Gynecology & Obstetrics
ISSN: 2161-0932
OPEN ACCESS Freely available online
Research Article

Newborn Height and Other Factors Associated with Vaginal Delivery of a Macrosomic Newborn in a Single Post Cesarian Scar in Low Resources Settings

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ABSTRACT

Macrosomia is no longer a contraindication of vaginal delivery in the context of uterine scar. A new fetal anthropometric factor seems promising.

Objective: The aim was to study factors associated with vaginal delivery of a Macrosomic New-born on Scarred Uterus (MNBSU).

Patients and Method: we conducted a case-control study over a period of 9 months in 2020, at two Yaoundé university teaching hospitals, from January 1st, 2013 to December 31st, 2019. Cases were files of women who gave birth vaginally to a singleton macrosomic baby on a single lower segment scarred uterus. Controls were those who gave birth by emergency cesarian section. Statistical analyses were performed using Epi-Info 7.2.2.6 software and Excel 2016.

Results: we included 31 cases matched to 62 controls. Independent factors increasing the vaginal delivery of MNBSU were : Past-History (PH) of vaginal delivery of a macrosomic baby (OR=20.48; p=0.014), PH of vaginal delivery before and/or after Cesarean Section (CS) (OR=5.07, OR=21.58 respectively; p<0.05), cervix effacement ≥ 75% (OR=10.58; p<0.001), or more than 7cm dilated on admission (OR=6.11; p=0.016) no dynamic dystocia (OR=11.57; p<0.001) and labor duration <4 hours (OR=27.59; p<0.001), newborn height ≥ 53 cm (OR=1.31; p=0.014).

Conclusion: safe vaginal delivery of macrosomic fetus on post cesarian single uterine scar is possible. In case of clinical proof of adequate pelvis, spontaneous onset of labor and admission at advanced stage of eutocic labor, labor should be allowed to proceed. New-born height ≥ 53cm is a new decision-making parameter to confirm.

Keywords: Newborn height, Macrosomia, Post cesarian scar, Associated factors

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Received: 13 December, 2023, Manuscript No. GOCR-24-28483; **Editor assigned:** 24 January, 2024, PreQC No. GOCR-24-28483(PQ); **Reviewed:** 29 January, 2024, QC No. GOCR-24-28483(Q); **Revised:** 02 Feburary, 2024, Manuscript No. GOCR-24-28483(R); **Accepted Date:** 03 February, 2024; **Published:** 06 February, 2024

Citation: Valère MK. (2024) Newborn Height and Other Factors Associated with Vaginal Delivery of a Macrosomic Newborn in a Single Post Cesarian Scar in Low Resources Settings, Cameroon, Gynecol. Obstet. 14:1

INTRODUCTION

The delivery of macrosomic fetus defined as a birth weight greater or equal to 4000 g remains an important challenge in medical practice. There is a rise of the frequency of delivery by cesarian section throughout the world. It increased from 8% to 11.5% in 15 years in France, 2.3% to 27.3% in East-Africa, 12% to 25% in Senegal [1-3]. In Cameroon where this study was conducted, the frequency of cesarian section was 19.4% according to Foumane et al. and 8% of pregnancy occurred on scar uterus in a study we conducted [4,5]. The prevalence of macrosomia is also on the rise and was 8% in our setting in 2018 [6,7]. There is therefore an increasing risk of macrosomic fetus pregnancy on scarred uterus.

The mode of delivery of macrosomic fetus without any comorbidity is by itself a debated issue in modern obstetrics. In low resources settings, it is a regular indication of elective cesarian

section. In case of scarred uterus, cesarian section is systematically indicated with all the shortness of prediction, increasing the number of avoidable scars, a greater financial burden compared to vaginal route in lower resources settings and a higher morbidity, compared to vaginal delivery [8].

But in many developed countries, macrosomia is no longer a systematic contraindication to safe vaginal delivery even in the context of a single lower segment scarred uterus. Flamm (301 cases) and Phelan (140 cases) found a risk of uterine rupture during trial of scar in the context of macrosomic fetus not greater than when delivering non macrosomic fetus, with no difference in neonate outcome [9, 10].

Concerning the factors related to the mode of delivery, Senturk MB et al, found that advanced cervical opening, effacement, or prior vaginal delivery were some parameters to consider [11]. Moreover, a study we conducted in Cameroon assessing the mode of delivery of 77 macrosomic fetus according to newborn anthropometric parameter with prospective data collection, not only found that 9% of vaginal delivery were successful trial of scar, but the most important finding of that study was the unveil of a new anthropometric parameter with better discriminating power, as long as the delivery route was concerned, the macrosomic new born height. We found that a macrosomic newborn with height >53 cm was a precursor of safe vaginal delivery even when the weight was ≥ 4500 g, whereas a height <53 cm was related to a drastic increase of cesarian section rate (18 versus 50%) [7]. This new finding has never been assessed in the context of delivery of macrosomic baby on single lower segment scarred uterus. The aim of this work was to study the newborn height and other factors associated with vaginal delivery of a macrosomic baby in a single scarred uterus in low resources settings.

METHODOLOGY

We conducted a case-control study over a period of 9 months from November 11th to August 11th, 2020, at the Yaoundé University Teaching Hospital and the Yaoundé Gynaeco-Obstetric and Pediatric Hospital two university teaching hospital in the capital city of Cameroun. Files of women who gave birth to a singleton macrosomic baby on a single lower segment scarred uterus confirmed by surgical findings in the maternity of those two health facilities, from January 1st, 2013 to December 31st, 2019 were included.

Cases were those who gave birth vaginally and controls were those who delivered by cesarian section. File without surgical report, cases of corporal uterine scars, pregnancy complicated by diseases in pregnancy indicating emergency cesarian section and elective cesarian section were excluded. Gestational diabetes was not an exclusion criterion. Macrosomic baby's mother's files data collection sheet pretested on 10 cases included sociodemographic, pregnancy follow-up, perpartal and prognostic variables. Statistical analyses were performed using Epi-Info 7.2.2.6 software and Excel 2013. We matched 1 case to 2 controls and the minimum sampling size according to Shesselsman formula using the frequency of past history of vaginal delivery before or after uterine scar according to Mve Koh et al. was 18 cases and 36 controls [5]. A p value ≤ 0.05 was the statistical threshold. Logistic regression was carried out to identify independents factors. the research protocol was approved by Ethics Committee of Université des Montagnes before the study began.

RESULTS

We included 31 cases and 62 controls. No sociodemographic factor was related to the mode of delivery of macrosomic fetus on scar uterus whereas many clinical factors were related (Tables 1-6).

Table 1: Past History (PH) and delivery of macrosomic fetus on scar uterus.

Variables	Case	Controls	Total	OR	p-Value
	N=31	N=62	N=93	(IC 95%)	
	n (%)	n (%)	n (%)		
PH of vaginal delivery of macrosomic baby					
Yes	12(85.7)	3(11.1)	15(36.6)	48.0(7.04-326.99)	<0.001
No	2(14.3)	24(88.9)	26(63.4)	0.02(0.00-0.14)	
PH of macrosomia					
Yes	13(43.3)	25(40.3)	38(41.3)	1.13(0.46-2.73)	0.783
No	17(56.7)	37(59.7)	54(58.7)	0.88(0.36-2.13)	
PH of vaginal delivery after cesarian section					
Yes	17(54.8)	3(4.8)	20(21.5)	**23.88**(6.13-92.92)	<0.001
No	14(45.2)	59(95.2)	73(78.5)	0.04(0.01-0.16)	
PH of vaginal delivery before cesarian section					
Yes	22(71.0)	20(32.3)	42(45.2)	**5.13**(2.00-13.15)	<0.001
No	9(29.0)	42(67.7)	51(54.8)	0.19(0.07-0.49)	
Previous cesarian section non indicated for cephalo-pelvic disproportion					
No	30(96.8)	39(62.9)	69(74.2)	**17.69**(2.26-138.53)	<0.001
Yes	1(3.2)	23(37.1)	24(25.8)	0.05(0.00-0.44)	

Table 2: Antenatal event, other clinical event and delivery of macrosomic fetus on scar uterus.

Variables	Case	Controls	Total	OR	p-Value
	N=31	N=62	N=93	(IC 95%)	
	n (%)	n (%)	n (%)		
Antenatal contacts					
Yes	28(93.3)	60(96.7)	88(95.7)	0.46(0.06-3.48)	0.593
No	3(6.7)	2(3.3)	5(4.3)	2.14(0.28-16.00)	
Antenatal healthcare provider					
Obs/Gyne	22(75.9)	37(62.7)	59(66.3)	0.51(0.19-1.39)	0.184
Other profile	7(24.1)	23(38.3)	30(33.7)	0.51(0.18-1.38)	
Antenatal contacts conducted in first degree health facility					
Yes	18(62.1)	32(53.3)	50(56.2)	1.43(0.58-3.54)	0.436
No	11(37.9)	28(46.7)	39(43.8)	0.69(0.28-1.72)	
Gestity >2					
Yes	28(90.3)	40(64.5)	68(73.2)	**5.13**(1.39-18.82)	0.011
No	3(9.7)	22(35.5)	25(26.8)	0.29(0.09-0.87)	
Parity >2					
Yes	16(51.6)	18(29.0)	34(36.6)	**2.60**(1.06- 6.36)	0.033
No	15(48.4)	44(71.0)	59(63.4)	0.38(0.15-0.93)	
Pathologies during pregnancy*					
Yes	13(44.9)	34(55.7)	47(52.2)	0.64(0.26-1.57)	0.332
No	16(55.1)	27(44.3)	43(47.8)	1.55(0.63-3.77)	
Third trimester obstetrical ultrasound done					
Yes	21(70.0)	41(67.2)	62(68.1)	1.13(0.44-2.93)	0.788
No	9(30.0)	20(32.8)	29(31.9)	0.87(0.34-2.26)	
More than 2 living children					
Yes	17(54.8)	20(32.3)	37(39.8)	**2.55**(1.05-6.18)	0.035
No	14(45.2)	42(67.7)	56(60.2)	0.39(0.16-0.95)	

*PH: past history

Table 3: Perpartum event and delivery of macrosomic fetus on scar uterus.

Variables	Case	Controls	Total	OR	p-Value
	N=31	N=62	N=93	(IC 95%)	
	n (%)	n (%)	n (%)		
No dynamic dystocia					
Yes	27(87.1)	7(36.8)	34(68.0)	**11.57**(2,84-47.11)	<0.001
No	4(12.9)	12(63.2)	16(32.0)	0.08(0,02-0,35)	
Cervix effacement > 75% on admission					
Yes	26(83.9)	14(22.6)	40(43.0)	**17.82**(5.77-55.03)	<0.001
No	5(16.1)	48(77.4)	53(56.9)	0.05(0.01-0.17)	
Cervix dilatation > 7cm on admission					
Yes	20(64.5)	4(6.5)	24(25.8)	**26.36**(7.53-92.21)	<0.001
No	11(35.5)	58(93.5)	69(74.2)	0.03(0.01-0.13)	

Spontaneous onset of labor					
Yes	31(100.0)	48(96.0)	79(97.5)	-	0.521
No	0(0.0)	2(4.0)	2(2.5)		
Active phase of labor < 4 hours					
Yes	25(80.6)	8(12.9)	4(4.3)	**28.12**(8.81-89.70)	<0.001
No	6(19.4)	54(87.1)	89(95.7)	0.03(0.01-0.11)	

Table 4: Newborn weight, height and delivery of macrosomic fetus on scar uterus.

Variables	Case	Controls	Total	OR	p-Value
	N=31	N=62	N=93	(IC 95%)	
	n (%)	n (%)	n (%)		
Newborn weight (g)					
[4000-4500[	29(93.6)	50(80.7)	79(84.9)	3.48(0.72-16.64)	0.182
≥ 4500	2(6.4)	12(19.3)	14(15.1)	0.28(0.06-1.37)	
Newborn height ≥ 53cm at delivery					
Yes	16(53.1)	18(29.5)	35(37.6)	2.54(1.04-6.23)	0.042
No	15(46.9)	43(70.5)	58(62.4)	0.36(0.15-0.89)	

Table 5: Macrosomic newborn post-natal outcome factors related to delivery of macrosomic fetus on scar uterus.

Variables	Case	Controls	Total	OR	p-Value
	N=31	N=62	N=93	(IC 95%)	
	n (%)	n(%)	n(%)		
APGAR score ≥ 7 at the 1^{rst} minute					
Yes	25(80.6)	45(72.6)	70(75.3)	1.57(0.55-4.50)	0.454
No	6(19.4)	17(27.4)	23(24.7)	0.63(0.22-1.81)	
APGAR score ≥ 7 at the 5th minute					
Yes	28(90.3)	59(95.2)	87(93.6)	0.47(0.09-2.50)	0.396
No	3(9.7)	3(4.8)	6(6.4)	2.10(0.40-11.10)	
APGAR score ≥ 7 at the 10th minute					
Oui	31(100.0)	60(96.8)	91(97.9)	-	0.55
Non	0(00.0)	2(3.2)	2(2.1)	-	

Table 6: Independants factors related to delivery of macrosomic fetus on scar uterus.

Variables	Rapport de cotes ajusté (I.C 95%)	Valeur P ajustée
PH of viganal delivery of macrosomic baby	20,48(1,81-231,57)	0,0147
PH of vaginal delivery before before cesarian section	5,07 (1,52-16,82)	0,0079
PH of vaginal delivery before after cesarian section	21,58(1,29-360,55)	0,0325
Previous cesarian section non indicated for cephalo-pelvic disproportion	17,69(2,26-138,53)	0,0071
Rupture of membranes occuring during labor	3,89 (1,40-10,83)	0,0091
Adequate pelvis	27,33 (3,10-31,97)	0,0018
No dynamic dystocia during labor	11,57(2,84-47,11)	0,0006
Cervix effacement > 75% on admission	10,58(2,69-41,51)	0,0007
Cervix dilatation > 7cm on admission	6,11(1,38-27,02)	0,016

Active phase of labor < 4 hours	27,59(8,60-88,52)	<0,001
Newborn height ≥ 53 cm	1,31(1,05-1,63)	0,0149

DISCUSSION

The appropriate mode of delivery of macrosomic fetus on scar uterus is still debated in modern obstetrics. Our study didn't find any sociodemographic factor related to the delivery of macrosomic fetus on scar uterus, probably due to selection bias. Landom et al in a cohort study assessing 1556 macrosomic newborn found that the age range increased the chances of vaginal delivery of macrosomic fetus on scar uterus and, according to Haumonté et al in a meta-analysis, when the mother was 40 years and above, this reduced the chances of vaginal delivery of macrosomic fetus after cesarian section [12,13].

What would be the appropriate route of delivery of macrosomic fetus in scar uterus? Some authors advocated the elective caesarian delivery. Some African studies found an increased risk of uterine rupture in case of fetal macrosomia on scarless uterus [14,15]. Lili Qiu et al in a meta-analysis including 676,532 cases of trial of labor after caesarean section of macrosomic fetus or not, found a higher risk of uterine rupture, neonatal asphyxia, and perinatal death compared with elective repeat cesarean section [16].

In front of those evidences, is the vaginal delivery of macrosomic fetus on scar uterus sealed? The answer may come from the very meta-analysis mentioned above. In that study, the frequency of uterine rupture was not 100%, revealing the action of other parameters to be identified [16].

There is indeed an increasing advocacy for the possibility of trial of scar even in case of confirmed fetal weight ≥ 40 00 g. Lopian et al recently found that women attempting Trial of Labor After Cesarian Section (TOLAC) with a macrosomic neonate were not at increased risk for failed TOLAC, operative vaginal delivery, uterine rupture, among others [17]. This was confirmed by other authors [18,19]

The vaginal route appears to have some ground but, as mentioned earlier some studies rather found some real risks related to vaginal delivery. What might therefore be the factors to rely on for safe vaginal delivery of macrosomic fetus on scar uterus?

This study found the following independents factors (Table 5: The presence of clinical findings of adequate pelvis, coupled with pelvic gift thanks to prior vaginal delivery, increased the chances of vaginal route. This study found that past-history of vaginal delivery of a macrosomia baby (OR=20.48; p=0.014), past-history of vaginal delivery before and/or after caesarean section (OR=5.07 and OR=21.58 respectively; p<0.05), and caesarean section not indicated for cephalopelvic disproportion (OR=17.69; p<0.001), increased significantly the chance of vaginal delivery of macrosomic fetus on single post caesarian scar, so were gestity/parity ≥ 2 and (p=0.011 and 0.033 respectively; Table 1 and 2), Weinstein et al, assessing the predictive factors for vaginal birth after caesarian section including 471 women, 9.7% of them with macrosomic newborn also found that, past history of vaginal delivery before or after cesarian section significantly predicted subsequent safe vaginal delivery [20]. This was confirmed by Srinivas et al analysing 13706 deliveries on scar uterus, including 3444 macrosomic newborn. They found that safe vaginal delivery before or after the uterine scar reduced the risk of subsequent cesarian delivery (OR=0,21(0,12-0,24) [21]. Many other authors confirmed that, and, in the study of Landon et al which included more than 14500 women who underwent trial of labor after cesarian delivery, the absence of this past history reduced the chances of vaginal route [22-24].

Admission at advanced stage of labor might be another decision-making factor. Our study found that, being admitted with ruptured membrane in active phase of labor (OR=3.89; p=0.009), cervix effacement ≥ 75% on admission (OR=10.58; p<0.001), or more than 7cm dilated on admission (OR=6.11; p=0.016) absence of dynamic dystocia during labor (OR=11.57; p<0.001) and labor duration less than 4 hours (OR=27.59; p<0.001), signs of advanced stage of labor without materno-fetal complications significantly increased the chances of vaginal delivery of macrosomic fetus on scar uterus (Table 3). This study is not the first to observe that.

Landon et al assessing 14529 trial of scar including 1556 deliveries of macrosomic newborn, also found like us that cervical dilatation >7 cm on admission increased the chances of successful vaginal route [24]. Advanced cervical opening, effacement among others were also factors associated with successful vaginal birth according to Senturk MB [11]. Flamm et al even considered that a 25% cervical effacement was enough to let labor unfold on scar uterus [9]. Rosli et al even concluded in Malaysia that active phase of labour at 6 cm cervical dilatation is associated with reduced primary caesarean delivery rate [25]. This was also confirmed in Africa [26]. Therefore, labor should probably be allowed to continue when scar uterus mothers with macrosomic fetus are admitted at clinically uneventful advanced stage of labor, as this study also found no difference in the newborn outcome (Table 5).

Fetal morphology might also be a decision-making parameter. This study found that macrosomic newborn weight was not statistically related to the mode of delivery of macrosomic fetus after cesarian section but a new one, the macrosomic Fetus Height (FH) seemed more discriminant. FH ≥ 53 cm at birth increased the chance of safe vaginal delivery of macrosomic newborn (p=0.014) (Table 4).

In a previous prospective data collection study including 77 macrosomic newborn we conducted, the newborn weight was also not significantly related to the mode of delivery, but a then pioneer finding revealed a new anthropometric parameter the newborn height. We then found that when newborn height was <53 cm, 50% were born by cesarian section indicated for mechanic dystocia, but when it was ≥ 53 cm, 92% were safely born vaginally and this was highly significant, moreover, among the eight newborn weighting more than 4500 g, only the four with a height ≥ 53 cm was safely born vaginally [7]. The hypothesis we gave then still stands for us. We hypothesized that a longer macrosomic fetus has probably a longitudinal distribution of his weight than shorter ones, the result being relatively smaller transversal diameters (bi acromial biparietal...) and therefore, lower risk of mechanical dystocia. This is the first time that the relationship between delivery of macrosomic fetus on scar uterus and macrosomic newborn height is raised. Macrosomic fetus morphology is probably more important than its mere weight as long as the mode of delivery is concerned (Table 6).

CONCLUSION

Safe vaginal delivery of macrosomic fetus on post cesarian single uterine scar is possible. No sociodemographic factor might probably guide us in the decision-making process but in case of clinical proof of adequate pelvis, spontaneous onset of labor and mothers admitted on advanced stage of eutocic labor, labor should be allowed to proceed. Macrosomic newborn height is a new promising determinant. If confirmed by other studies, its prediction might be the next challenge.

AUTHOR CONTRIBUTIONS

MVE KOH Valère and MBOMBO Moctar wrote the article. METOGO Junie, ESSOME Henri and ENGBANG Jean Paul reviewed the article.

FUNDING

None

CONFLICT OF INTEREST

None declared

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