Gynecology & Obstetrics
ISSN: 2161-0932

Valere, et al., Gynecol Obstet (Sunnyvale) 2018, 8:10
DOI: 10.4172/2161-0932.1000490

Research Article Open Access

Macrosomic Newborn Anthropometric Parameters and the Mode of Delivery

MVE KOH Valere[1,2*], **Belinga Etienne**[1,3], **Engbang Ndamba Jean Paul**[4,5] **and Kasia Jean Marie**[1,3]

[1]*Faculty of Medicine and Biomedical Sciences of University of Yaounde I, Cameroon*

[2]*University Teaching Hospital of Yaounde, Cameroon*

[3]*Centre Hospitalier de Recherche et d'Application en Chirurgie Endoscopique et Reproduction Humaine, Cameroon*

[4]*Faculty of Medicine and Pharmaceutical Sciences of the University of Douala, Cameroon*

[5]*Laquintinie Hospital of Douala, Cameroon*

***Corresponding author**: MVE KOH Valere, Faculty of Medicine and Biomedical Sciences of University of Yaounde I, Cameroon, E-mail: vmvekoh@yahoo.com

Received date: October 31, 2018; **Accepted date:** November 15, 2018; **Published date:** November 25, 2018

Abstract

Macrosomia is defined as a newborn weighing 4000 g and above. Its incidence varies between 2% to 15% in recent publications. The morbidity and mortality are still high in Sub Saharan Africa. The mode of delivery of the macrosomic fetus remains a challenging moment in obstetrics even today. The objective of this study was to assess the relation between macrosomic newborn anthropometrics parameters and the mode of delivery.

It was a descriptive cross-sectional study, conducted from November 4th, 2013 to June 4th, 2014. All macrosomic newborn defined as birth weight ≥ 4000 g taken at the moment of delivery were included. Those born through an elective caesarian section or dead before maternal admission were excluded, so were mothers with a true conjugate <10.5 cm. Newborn anthropometric data were assessed according to the mode of delivery and maternofetal outcome. We used X2 for statistical analysis.

The incidence was high, 7.68% (77/1002). Many macrosomia contributing factors like maternal age, parity, obesity, previous delivery of the macrosomic baby and male newborn were frequent in the study population. Maternal and fetal complications were rare. The frequency of vaginal delivery was 71.4% and the mode of delivery was not related to newborn weight, but rather to a new parameter, the newborn length, and the cut-off point was a newborn length of 53 cm. Macrosomic baby measuring 53 cm and above were more likely to be born vaginally whereas a length less than 53 increased the frequency of delivery by caesarian section (P=0.0001).

Keywords: Macrosomia; Anthropometric parameters; Mode of delivery

Introduction

Macrosomia is usually defined as a newborn weighing 4000 g and above regardless of gestational age and, it was the one adopted in this study, but widely, its definition uses threshold birthweight percentile or birthweight [1]. It is often the result of maternal morbidities like diabetes, obesity [2,3], but can also occur without identified maternal morbidity [4]. Its incidence varies between 2% to 15% in recent publications [5,6], and it is increasing in some countries or regions [7,8] while reducing in others [9]. It is still associated with high morbidity and mortality in Sub Saharan Africa [10,11]. Cameroon is a Sub-Saharan African country at the Gulf of Guinea, with 23 million inhabitants. Macrosomia is also associated with maternal, fetal and post-natal complications such as cephalopelvic disproportion, shoulder dystocia, a higher proportion of cesarean, hypoglycemia, birth trauma [12,13]. The decision concerning the mode of delivery of macrosomic fetus and management remains therefore a challenge in modern obstetrics.

Some authors have shown an association between macrosomia and the increase of shoulder dystocia [12], but others like Sharaf did not [14], revealing the implication of other fetal anthropometric factors determining the most appropriate mode of delivery of the macrosomic fetus. Newborn size at birth is assessed by routine anthropometric parameters and, the objective of this study was to assess the relationship between newborn macrosomic baby anthropometrics parameters and the mode of delivery, in order to improve the mode of delivery-decision making and, therefore, promote more appropriate management of macrosomic pregnancy at term.

Materials and Methods

It was a descriptive cross-sectional study, with prospective data collection over an eight months period, from November 4th 2013 to June 4th 2014 in the Yaounde University Teaching Hospital which is affiliated to the Faculty of Medicine and Biomedical Sciences of the University of Yaounde I and the district Hospital of Biyemassi, a tertiary health facility with the possibility of surgical management of obstetrical complication in the same town.

All macrosomic newborns, defined as birth weight ≥ 4000 g taken at the moment of delivery were included. We excluded macrosomic babies born through the elective caesarian section, multiple pregnancies or from mothers who did not give their written consent. Cases of macrosomia associated with any fetal congenital macroscopic malformations like hydrocephalus, or intra-uterine fetal death before

admission and women with protracted pelvis which we defined in this study as true conjugate <10.5 cm (got from clinical pelvis assessment through the formula True conjugate (cm)=Promontory-subpubic distance (cm) minus 1.5 were also excluded.

The data collected were represented by tables and figures and focused on maternal sociodemographic and obstetrical data (age, gestity parity, past history, maternal height). The newborn data assessed were the route of delivery, the anthropometric parameters (cranial perimeter, newborn length, thoracic perimeter…) and the outcome. Data statistical analysis was done using Epi info version 3.5.4, and we used X2 for data distribution assessment and bivariate analysis. A P value <0.05 was the statistical significance threshold, for an interval confidence of 95%. This study received the approval of the ethics committee of the two hospitals and the authorizations of their managers.

Results

We included 77 cases of macrosomic newborn, 1002 deliveries occurred during the same period, thus a macrosomic delivery frequency of 7.68% among which, 10.4% weighed 4500 g and above. The vaginal delivery frequency was 71.4% (55/77).

Parameters		n	Frequencies (%)
Sexes	Male	53	68.9
	Female	24	31.1
Maternal complications	Perineal tear	24	31.2
	PPH	4	5.2
Post-natal complications	5mn Apgar score<7	7	9.1
	5mn Apgar score ≥ 7	70	90.9
	Shoulder dystocia	0	0
	Brachial plexus lesions	0	0
	Fracture	0	0
Indications of caesarean section	CPD	15	68.2
	Acute fetal distress	3	13.6
	Macrosomia on scar uterus	4	18.2
Male fetus represented 69%, 91% had a 5 mm Apgar score >7, there was no shoulder dystocia			

Table 1: Post-partum and post-natal parameters.

Parameters		N	Frequencies (%)
Gestity	G1	6	7.8
	G2-3	39	50.6
	G4	22	28.6
	≥G5	10	13
Parity	P1	15	19.5
	P2-3	43	55.8
	P4	13	16.9
	≥P5	6	7.8
Previous history of MB*	None	53	68.8
	1MB	16	20.8
	2MB	4	5.2
	3MB	1	1.3
	4MB	2	2.6
	5MB	1	1.3

*MB: macrosomic baby Parity ≥ 2 represented 80.5%, 31.5% had previously delivered a macrosomic baby, some of them five times

Table 2: Obstetrical parameters.

Parameters		n	Frequencies (%)
Maternal age (years)	<25	9	11.7
	(25-30)	26	33.8
	(30-35)	25	32.5
	(35-40)	14	18.2
	≥ 40	3	3.9
Highest Level of education	Never attended school	1	1.3
	Primary school level	12	15.6
	Middle school level	37	48.1

	University level	27	35.1
Body Mass Index	Normal	13	17.2
on the day of delivery	Weight excess	22	27.6
	Grade I obesity	27	34.5
	Grade 2 obesity	10	13.8
	Grade 3 obesity	5	6.9
The age group (25-35) years represented 66.3% of the study population; all ages were represented, only 17.2% had normal BMI			

Table 3: Maternal socio-demographic and anthropometric factors.

Parameters on admission		**n**	**Frequencies (%)**
Mother's height (cm)	<160	3	2.8
	(160-170)	55	72.2
	(170-180)	15	19.4
	≥ 180	4	5.6
Fundal height (cm)	<35	11	14.3
	35-37	10	13
	37-39	20	26
	39-41	18	23.4
	41-43	12	15.6
	≥ 43	6	7.8
Fetal presentation	Cephalic	72	93.5
	Breech	5	6.5
Cervical dilatation	<4 cm	16	79.4
	≥ 4 cm	61	20.6
Only 2.8% maternal height was less than 160 cm, they were all admitted in labor most of them in the latent phase. PPH: Post-partum hemorrhage CPD: Cephalo-pelvic disproportion			

Table 4: Maternal parameters on admission.

Birth weight (g)	**Caesarian section**	**Vaginal delivery**	**Total**
4000-4500	18	51	69
≥ 4500	4	4	8
Total	22	55	77
P=0,156 (P value) Newborn weight was not related to the mode of delivery. The mean cranial perimeter was 36,26 ± 1,62 cm 32-40 and was not related to the mode of delivery			

Table 5: Relationship between birthweight and mode of delivery.

	Newborn weight		
Newborn length (cm)	(4000 g-4500 g)	≥ 4500 g	Total
47-49	5	0	5
49-51	17	0	17
51-53	12	4	16
53-55	21	4	25
≥57	14	0	14
Total	69	8	77
P=0.0001 There was an obvious shift to vaginal delivery when newborn length was ≥ 53 cm and it was highly statistically significant (p=0,0001)			

Table 6: Correlation between newborn length (NL) and mode of delivery.

Newborn length (cm)	**Newborn weight**		
	(4000 g-4500 g)	**≥ 4500 g**	**Total**
47-49	5	0	5
49-51	17	0	17
51-53	12	4	16
53-55	21	4	25
≥57	14	0	14
Total	69	8	77
P=0,069 NL and weight shew some weak relation (p=0.069), some newborn weighing 4500 g and above had an NL<53 cm, this value was a turning point			

Table 7: Relation between newborn weight and NL.

Discussion

This study was conducted in a university teaching hospital and in a tertiary medical center with caesarian section and newborn resuscitation capacity. Together they both realize more than 1500 deliveries/year.

The frequency of macrosomia was 7.7% (77/1002), more than twice the incidences found in Tanzania, Australia and higher than a Brazilian study over a 13-year period [15,16]. A similar incidence was recently found in Chad a neighboring country of Cameroon [17]. The incidence of macrosomia varies between 2% to 15% in recent publications [5,18], but an incidence of 20% was found in 2008 in Scandinavia [18]. It is different from one region to another within the same country [7], and even from one hospital to another [19].

Macrosomia has been shown to be related to maternal and fetal factors. Abubakari et al, have shown in Ghana that parity female fetus was significantly associated with decreased risk of macrosomic births [19]. Beyond the shorter time of our study period, parity 1 and female sex represented indeed only 20 and 31% respectively of our sample (Tables 1 and 2). Obesity is another risk factor [20] and only 17%

(13/77) had a normal BMI on the day of delivery and, more than half were frankly obese (Table 3), probably preexisting before pregnancy. Macrosomia can also be related to multiparity and macrosomic sibling [12]. Parity>1 represented indeed 80.5% (62/77), and 31.2% (24/77) had previously delivered a macrosomic baby, some of them five times in our study population (Table 1). Maternal height ≥ 1.55 m like nearly 100% of our sample (Table 4)could multiply the risk of the macrosomic baby by five-fold in Peru [21].

Some other identified factors not analyzed in this study are maternal delivery weight ≥ 80 kg, diabetes mellitus, gestational age ≥ 40 years, post-term, pregnancy weight gain ≥ 18 kg, maternal lifestyle [22-24].

Route of Delivery

The complications of macrosomia happen mostly during labor, delivery, the post-partum and post-natal periods. The choice of the most appropriate route of delivery is still a challenging moment for any obstetrician. The macrosomic fetus estimated weight has been until today the main parameter of the decision, and many authors have reported a positive correlation between the fetal weight and delivery by caesarian section, even when there was no maternal co-morbidity.

Some authors have indeed shown a relation between dystocia and increasing macrosomic weight [25], interventional deliveries, shoulder dystocia, and genital laceration [26], but we found no relation between fetal weight and mode of delivery (p=0,156, Table 5). Bekdas et al. analyzing 509 macrosomic newborns from non-diabetic mothers with 500 healthy ones, also found no difference in the mode of delivery, [4], revealing the probability of the implication of other fetal anthropometric factors.

The macrosomic fetal length (FL) at the onset of labor might be one of the missing ones, as this study seems to show. Our results have shown that 86.4% of macrosomic babies born by caesarian section had a delivery day newborn length less than 53 cm, and only 8.3% of all the macrosomic newborn with an FL ≥ 53 cm was born by caesarian section, and this was statistically highly significant (p<0.0001) (Table 6). This is the very first time this observation is raised.

One hypothesis is that, longer FL increases fetal body mass, sometime reaching the macrosomic threshold ,without additive effect on other fetal body parts, including the bi acromial diameter, leading to vaginal delivery without dystocia or trauma, a longer and thinner "snake-like " appearance, as compared to FL<53 cm macrosomic newborn, where the excess macrosomic body mass lost in length is manifested in another fetal body part including biparietal or bi acromial, a "wide, thick and short frog-like" effect, leading to mechanic dystocia like shoulder dystocia, an indication of caesarian section. Maternal height is already a suspected risk of macrosomia [21], with a probable possibility of greater risk of the longer, therefore, heavier fetus.

Antenatal Magnetic Resonance Imaging (MRI) technology can nowadays show the whole body of a term fetus, allowing intrauterine measures of other fetal anthropometric parameters including fetal length.

We also noticed that they were a statistical relation-like (p=0.069) between macrosomic newborn fetal length and weight showing that among the 8 fetuses weighing 4500 g and above, 50% measured (51-53) and 50% (53-55), with the TFL value of 53 cm, (Table 7), appearing as a probable decisive threshold value in the prediction of the mode of delivery of macrosomic baby. We didn't find previous publications to confront findings concerning the implication of fetal length in the determination of the most appropriate mode of delivery of the macrosomic baby. Further and larger scale case-control or cohort studies are of course needed to confirm FL at the onset of labor, in case of suspicion of macrosomia as a predictor of the most appropriate delivery route.

Conclusion

The frequency of macrosomia was high, probably due to the presence of many previously identified macrosomia favoriting factors in our study population. The fetal length of the suspected macrosomic fetus at the onset of labor, rather than body weight, seemed to be a better predictive parameter to determine the mode of delivery of a macrosomic fetus. In our study population, FL<53 cm at the onset of the labor of macrosomic fetus might increase the risk of delivery by caesarian section, while an FL ≥ 53 cm increases the chance of successful vaginal birth. The way forward is the evaluation and improvement of the accuracy of suspected macrosomic baby intra-uterine TFL assessment, using new numeric medical imaging technology like MRI or 4D ultrasound.

Contribution of Authors

MVE KOH Valère did the study design and wrote the article; Belinga Etienne, Jean Paul Engbang and Jean Marie Kasia reviewed and provided critical comments and suggestions for the manuscript.

Competing Interests

The authors declare no conflict or competing interest; this work was not sponsored by any organization and was self-financed.

Acknowledgment

We thank all the team of the two health facilities including the managers who made this study possible.

References

1. Ye JF, Torloni MR, Ota E, Jayaratne K, Pileggi-Castro C, et al. (2015) Searching for the definition of macrosomia through an outcome-based approach in low- and middle-income countries: A secondary analysis of the WHO Global Survey in Africa, Asia, and Latin America. BMC Pregnancy and Childbirth. 15: 324 -333.
2. Kamana KC, Shakya S, Zhang H (2015) Gestational diabetes mellitus and macrosomia: A literature review. Ann Nutr Metab 66: 14-20.
3. Gaudet L, Ferraro ZM, Wen SW, Walker M (2014) Maternal obesity and occurrence of fetal macrosomia: A systematic review and meta-analysis. BioMed Res Int 6: 210-212.
4. Bekdas M, Demircioglu F, Goksugur SB, Ekici A, Kısmet EA, et al. (2013) Cross-sectional study of non-diabetic macrosomic infants. Sri Lanka Journal of Child Health 42: 76-80.
5. Onankpa BO, Nauzo AM (2015) Prevalence and outcome of macrosomic babies admitted to special care baby unit of a Nigerian teaching hospital. Res J of Health Sci 3: 31-37.
6. Koyanagi A, Zhang J, Dagvadorj A, Hirayama F, Shibuya K, et al. (2013) Macrosomia in 23 developing countries: an analysis of a multicountry, facility-based, cross-sectional survey. Lancet 381: 476-83.
7. Do Nascimento MI, Pereira DL, Lopata C, Flores Oliveira CL, et al. (2017) Trends in the prevalence of live macrosomic newborns according to gestational age in Brazil, 2001-2010, and 2012-2014. Strata, Rev Bras Ginecol Obstet 39: 376-383.

8. Bonellie SR, Raab GM (1997) Why are babies getting heavier? Comparison of Scottish births from 1980 to 1992. 315: 1205.
9. Rao JM, Fan DZ, Wu SZ, Lin DX, Zhang HS, et al. (2018) Trend and risk factors of low birthweight and macrosomia in south-China, 2005-2017: A retrospective observational study. Scientific Reports 8: 3393.
10. Ojule JD, Fiebai PO, Okongwu C (2010) Perinatal outcome of macrosomic births in Port Harcourt. Niger J Med 9: 436-440.
11. Onyiriuka AN (2006) High birth weight babies: Incidence and fetal outcome in a mission hospital in Benin City. Niger J Clin Pract 9: 114-119.
12. Ribeiro SP, Costa RB, Dias CP (2017) Neonatal macrosomia: risk factors and postpartum complications. Birth and Growth Medical Journal 1: 21-30.
13. Akın Y, Comert S, Turan C, Pıcak A, Agzıkuru T, et al. (2010) Macrosomic newborns: A 3-year review. Turk J Pediatr 52: 378-383.
14. Sharaf AliH, Zubaida M, Rabel GU (2017) Prevalence of macrosomia and its obstetric complications. Isra Medical Journal 9: 34-38.
15. Said AS, Premji Manji K (2016) Risk factors and outcomes of fetal macrosomia in a tertiary center in Tanzania: A case-control study. BMC Pregnancy and Childbirth 16: 243.
16. Ehrenberg H, Mercer B, Catalano P (2004) The influence of obesity and diabetes on the prevalence of macrosomia. Am J Obstet Gynecol 191: 964-968.
17. Madoue GB, Nguele Sile S, Lhagadang F, Saleh A (2018) Fetal macrosomia: Risk factors, maternal and fetal outcome in NDjamena mother and child hospital, Chad. Obstet Gynecol Int J 9: 153-155.
18. Henriksen T (2008) The macrosomic fetus: A challenge in current obstetrics. Acta Obstet Gynecol Scand 87:134-145.
19. Abubakari A, Kynast-Wolf G, Albrecht Jahn (2015) Prevalence of abnormal birth weight and related factors in Northern region, Ghana. BMC Pregnancy and Childbirth 15: 335.
20. Cabral Madi SR, Rahmi Garcia RM, De Souza VC, Rombaldi RL, De Araujo BF, et al. (2017) Effect of obesity on gestational and perinatal outcomes. Rev Bras Ginecol Obstet 39: 330-336.
21. Alves da Cunha AJL, Sobrino-Toro M, Gutierrez C, Alarcon-Villaverde J (2013) Prevalence and associated factors of macrosomia in peru. Rev Peru Med Exp Salud Publica 34: 36-42.
22. Wondie T, Jara D, Ayana M (2014) Factors associated with macrosomia among neonates delivered at Debre Markos referral hospital, northwest Ethiopia: A case-control study. J Diabetes Metab 5: 468.
23. Mardani M, Khalkhalirad A, Rossta S, Rezapour P (2014) Evaluation of the prevalence of macrosomia and the maternal risk factors. Iranian Journal of Neonatology 5: 5-9.
24. Kathy MR, Gail AR, Jonathan H (2012) Maternal lifestyle factors and fetal macrosomia risk: A review. EMJ Repro Health 2: 52-58.
25. Ozmen B, Sukur YE, Yuce T, Bayramo V, Olmus, et al. (2012) Mode of delivery and birth complications in fetal macrosomia: a simple cost-effectiveness analysis. Turk J Med Sci 42: 119-125.
26. Oghenefegor EO, Ubini OJ, Adeniyi KA (2015) Determinants and outcome of fetal macrosomia in a Nigerian tertiary hospital. Niger Med J 56: 411-415.