

Prevalence of fetal macrosomia and neonatal complications in a Nigerian suburban hospital: a five year study

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Abstract

Background: Fetal macrosomia has been the subject of several studies with a view to identifying the maternal risk factors and obstetric complications. There is a paucity of data on the neonatal complications.

Aim: The aim of the study was to determine the prevalence of macrosomia in Irrua Specialist Teaching Hospital (ISTH), its contribution to neonatal admission and the morbidities in neonatal life.

Subjects and methods: It was a descriptive, predominantly retrospective five year study from 2011 to 2015.

Results: There were 3,644 deliveries, out of which 290 were macrosomic, giving a prevalence of 8.0%. The mean birth weight for the macrosomic infants was 4.39 ± 0.43 (range 4-6.1) kg and the males were significantly more than the females. The contribution of macrosomia to neonatal admissions was 6%. The most prevalent neonatal morbidities in the present study were hypoglycemia (22.2%), jaundice (20.4%) and respiratory distress (18.5%). Other morbidities observed were sepsis (11.1%), asphyxia (10.2%), hypertrophic cardiomyopathy (3.7%) and Erb's palsy (3.7%).

Conclusion: The prevalence of macrosomia was in the range found globally, it was an important cause of admission and the spectrum of neonatal morbidities was more than previously described.

Keywords

Prevalence, macrosomia, complications.

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Introduction

In perinatal medicine, extremes in fetal weight have attracted immense attention because of the associated increase in morbidity and mortality. However, the low birth weight infants have attracted more attention than the macrosomic infants despite the reported increase in the number of macrosomic infants born globally [1]. Reports show that the trends in the prevalence of fetal macrosomia vary across different regions of the world with contrasting trends in the occurrence of macrosomia reported from the USA, Asia and Europe [2-4].

Fetal macrosomia has been defined in several different ways, including birth weight of 4,000-4,500 g or greater than 90% for gestational age after correcting for sex and ethnicity [1].

Due to the variation of the minimum weight that defines macrosomia, the incidence varies depending on the cut-off value. The incidence is believed to be higher in industrialized nations and among women of high socio-economic status within a given population. It occurs in 3-10% of all deliveries [1].

Factors determining birth weight include race, genetics, fetal sex, duration of gestation, parity, maternal size and diabetes mellitus. Male newborns typically weigh more than female newborns and thus comprise a greater proportion of infants with birth weights exceeding 4,000 g at any gestational age. Even when controlled for diabetes, studies have demonstrated that Hispanic women have a higher risk of fetal macrosomia compared with white, African American, or Asian women [5-6].

A higher incidence of NICU admissions has been reported in neonates with a birth weight higher than 4,500 g compared with newborns with a birth weight of less than 4,000 g (9.3% vs 2.7%). The most notable neonatal complications of macrosomia include traumatic injury and perinatal asphyxia. Other morbidities include hypoglycaemia, hyperbilirubinemia and polycythemia [6].

There is also evidence that being born macrosomic is also associated with health risks in later life. The concept of fetal onset of adult disease hypothesise that both growth-restricted and macrosomic infants are highly predisposed to

coronary artery disease, hypertension, obesity, and insulin resistance in adulthood [7]

Some studies have evaluated the maternal risk factors for fetal macrosomia and the maternal complications [8]. There is paucity of data on the spectrum of neonatal complications attributable to macrosomia, particularly in developing countries, where it is not considered to be a significant problem. Adequate knowledge of its complications equips clinicians to manage these patients better.

The purpose of this study was to determine the incidence of macrosomia in a suburban hospital setting, its contribution to neonatal unit admissions and the associated neonatal complications.

Patients and methods

This descriptive study was carried out at the labour ward and special care baby unit (SCBU) of Irrua Specialist Teaching Hospital (ISTH). This public Hospital is located along the Benin-Abuja expressway in Irrua, Esan Central Local Government Area (ECLGA), Edo State, Nigeria. The SCBU has a capacity for 26 neonates, with an average annual admission rate of 500. The unit consists of 4 high dependency cots and 22 special care cots. There are no facilities for invasive assisted ventilation and total parenteral nutrition. The unit is staffed by specialist and trainee Paediatricians as well as Paediatric and general nurses.

The study was retrospective from January 2011 to December 2014 and prospective through 2015.

Birth weight of 4,000 g and above were classified as macrosomia. All the neonates admitted into the SCBU weighing 4,000 g and above were recruited. Data was obtained from patients' case notes. The information obtained includes the gender, birth weight and morbidities present while on admission.

The labour ward has an average annual delivery rate of 1,000 per year. Data was obtained from the delivery register; these included the method of delivery and birth weight.

The trend of the incidence over the study period was presented graphically and the frequencies of the observed morbidities were highlighted. Data analysis was done using the SPSS® version 16.

Results

Delivery details from the labour ward were available from January 2012, while details of admissions into the SCBU were available for the entire study period.

Total deliveries in ISTH labour ward between 2012 and 2015 were 3,644, of which 290 were macrosomic, giving the prevalence of 8.0% (80/1,000 live births). One hundred and sixty two (55.9%) of the macrosomic infants were delivered via caesarean section (CS) and 128 (44.1%) through the vaginal route.

Macrosomic neonates accounted for 108 (6%) of the 1,803 admissions into SCBU during the review period. The admitted babies consisted of 77 (71.3%) males and 31(28.7%) females. This was statistically significant with $p < 0.001$

The mean weight of the infants was $4,390 \pm 430$ (range 4,000-6,100) g.

The trend of admission of macrosomic infants over the five year period is shown in **Fig. 1**, the numbers peaked in 2011, with no obvious pattern identified.

Fig. 2 shows that hypoglycemia and jaundice were the most frequent problems amongst the admitted babies while hypertrophic cardiomyopathy (HCMP) and Erb's palsy were the least. Some babies had multiple morbidities, while 5% of the babies had no identifiable morbidities and were only admitted for close monitoring of blood glucose.

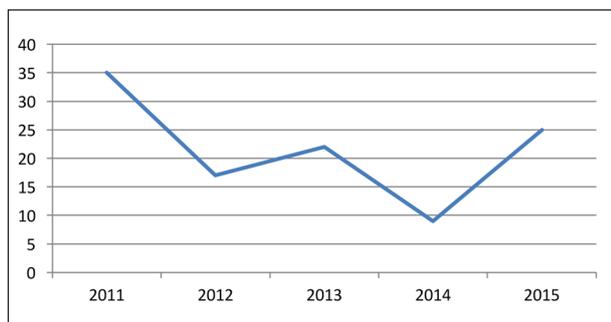


Figure 1. Trend of macrosomia admissions into special care baby unit (SCBU) over 5 years.

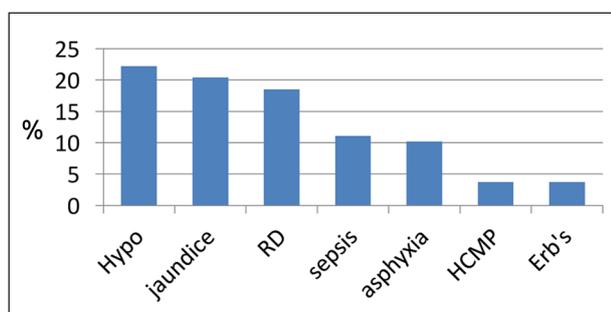


Figure 2. Frequencies of morbidities observed among the admitted babies.

Hypo: hypoglycemia; RD: respiratory distress; HCMP: hypertrophic cardiomyopathy; Erb's: Erb's palsy.

Discussion

The overall prevalence of macrosomia in our study was 8.0%, this was similar to the 7.4% reported by Onyearugha and Ugboma from Port Harcourt, 8.1% by Ezegwui et al. from Enugu, 9% by Najafian and Cheraghi in Iran and 9.3% by Iyoke et al. in Eastern Nigeria. It was however higher than 2.9%, 3.6% and 4.2% reported by Mutahir and Ujah, Osaikhuwuomwan et al. and Abdul et al. from Jos, Benin and Zaria, respectively [9-15].

The role of race and ethnicity in the incidence of macrosomia has been documented [4]. The prevalence in these studies seems to suggest a regional variation in macrosomia. While this observation may be anecdotal, it is not impossible that there is a higher prevalence of overweight, obesity and diabetes, factors associated with macrosomia, among women in the Southern region as compared with those from Northern Nigeria. There is a high prevalence of diabetes in the region of Nigeria where the current study was carried out.

The association between male sex and macrosomia was corroborated by the current study, where the male sex was more than double the female sex among the admitted subjects, 71.3% vs 28.7% ($p < 0.001$). The male preponderance among macrosomic infants in the study was similar to the findings from Enugu, Jos, Port Harcourt and Iran and at variance with the report by Iyoke et al. from Eastern Nigeria where there was no gender difference [9-13].

Fetal macrosomia is known to increase the risk of instrumental and operative deliveries [5, 6]. The incidence of CS was 55.9% in this study, less than the 89% reported in the Iranian study and higher than findings from Enugu, Port Harcourt, Benin and Saudi Arabia with rates of 27.3%, 32.6%, 41.2% and 47.6% respectively [9-11, 14]. The wide variation in CS rates in various studies may be due to the different guidelines adopted by each institution for instrumental/operative delivery as well as variable expertise for the same. In addition, the extent to which instrumental deliveries are practised in a centre has a bearing on the CS rates. In ISTH, instrumental delivery is rarely practised, this may account for the high incidence of CS delivery compared to other centres in Nigeria.

The mean weight of the macrosomic subjects in the current study was 4,390 g, similar to the 4,230 and 4,420 observed in Benin and Port Harcourt respectively, the maximum birth weight of 6,100

recorded was however higher than those from Benin (5,600 g) and Port Harcourt (5,500 g) [9, 14].

The most prevalent neonatal morbidities in the present study were hypoglycemia (22.2%), jaundice (20.4%) and respiratory distress (18.5%). Other morbidities observed were sepsis (11.1%), asphyxia (10.2%), HCMP (3.7%) and Erb's palsy (3.7%). To the best of our knowledge, this is the only study that describes the full spectrum of neonatal morbidities.

Other researchers document asphyxia rates and birth trauma as indices of neonatal morbidity.

The incidence of perinatal asphyxia among macrosomic babies in the current study was 10.2%, similar to findings from two reports from Benin, higher than 4.8% observed in Enugu, and less than 16.9% (moderate plus severe asphyxia) and 20.6% (moderate plus severe asphyxia) observed in Jos and Port Harcourt, respectively [9, 10, 13, 14, 16]. It is however difficult to comment on asphyxia rates from different studies. This is because the tool used to assess asphyxia (APGAR score) is very subjective, also while some workers used the first minute, others used the fifth minute score. In the current study, the criteria for the diagnosis of asphyxia varied widely over the study period such that a subject diagnosed with asphyxia in 2011 and 2012 may be normal in 2014/5 based on the revised criteria of persistently low scores at the fifth minute. Among macrosomic neonates, perinatal asphyxia occurs more commonly following vaginal delivery.

Erb's palsy was recorded in 3.7% of the babies in the current study; this was higher than the findings from Iran (0.96%) [11]. Erb's palsy is more likely to result from vaginal delivery.

HCMP is a well documented complication, related to transient hyperinsulinemia among infants of diabetic mothers (IDM), a common cause of macrosomia [17, 18], In the current study, HCMP was found in 3.7% of cases, this figure may be an underestimation of the true incidence as the diagnosis is made only after a chest radiograph and/or echocardiography is performed. A significant number may have been classified as respiratory distress in the absence of thorough investigation.

Hypoglycemia, jaundice and respiratory distress were the most prevalent morbidities in the present study, these are well documented problems associated with IDM. While this study did not seek to elicit the aetiology of macrosomia, a large proportion of the subjects were indeed IDMs. Hypoglycemia in particular is an early onset complication which may

be undetected, asymptomatic, yet with far reaching neurodevelopmental implications for a baby.

Study limitations

The current study was predominantly retrospective and therefore data collection was not standardized with a study protocol. It is pertinent to note also that some of the morbidities observed are possibly independent of the size of the babies. In addition, delivery data from the labour ward was incomplete.

Conclusion

It can be concluded that the prevalence of macrosomia in ISTH is similar to other centres globally. Macrosomic infants contribute significantly to neonatal unit admissions in ISTH, and the problems associated with this group are more extensive than previously thought. In the light of the plethora of morbidities associated with macrosomia, elective admission into the neonatal unit for close monitoring and early intervention may be justified.

Declaration of interest

The Authors declare that there is no conflict of interest. Funding: none.

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