Neonatal Outcome of Macrosomia

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ABSTRACT

Introduction: Macrosomia is an emerging public health problem, both in the developed as well as in the developing countries. This study was aimed to examine the maternal and neonatal risk factors associated with macrosomia and compare adverse neonatal outcome between appropriate for gestational age (AGA) and macrosomia.

Methods: Records of all live singleton AGA and macrosomic babies delivered at a tertiary care teaching hospital in Lalitpur, Nepal, between 14th April 2013 and 13th April 2014 were retrospectively reviewed.

Results: Of the 769 deliveries, 684 neonates were eligible of which 93 were born macrosomic with an incidence of 12.1%. We observed the most significant neonatal outcome to be neonatal sepsis (14%; p = 0.005) compared to AGA babies (5.9%). Macrosomia was found to be associated with increasing maternal age and parity (p = 0.007) relative to mothers of AGA babies, most of whom underwent caesarean section (55.9%) whilst the same outcome was fewer for mothers of AGA babies (29.9%). A higher incidence of pregnancy induced hypertension (PIH) as maternal comorbidity (5.4%) was associated with macrosomia contrasted with mothers of AGA babies (4.4%).

Conclusion: Macrosomic birth was found to be associated with relatively higher adverse neonatal outcome, warranting prolonged hospital admission than AGA births.

Key words: appropriate for gestation age; macrosomia; neonatal sepsis

INTRODUCTION

Macrosomia is an emerging public health problem, both in the developed as well as in the developing countries.[1] The prevalence of macrosomia is increasing and is predicted to continue increasing in the future. However, the concern is not only limited to increasing macrosomic deliveries, but also towards the fetal and maternal adverse outcomes that tag along. The exact cause of macrosomia is not known. However, the risk factors are higher maternal age, height, parity, body-mass index and presence of diabetes, post-term pregnancy, and male foetal sex.[1] Macrosomic babies of non-diabetic mother are expected to have high incidence of hypoglycaemia, transient tachypnoea of the newborn, hyperthermia and birth trauma.[2]

The birth weight of babies has physiological variations among different populations. Therefore, classification of babies based on local or country specific growth percentile curves have been advocated.[3] Even though a study presented intrauterine growth curve with reference to gestational age in Nepalese infants, there has been no published study that compares neonatal outcome between the appropriate for gestational age (AGA) and macrosomia in Nepal.[4]

Considering the paucity of study as mentioned, the aim of this study was to examine the maternal and neonatal risk factors associated with macrosomia and compare adverse neonatal outcome between AGA and macrosomia based on local intrauterine foetal growth curve in a tertiary care level teaching hospital of Nepal.

METHODS

This was a retrospective study done on live singleton babies delivered between 14th April 2013 and 13th April 2014 at tertiary care teaching hospital, located at Lalitpur district of Nepal. The consent for study was taken from the Institutional Review Committee. The inclusion criteria were gestational age at delivery of ≥ 37 to 42 completed weeks and birth weight of ≥ 10th percentile for gestational age based on local curves. They were further classified into two groups. The first group consisted of babies with birth weight of 10th to 90th percentile for gestational age which was considered as appropriate for gestational age (AGA). The second group consisted of babies with birth weight greater than 90th percentile according to gestational age or birth weight of ≥ 4000 grams irrespective of gestational age which was considered as macrosomia. Multiple birth and stillbirths were excluded.

The maternal and neonatal information of eligible babies were extracted from hospital records. The maternal characteristics, mode of delivery and neonatal characteristics were reviewed. Maternal demographic and obstetric characteristics studied were age, gravida, parity, abortion, period of gestation, and associated co-morbid conditions. Neonatal characteristics studied were gestational age at delivery, birth weight, gender and Apgar score. The hospital records of all babies were reviewed till the time of discharge. The babies, needing admission into the neonatal care unit due to one or more morbidities, were considered as complicated ones.

Neonatal outcome included neonatal sepsis, hypoglycemia, significant hyperbilirubinemia requiring phototherapy, perinatal asphyxia including hypoxic ischemic encephalopathy, neonatal depression, transient tachypnea of newborn, meconium aspiration syndrome, transient hypernatremia of newborn, cephalohematoma, congenital malformation and phenotypical Down's syndrome. The data analysis was performed with SPSS 20.0 version (Chicago IL, USA). The neonatal outcomes were compared between the AGA and macrosomia using t - independent test, chi-square test and Fisher's Exact test.

RESULTS

Among 769 neonates born in our hospital during one year, 684 singleton live full-term babies were eligible and available for analysis. They included 93 macrosomic babies who met the inclusion criteria. So, the incidence of macrosomia was 12.1%. This group was compared to 591 AGA babies who met the inclusion criteria.

Overall mothers of macrosomia babies were more likely to be more or equal to 35 years of age (Table 1). The increasing number of gravida and parity of

Table 1. Neonatal outcome versus socio-demographic and other clinical parameters and its significance

Risk Factor	AGA (n = 591)	Macrosomic (n = 93)	P-value
Age (years, Mean SD) ≥ 35 years	24.73 (4.5)	24.58 (4.6)	0.764
Gravida Mean (SD)	1.73 (0.90)	1.91 (0.85)	0.072
Parity Mean (SD)	0.52 (0.72)	0.74 (0.90)	0.007
Abortion Mean (SD)	0.21 (0.49)	0.18 (0.44)	0.643
Period of gestation (completed weeks) Mean (SD)	39.05 (1.31)	38.95 (1.30)	0.491
Mode of delivery (%)			< 0.001
• Vaginal delivery	195 (32.1)	23 (24.7)	
• Vaginal delivery with episiotomy	208 (35.2)	18 (19.4)	
• Caesarean section	177 (29.9)	52 (55.9)	
• Assisted forceps delivery	11 (1.9)	0	
Maternal co-morbidity (%)	76 (12.9)	12 (12.9)	0.991

mother was associated with macrosomia. In fact, there was a significant association with increasing number of parity of mother with macrosomia.

There was no significant difference in mean maternal age, previous history of abortion, period of gestation and maternal co morbidity between the two groups. Pregnancy induced hypertension (PIH) was the commonest maternal co morbidity in both groups and mother of macrosomia had higher incidence of PIH (5.4%) compared to mother of AGA babies (4.4%). However, there were no cases of maternal diabetes mellitus recorded.

The number of deliveries via vaginal delivery route with or without episiotomy was higher compared to delivery via caesarean section in AGA babies (67.3% Vs 29.9%). In contrast, number of deliveries via vaginal delivery route with or without episiotomy was lower compared to delivery via caesarean section in macrosomic babies (44.1% Vs 55.9%). Undeniably, there was a highly significant difference between the two groups regarding mode of delivery.

Table 2. Neonatal characteristics

Risk Factor	AGA (n = 591)	Macrosomic (n = 93)	p-value
Birth weight Mean (SD)	2.94 (0.26)	3.63 (0.23)	< 0.001
Male gender (%)	314 (51.1)	63 (67.7)	0.008
Apgar score at 1 minute (%)			
≤ 6	13 (2.2)	3 (3.3)	
> 6	578 (97.8)	90 (96.7)	0.543
Apgar score at 5 minute (%)			
≤ 6	0	0	
> 6	591 (100)	93 (100)	1

The mean birth weight of macrosomia was 3.63 kgs which was significantly higher compared to AGA babies (Table 2). Similarly, male gender was associated significantly with macrosomia (67.7%). The Apgar score at one minute was less than seven in 3.3% of macrosomic babies compared to AGA babies 2.2%. There was no significant difference in Apgar score at five minute between the two groups.

The macrosomic babies had increased incidence of complications needing admission into the neonatal care unit (19.4% vs 13.7%). In comparison to AGA babies, the neonatal complications like neonatal sepsis, hyperbilirubinemia requiring phototherapy, transient tachypnea of newborn, acyanotic congenital heart disease and phenotypical Down's syndrome were higher in macrosomic babies (Table 3). Regarding complications, neonatal sepsis was the commonest and occurred in 14% of macrosomic babies as compared to AGA babies (5.9%), revealing significant association of adverse neonatal outcome with macrosomic babies.

DISCUSSION

Macrosomia, a common encounter nowadays in the ever-progressing world, is associated with wide range of neonatal and maternal risk factors and outcomes. Consistent with previous reports,[2,4,6] we observed macrosomia predisposed to more adverse neonatal and obstetric outcomes resulting in

Table 3. Neonatal outcome

	AGA (n,%) (n = 591)	Macrosomic (n, %) (n = 93)	p value
Complicated babies	81 (13.7)	18 (19.4)	0.150
Neonatal sepsis	35 (5.9)	13 (14.0)	0.005
Hyperbilirubinemia	30 (5.0)	6 (6.5)	0.581
Meconium aspiration syndrome	14 (2.4)	0 (0)	0.134
Transient tachypnea of newborn	8 (1.4)	2 (2.1)	0.552
Perinatal asphyxia	7 (1.2)	1 (1.1)	0.927
Acyanotic congenital heart disease	5 (0.8)	1 (1.1)	0.826
Phenotypical Down's syndrome	2 (0.3)	1 (1.1)	0.318
Hypoxic ischemic encephalopathy	2 (0.3)	0 (0)	1
Hyperthermia	2 (0.3)	0 (0)	1
Hypoglycemia	1 (0.2)	0 (0)	1
Cephalohematoma	1 (0.2)	0 (0)	1
Suspected posterior urethral valve	1 (0.2)	0 (0)	1

prolonged hospital stay and related complications compared to AGA babies.

Perinatal outcome was found to be complicated with increasing birth weight percentile. Our study also illustrated the increasing incidence of macrosomic birth (12.1%) in the modern world, its association with increasing maternal age, increasing gravida and parity and its male preponderance. Moreover, it highlighted PIH as an important maternal comorbidity to be associated with macrosomia.

Our society is constantly evolving and people have started becoming more independent and career-centric. Consequently, delayed marriage and increasing maternal age at first birth is a common occurrence these days. Our study reported the association of macrosomia with increasing maternal age, with mothers of macrosomic babies likely being equal to or more than 35 years of age. This finding parallels with the observation in past studies.[7,8]

Previous studies have consistently reported the significant association of macrosomia with multiparity.[1,9] One study done at Turkey states the rate of grand multipara to be four times higher in the macrosomic group than control group.[10] Similar to these previous reports, our figures also showed significant association of increasing number of gravida and especially parity (p = 0.007) with macrosomia.

Increase in health awareness, frequent antenatal visits and aid of antenatal ultrasound examination have cumulatively facilitated the tentative prediction of macrosomia in the changing world. Owing to the possible unpreventable maternal and perinatal complications during labour, higher number of babies with macrosomia are delivered via caesarean section than AGA babies, as suggested by many other studies.[6,11] Additionally, our analysis also exhibited the number of deliveries via caesarean section to be significantly higher (55.9%) in macrosomic babies than in AGA babies (29.9%), compared to vaginal delivery with or without episiotomy. This may be attributed to the previous incidence of adverse outcome of vaginal deliveries in macrosomia.[12] Likewise, previous studies, state the benefit of antenatal prediction and elective Caesarean section to avoid severe complications of macrosomia.[6,8] However, there are no specific guidelines as of yet to estimate a sonographic weight at or above which elective Caesarean section is recommended.[13]

One of the findings of our study report was higher incidence of PIH in macrosomic pregnancies (5.4%) than in AGA pregnancies (4.4%). This hints towards macrosomia to be an important consequence. Previous literatures have constantly mentioned about diabetes mellitus and its stronger association with macrosomic birth.[1,9] On the contrary, no case of maternal diabetes mellitus was noted in our study. As per our findings, higher incidence of macrosomia was observed among male gender (67.7%) compared to AGA babies (51.1%) concomitant with various studies in the past.[8,11,12]

Macrosomic babies are also found to have low five minutes Apgar scores in several studies.[5,8,11] However, the result of the present study showed that the decrease in APGAR score in 1st and 5th minute among macrosomic child was not significant, although an APGAR score of < 7 in 1st minute was seen slightly more among macrosomic babies (3.3%) compared to AGA babies (2.2%). This must have been because of the association of macrosomic babies with severe adverse perinatal outcomes than AGA babies.

Many studies till date have predominantly reported higher rate of perinatal complications in macrosomic babies.[2,5,8] This finding has also been found in our study. Our study also showed neonatal sepsis being significantly higher among the macrosomia (14%) compared to AGA babies (5.9%). The incidence of complications leading to NICU admission has been found to be higher in macrosomic babies compared to AGA babies.[2,13,14] Similarly, the need for interventions like CPAP and mechanical ventilation for increased respiratory morbidity has been found to be more in macrosomic babies.[6] All these complications may also have been a contributing factor in the increased frequency of neonatal sepsis in macrosomic babies in comparison to AGA babies. Similarly, complications like meconium aspiration syndrome, transient tachypnea of newborn, perinatal asphyxia, hyperbilirubinemia, congenital heart disease, Down's syndrome, and hypoxia ischaemic encephalopathy were also higher in our study but there was no significant difference among the macrosomic babies compared to AGA. Macrosomia has been nevertheless found to be associated with long term health consequences.[15]

Our study has few limitations. The number of cases in our study was relatively less. The number of cases in any study is an important factor to increase the power of the study. This could have been the reason for many of our outcomes not being statistically significant. Also, if we had divided the cases of macrosomia furthermore according to the increasing birth weight, more clarification could have been achieved on the risk factors and outcomes that would have been further helped in setting the standards for the management of macrosomia in the future.

CONCLUSIONS

Taking into account the limited studies on macrosomic births, our study is one of the few to address the comparison between outcome of macrosomic and AGA births. It has revealed several risk factors and occurrence of higher frequency of complications associated with macrosomic births than AGA births. This can henceforth facilitate towards optimisation of strategy towards management of macrosomic deliveries which still proves to be a challenge to health care providers. Further research work and study into this issue will definitely continue to become more beneficial in health care management.

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