reference*		
Maternal complication	HDP	4.88	2.05 – 11.62	**<0.001**
	No HDP	*Reference*		
Gender of twins	Same gender	2.51	1.17 – 5.36	**0.018**
	Different	*Reference*		

HDP - Hypertensive Disease of Pregnancy; aOR adjusted Odd Ratio

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