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Perinatal Presentation and Outcome of High Birthweight Infants in Zaria, Nigeria.

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ABSTRACT

Background: Infants with high birth weight are candidates for birth trauma, birth asphyxia and sometimes, death. Perinatologists are therefore gradually beaming the searchlights on the contribution of high birthweight delivery to perinatal morbidity and mortality.

Objectives: To determine the prevalence, presentation and outcome of high birthweight deliveries in Zaria.

Methods: A retrospective review of records of babies delivered at Ahmadu Bello University Teaching Hospital, Zaria, weighing 4000 grams and above at birth, over a 4-year period was undertaken. Maternal and neonatal records were obtained from the delivery suite and neonatal unit respectively, between January, 2005 and December, 2008. Data were analyzed with EPI INFO version 3.5.1 and statistical significance was set at $p < 0.05$.

Results: Of the 3065 deliveries in the study period, 167 (5.5%)

weighed 4000 grams and above, giving a prevalence of 54.5 per 1000 births. The male: female ratio was 1.2:1, mean birthweight was 4340 ± 290 grams and 65.9% of them were delivered during the rainy season. High birthweight delivery was associated with high maternal age, high birth order and assisted delivery. Perinatal asphyxia, hypoglycaemia, hyperbilirubinaemia, sepsis and trauma were the common perinatal conditions in high birthweight babies. Perinatal mortality rate for high birthweight babies was 3.9 per 1000 total births and 71.9 per 1000 high birthweight deliveries.

Conclusion: High birthweight deliveries in the present study had high perinatal morbidity and mortality. Antenatal prediction and generous use of Caesarian section could reduce the prevalent morbidity and mortality rates.

Key Words: High birthweight, Presentation, Outcome.

Introduction

High birthweight infants (birthweight of 4000 grams and above) constitute a high risk group because of the associated increased incidence of morbidity and mortality particularly in the perinatal period.¹ Perinatal mortality contributes two-thirds of neonatal mortality.² Low birthweight has been a

major contributory factor, hence the overwhelming focus on low birthweight babies, which has, expectedly, given rise to a significantly improved outcome in low birthweight infants.¹ The role of high birthweight is however sparsely investigated and less attention is given to it. Available studies^{1,3-5} commonly report significant perinatal morbidity in this group of babies which include birth asphyxia, brachial plexus

injury, clavicular fracture and meconium aspiration syndrome.

Data on the presentation of high birthweight babies are uncommon in our environment. The paucity of data on this group of infants in Nigeria justifies the need for the present study which sought to describe the prevalence, sex and ethnic distribution, morbidity and mortality pattern of high birthweight infants.

Patients and Methods

A retrospective review of records of babies with high birthweight of ≥ 4000 grams over a period of four years, from January, 2005 through December, 2008, in Ahmadu Bello University Teaching Hospital, Zaria was conducted. The hospital is a tertiary hospital that serves as the major paediatric referral centre for Kaduna State and its environs. The staff of the delivery suite of the hospital routinely refers all babies weighing ≥ 4000 grams to the Neonatal Unit for assessment, observation and management as necessary.

The Delivery Register of the Labour Ward and Admission Register of the Neonatal Unit were used to identify cases of macrosomia and their case files. Records of non-macrosomic inborn babies were used as control.

The variables studied included maternal age, ethnicity, date and mode of delivery, infant's birthweight, birth order, sex and perinatal outcome. Data were analyzed using the Epi Info package version 3.5.1 and statistically significant difference level was set at $p < 0.05$.

Results

There were a total of 3065 deliveries (2898 live births and 167 stillbirths) over the study period; 167 (5.4%) weighed ≥ 4000 grams, 373 (12.2%) weighed below 2500 grams while the remaining weighed between 2500 and 3999 grams. The birthweight of the macrosomic infants ranged from 4000 to 5500 grams with a mean of 4340 ± 290 grams. One hundred and twenty-eight (76.6%) of them weighed between 4000 and 4499 grams while 39 (19.8%) and six (3.4%) weighed between 4500 and 4999 and between 5000 and 5500 grams respectively (Table I). Thus the delivery of macrosomic babies in the hospital averages about 42 per annum or one in every 8-9 days. The prevalence of birthweight ≥ 4000 grams in the study was 54.49 per 1000 births, that of birthweight ≥ 4500 grams was 12.72 per 1000 and that of birthweight ≥ 5000 grams was 1.96 per 1000 births.

Sex distribution: The 167 macrosomic babies were made up of 92 (55.1%) males and 75 (44.9%) giving a male to female ratio of 1.2:1. The male

predominance was present in all the three groups of high birthweight infants, as shown in Table I. The heaviest male and female weighed 5,500 grams and 5,200 grams respectively, the weight difference being 300 grams. The average birthweight for the male and female babies were 4383 ± 297 grams and 4288 ± 266 grams respectively.

Seasonal distribution: Of the total 1,715 births during the rainy season (May - October), 109 (6.4%) were of high birthweight while among the 1,350 deliveries that occurred during the dry season (November - April), 58 (4.3%) were of high birthweight. Thus the tendency towards delivery of high birthweight was higher in the rainy than dry season ($\chi^2 = 5.49$, $p = 0.0191$).

Ethnic group: The ethnic background of 47 (28.1%) of the high birthweight babies was Ibo, 30 (18.0%) was Hausa and 18 (12.6%) was Yoruba. Twenty-two (13.2%) was distributed between Idoma, Ibira, Igala, Etuno, Jabba, Buru, Nupe and Ishan. In 47 babies, the tribe of the parents was not indicated.

Influence of maternal age on high birthweight delivery: As depicted in Figure 1, the tendency to delivery of high birthweight babies increased with increase in maternal age up to the age of 40 - 44 years and subsequently nose-dived. Of the 96 teenage mothers seen, only one had a macrosomic baby as against 10 macrosomic babies recorded among 107 mothers aged 40-44 years (Table II). This difference is statistically significant ($\chi^2 = 5.28$; $p = 0.0215$).

Mode of delivery: Most (118) (70.7%) of the high birthweight infants were delivered per vaginum: 110 (65.9%) was spontaneous vaginal delivery, 5 (3.0%) was assisted with forceps and 3 (1.8%) by vacuum extraction. Caesarian section was recorded in 49 deliveries (29.3%), representing 11% of total cases of Caesarian section delivery. As shown in Table III, high birthweight infants tend to be delivered by Caesarian section ($\chi^2 = 31.21$, $p < 0.0001$) and forceps (Fisher exact 2-tailed p -value = 0.0312) more commonly than non-high birthweight infants.

Morbidity pattern: Table IV shows the pattern of morbidity among the high birthweight live births in the perinatal period distributed according to the mode of delivery. Of the 157 live births, 62 (39.5%) had one or more clinical conditions necessitating admission into the Neonatal Ward. The common conditions observed are low 5-minutes Apgar Scores in 21 (13.4%), Hypoglycaemia in 12 (7.6%), hyperbilirubinaemia in 7 (4.5%), sepsis in 14 (8.9%) and birth trauma in 8 (5.1%), four of which had multiple bruises, three had cephalhaematoma, two had Erb's palsy, one had clavicular fracture and one had fracture of the humerus. Other conditions present in a few of the macrosomic live births are meconium aspiration syndrome (3), cardiomyopathy (1), respiratory distress syndrome (1), hypocalcaemia (1) and dehydration fever (1).

Eleven (10.8%) of the babies delivered unassisted (vaginally) had low Apgar Scores compared with 10 (21.3%) in those delivered by Caesarian section. The difference, however, was not statistically significant ($\chi^2 = 2.21$, $p = 0.1451$). Similarly, hypoglycaemia occurred with greater frequency in babies delivered by Caesarian section (8.5%) than in those delivered through the vaginal route (6.9%), but again, the difference fell short of statistical significance (Fisher exact 2-tailed $p = 0.7422$). Six of the 8 cases of birth trauma occurred in babies delivered spontaneously by vaginal route as against 1 case among those delivered by Caesarian section (Fisher exact 2-tailed $p = 0.4331$) while infection rate was 4.3% with Caesarian section delivery and 11.8% in those delivered vaginally (Fisher exact 2-tailed $p = 0.2268$). Caesarian section delivery appeared protective against birth trauma and neonatal sepsis but the observed advantage failed to reach statistical

significance ($p > 0.05$). On the overall, perinatal morbidity associated with vaginal (41) (40.2%) and Caesarian section (19) (40.4%) delivery of macrosomic babies did not differ significantly ($\chi^2 = 0.02$, $p = 0.8782$).

Perinatal Outcome: Of the 167 total high birthweight infants, 10 (6.0%) were stillbirths, 88 (52.7%) had normal perinatal course while 69 (41.3%) had various illnesses warranting admission into the neonatal unit. Of the 69 that were ill, 62 (89.9%) recovered completely, mother absconded with one baby, two died and four had residual neurologic and/or orthopedic complications (Erbs palsy and fractures) at the time of discharge from the unit. The perinatal mortality rate for the high birthweight babies was 3.9 per 1000 total births and 71.9 per 1000 high birthweight deliveries. The stillbirth rate for the high birthweight deliveries was 6.0%, corresponding to 6.0% of the 167 total stillbirths.

Table I: General demographic characteristics of the high birthweight infants

Parameters	Birthweight (grams)			Total (n=167)
	4000-4499 (n=128)	4500-4999 (n=33)	=5000 (n=6)	
<i>Sex</i>				
Male	68 (53.1)	20 (60.6)	4 (66.7)	92 (55.1)
Female	60 (46.9)	13 (39.4)	2 (33.3)	75 (44.9)
<i>Ethnic group</i>				
Hausa	19 (14.8)	8 (24.2)	3 (50.0)	30 (18.0)
Ibo	39 (30.5)	6 (18.2)	2 (33.3)	47 (28.1)
Yoruba	20 (15.6)	1 (3.0)	-	21 (12.6)
Others	20 (15.6)	2 (6.1)	-	22 (13.2)
Unknown	30 (23.4)	16 (48.5)	1 (16.7)	47 (28.1)
<i>Mode of delivery</i>				
SVD	80 (62.5)	26 (78.8)	4 (60.6)	110 (65.9)
Caesarian section	41 (32.0)	6 (18.2)	2 (33.3)	49 (29.3)
Forceps	4 (3.1)	1 (3.0)	-	5 (3.0)
Vacuum	3 (2.3)	-	-	3 (1.8)
<i>Birth order</i>				
1	15 (11.7)	3 (9.1)	-	18 (10.8)
2	21 (16.4)	3 (9.1)	1 (16.7)	25 (15.0)
3	25 (19.5)	8 (24.2)	-	33 (19.8)
4	30 (23.4)	8 (24.2)	1 (16.7)	39 (23.4)
5	14 (10.9)	7 (21.2)	-	21 (12.6)
=6	23 (18.0)	4 (12.1)	4 (66.7)	31 (18.6)
<i>Season</i>				
Rainy	85 (66.4)	22 (66.7)	3 (50.0)	110 (65.9)
Dry	43 (33.6)	11 (33.3)	3 (50.0)	57 (34.1)

Table 2: Distribution of high birthweight babies by maternal age.

Birthweight (grams)	Maternal age (years)						
	<20 (n=96)	20-24 (n=488)	25-29 (n=1012)	30-34 (n=837)	35-39 (n=428)	40-44 (n=107)	≥45 (n=9)
4000-4499	1 (1.0%)	8 (1.6%)	38 (3.6%)	46 (5.5%)	25 (5.8%)	10 (9.3%)	-
4500-4999	-	1 (0.2%)	15 (1.5%)	9 (1.1%)	8 (1.9%)	-	-
≥5000	-	-	1 (0.1%)	2 (0.2%)	3 (0.7%)	-	-
Total	1 (1.0%)	9 (1.8%)	54 (5.3%)	57 (6.8%)	36 (8.4%)	10 (9.3%)	-

Figure 1: Relationship between maternal age and high birthweight delivery.

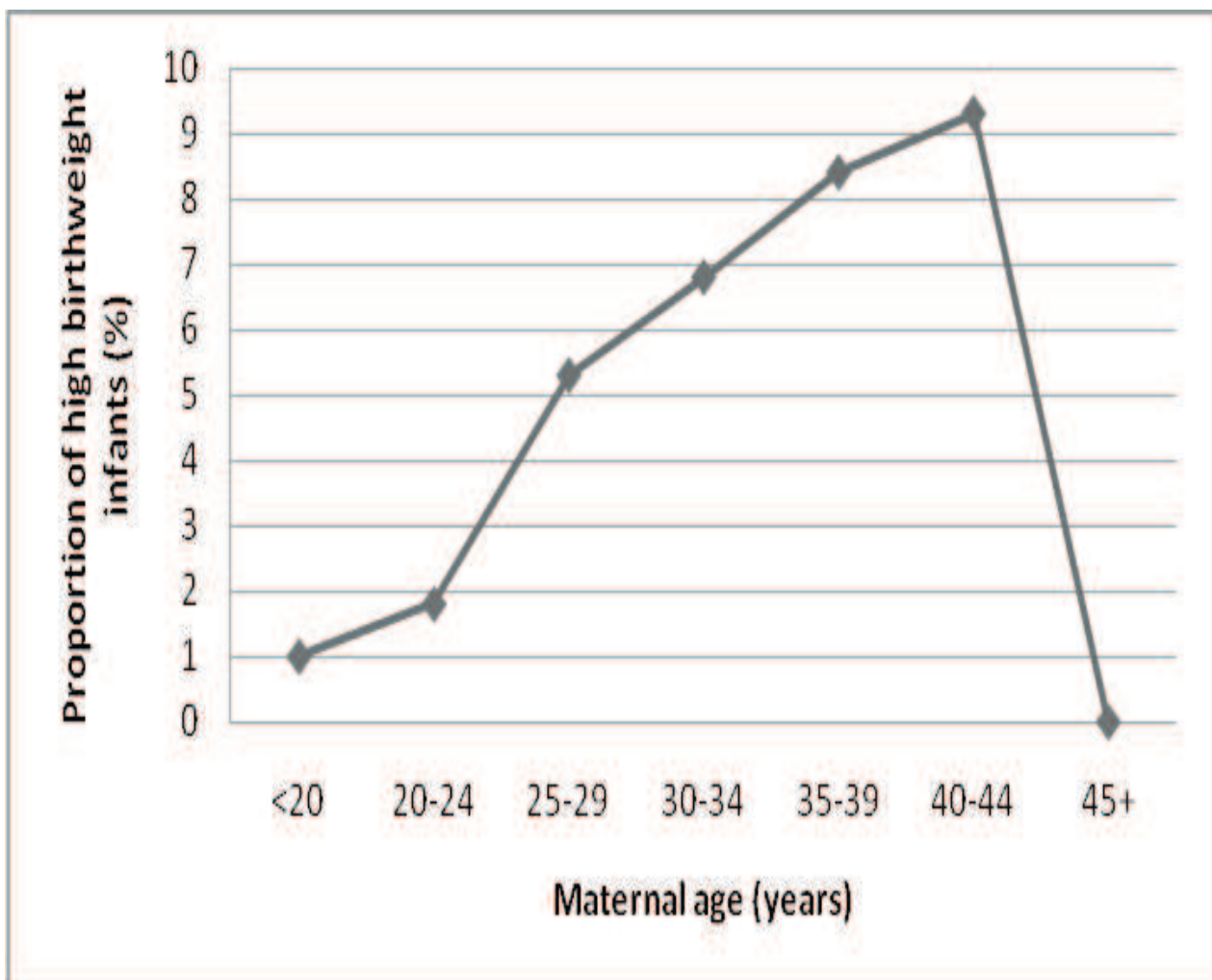


Table 3: Distribution of delivery mode among the study population

Mode of delivery	High birthweight(%) (n=167)	Not high birthweight(%) (n=2898)	Total (%) (n=3065)	χ^2	p-value
Spontaneous vaginal delivery	110 (65.9)	2461 (84.9)	2571(83.9)	41.00	<0.0001
Caesarian section	49 (29.3)	395 (13.6)	444 (14.5)	31.21	<0.0001
Forceps delivery	5 (3.0)	25 (0.9)	29 (0.9)	2-tailed Fisher exact	0.0312
Vacuum extraction	3 (1.8)	17 (0.6)	20 (0.7)	2-tailed Fisher exact	0.0916

Table 4: Morbidity pattern and mode of delivery of the 157 high birthweight live births.

Common clinical conditions	Mode of Delivery				
	SVD (%) (n=102)	C/S (%) (n=47)	Forceps (%) (n=5)	Vacuum(%) (n=3)	Total (%) (n=157)
Asphyxia (5-min Apgar Score=6)	11 (10.8)	10 (21.3)	-	-	21(13.4)
Hypoglycaemia (RBS<2.2mmol/l)	7 (6.9)	4 (8.5)	-	1 (33.3)	12 (7.6)
Significant Hyperbilirubinaemia (TSB =256 μ mol/l)	5 (4.9)	2 (4.3)	-	-	7 (4.5)
Sepsis	12 (11.8)	2 (4.3)	-	-	14 (8.9)
Birth trauma	6 (5.9)	1 (2.1)	1 (20.0)	-	8 (5.1)
Total	41 (40.2)	19 (40.4)	1 (20.0)	1 (33.3)	62 (39.5)

Discussion

The prevalence of high birthweight in this study was 54.5 per 1000 births. This is higher than the 31.4 per 1000 births (3140 per 100,000) reported by Lim *et al*⁴ from Malaysia and the 25.0 per 1000 births (246/9970 births) observed in Aba, eastern Nigeria⁵ but lower than the 266 high birthweight in 3303 deliveries (80.5 per 1000 births) reported by Onyiriuka³ in Benin City, Nigeria. The differences in the observed prevalence may not be unconnected with the differences in the study population. Ethnicity has been shown to affect the birthweight of babies,⁶ babies of certain ethnic groups having higher birthweight than others. In addition, recent studies^{7,8} have shown a steady increase in birthweight of babies in Benin City and eastern Nigeria suggesting that the weight of babies in more recent studies will be higher than those of earlier ones. Reasons adduced by these authors for the increase in birthweight being better maternal nutrition and hence higher maternal pre-pregnancy weight.

The sex distribution of the babies in the present study was in favour of the males with a male: female ratio of 1.2:1. Male predominance has been reported in virtually all studies^{1,3,4} on high birthweight deliveries, although the strength of this association varies from study to study, from 1.5:1 in Benin City³ to 2:1 in Malaysia.⁴ The reasons for this phenomenon have not been clearly elucidated. Speculations however abound and include antigenic dissimilarities established by the presence of Y chromosomes which enhance trophoblastic invasion and hence fetal growth.⁹

The role of seasonality in the prevalence of high birthweight has not been clearly demonstrated. The result of the present study however showed that higher proportion of high birthweight babies were born during the wet (rainy) season months of May to October than during the dry months of November to April. Although the report of Onyiriuka³ corroborated this finding, no scientific explanation is readily available.

Maternal ages above 20 years and particular the 30s and 40s has been suggested as an associate of high birthweight deliveries.^{1,3,4} The result of the present study tended to agree with that observation. High birthweight deliveries were uncommon with teenage mothers when compared with mothers in their 30s and 40s.³ Although it is uncertain that elderly primigravidae have higher incidence of high birthweight delivery, more studies are needed to corroborate the association of maternal age with high birthweight. The more tenable reason, however, is that of higher parturition of older women when compared to younger women. The tendency is that the more the number of deliveries the higher the probability of having high birthweight babies, thus

multiparity and high birth order have been associated with high birthweight.^{1,2,4,5}

Vaginal was the main route of delivery of the babies in the present study. Our observation has been supported by the reports of other authors^{1,5,10} who similarly documented lower Caesarian section rate in the delivery of high birthweight infants. It is however, of importance to note that the Caesarian section rate in the present study and those of other parts of Nigeria^{3,5} is much lower than that in non-African countries. For instance, 43.9% of high birthweight deliveries in a series from Malaysia⁴ were delivered abdominally as against 29.3% in the present study. The effect of the differences in rates of Caesarian section in the delivery of high birthweight babies cannot be concluded with certainty even though the morbidity and mortality rates in these areas^{2,4} with higher Caesarian section rates are lower than those in studies from Nigeria.^{3,5} It is arguable that the fetal death or damage that could result from mechanical difficulties at vaginal delivery may be clearly avoided in abdominal delivery, results of the present study did not show significant advantage of abdominal delivery over vaginal delivery as the overall morbidity associated with both routes are alike. Although some authors^{11,12} favoured the use of the abdominal route in the delivery of babies heavier than 4500 grams, there is no general consensus on the estimated fetal weight that must be delivered abdominally. Further studies are therefore needed to establish this.

Morbidity from high birthweight deliveries results from the consequences of prolonged obstructed labour, complications of difficult delivery and effects of the underlying conditions. In the present study, 41.3% of the high birthweight live births had one or more illnesses that warranted hospital admission and management. This proportion is higher than the 8.3% in Ireland² and 29.3% (88/300) in Malaysia.⁴ The differences in the quality of obstetric care in the respective localities might have accounted for the differences in admission rates in high birthweight deliveries.

The morbidity pattern in the present study revealed that high birthweight babies commonly present with low 5-minutes Apgar Scores (asphyxia), hypoglycaemia, hyperbilirubinaemia, sepsis and birth trauma in the perinatal period. The prevalence of asphyxia in the present study (13.4%) is higher than the 2.0% reported by Bérard *et al*¹ in Lille Cedex, France but lower than the 15.0% reported by Onyiriuka³ in Benin City, Nigeria. The association of birth asphyxia with high birthweight deliveries have been reported by some authors^{4,13} and it is attributable to meconium aspiration, birth injury particularly intracranial haemorrhage from cephalopelvic disproportion and complication of forceps delivery, cord compression by after-coming head in breech

delivery and maternal hypotension or haemorrhage. Birth injuries are common problems of macrosomic babies.^{1,14} In the present study, 5.1% of the babies had various forms of injuries which included multiple bruises, cephalhaematoma, clavicular fracture, fracture of the humerus and Erb's-Duchene palsy. Erb's-Duchene palsy was the only neural injury in the present study. Many researches^{1-4,14,15} have corroborated this finding, even though the reported incidence in some of the series was much lower than the 1.3% in the present study. Mocanu *et al*² and Lim *et al*¹ reported an incidence of 0.4% and 0.6% in Ireland and Malaysia respectively. The relatively high prevalence of Erb's-Duchene palsy in the present study underscores the need to improve on the current obstetric practices.

Mortality from complications of high birthweight deliveries is not unusual. Stillbirths were recorded in 0-0.6% in some series from developed countries.^{1,2,4} In the present study, stillbirth rate was 6.0% suggesting that big fetuses in this environment are at least 10 times at risk of perinatal death than their counterparts in developed countries probably due to availability of better obstetric care in these countries. The perinatal mortality rates of 3.9 per 1000 total births and 71.9 per 1000 high birthweight deliveries in the present study are worrisome and will require intensified effort to reduce.

CONCLUSION

The morbidity and mortality of high birthweight deliveries in the present study are relatively high. Antenatal prediction of macrosomia and generous use of timely elective Caesarian section for delivery of large fetuses especially severe macrosomia (>5000 grams) are needed to reduce the prevailing morbidity and mortality of high birthweight babies in developing countries.

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