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Research Article

RISK FACTORS SURVEY OF PEJORATIVE EVOLUTION OF DELIVERY LABOR IN A CONGOLESE RURAL HOSPITAL

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A R T I C L E   I N F O

A B S T R A C T

Introduction: Caesarean sections done in emergency situation are an important source of maternal and perinatal morbidity and mortality in Africa. Our aim is to identify risk factors for Caesarean section in primiparous patients at the Oïcha General Referral Hospital in the Democratic Republic of the Congo.

Materials and methods: This was a case-control documentary study conducted from April 1 to September 30, 2012 on a sample of 686 primiparous. Inclusion criteria: admission at the start of labor with term pregnancy, single fetus in top cephalic presentation, fetal heart sound in standards, followed by partogram.

Variables explained: caesarean section, low Apgar score, drawling work; Explanatory variables: age, height, body mass index at the beginning of pregnancy, angle adjacent to the hypotenuse calculated at the end of the period of cervical dilatation.

Description of the variables: calculation of the frequency, percentage, averages and their standard deviations. Association between explained and explanatory variables: tested in bi-varied analysis by the Pearson chi-square (p <0.05 at the 95% threshold); Strength of association by multivariate analysis of significant predictive factors (p <0.05) with conditional logistic regression.

Conclusion: The angle adjacent to the hypotenuse is a critical risk factor for Caesarean section, low Apgar score and work dragging when it remains below 45°. Find to it a corrective factor at this stage of labor could improve maternal and neonatal prognosis.

INTRODUCTION

At the primiparous, the main indications of the caesarean section under delivery labor (outside of pathologies) are the mechanical and dynamic dystocia, serious anomalies of the fetal cardiac rhythm, and a non-engagement of the presentation to advanced or complete dilation [1, 2, 3].

The results of the WHO world investigation [3] on the surveillance of the maternal and perinatal health show that the increase of the rates of caesareans section is associated to a high risk of antibiotherapy use after the childbirth as well as maternal stern morbidity and mortality. It is also associated to an increased rate of fetal death and the number of newborns admitted in intensive care units in relation to the newborn by eutocic mode [4, 5]. The precarious conditions of realizations of caesareans sections, in Africa, make thisintervention of high risk [4] and the relative data to the assessment of the maternal and neonatal prognosis that ensue from them are not sufficiently informative [5].

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At the General Referral Hospital of Oïcha (GRHO) where we led this research, the rates of caesareans (26.1%) and low scores of Apgar (13.6%) remain high in spite of the correct application of the partogramme of the WHO consecutive to the formation of the health care provider [6].

Hence, our objective was to identify the risk factors of the caesarean and low scores of Apgar at the 5th minute at the primiparousat the GRHO.

MATERIAL AND METHODS

This was a documentary case-control survey which was carried out at GRHO from April 1st to September 30, 2012 on a sample of 686 primiparous drawn in a population of 2136 parturient.

Our patients were distributed in two groups: the cases and the controls responding to the following inclusion criteria: being admitted at the beginning of delivery labor with a mono fetal pregnancy in term, cephalic presentation of summit, fetal heart rate in the norms, intact membranes, without cervix anomalies, and follow up on partograph. Each "case" possessing characteristic of the explained variable, was compared to a "control" group.

The dependent variables explained studied were

- The caesarean section: we had considered like "case", all parturient responding to the inclusion criteriaand having undergone a caesarean section;
- The weak score of Apgar: quotation lower to 7, at the 5th minute.
- The trailing delivery labor: the one whichthe duration was superior to 10 hours from the fast dilation phase [7].

Therefore, for every case of caesarean section (n = 179), we kept 2 controls (n = 358) having given birth by eutocic mode and who followed the case directly. For the cases of trailing dilation (n = 191), we had included 2 controls with of normal duration (n = 382) according to the case of trailing dilation. For every case of weak score of Apgar (n = 93), we kept 2 controls (n = 186) having had a good Apgar score after the case of weak score of Apgar. Finally, for every case of adjacent angle to the resulting hypotenuse of the vector of cervix dilation and the one of the duration of the time in hours <45° (n = 314), was kept a control (n = 314) with angle> 45° that followed the case directly.

The retained explanatory variables were: age, the size and the maternal weight at the beginning of pregnancy, but also the adjacent angle to the hypotenuse calculated at the end of the phase of latency of cervix dilation (dilation at 4cm or 8 hours after the beginning of delivery labor).

In relation with the maternal age, we had categorized our patients in 3 different age groups, expressed in years: 17 years, age of 18 to 25 years and age 26 years. The age group of 18 to 25ans was considered like slice of reference to least obstetric risk. According to their size, returned in centimeters, our parturient was distributed in 2 groups: those whose size was lower than 150 cm and those whose size was 150 cm. This last category had been taken like category of reference. According to their weight, our parturient had been classified in two groups depending on whether their weight, expressed in kilograms, in the beginning of pregnancy was <50 kg or then >50 kg. The class whose weight was superior to 50 kg had served us like class control. For the body mass index (BMI) expressed in kg/m^2, we had kept 3 groups: those with a BMI<18.5 kg/m^2, those whomBMI varied between 18.5 and 29.9 kg/m^2 and those whomBMI was 30 kg/m^2. The first and the third group were compared to the second group, it means the one whose IMC varied between 18.5 and 29.9 kg/m^2 and that had served us as value marks. The mean velocity of cervix dilation at the active phase of delivery labor was determined while calculating the total duration of the delivery laborfrom 4 cm of dilation until the moment of the childbirth by eutocic mode or by caesarean section. The parturient was classified in two groups: those with a velocity<1 cm/h and those with a velocity 1 cm/h. This last category had served us like witness.

The external pelvimetry, notably the diameter of Baudelocque and the bi-ischiatic diameter were taken. For the Baudelocque: the parturient was distributed in 2 groups depending on whether the Baudelocque was normal (20cm) or limit (19cm). In relation with the bi-ischiatic diameter: we had distinguished those withlimits diameter (8cm) and those with normal diameter (9-10cm). The parturient withlimits diameters was compared to those whose diameters were normal.

The adjacent angle to the hypotenuse, calculated at the end of the phase of latency of cervix dilation (dilation at 4cm or 8 hours after the beginning of delivery labor) was formed by the vector time (abscissa) and the equipollent of the vector dilation (ordinate). We had considered like hypotenuse, the resultant formed by the axis or vector of degree of dilation in ordinate, with the axis or vector of time in abscissa. The calculation of the angle made itself with the help of the reporter.

For describing the qualitative variables, we had calculated the frequency and the percentage, and for the quantitative variables, we had determined the means and their standards deviations.

The associations between the different explained and explanatory variables had been studied and tested in bivariedanalysis, with the help of the chi square of Pearson (*P*-value) or the test of Fischer. We had considered that the difference was significant when *P*<0.05 at 95%.

To measure the strength of association between the presence of a predictive factor and the intervening of an event, we had achieved amulti varied analysis of the significant predictive factors (*P*<0.05) with conditional logistical regression. The Odds ratio (OR) and their intervals of confidence (IC) at 95% were used to value the strength of the association for every parameter with a treshold of significance to P <0.05 or exact Fischer <0.05. We had concluded that there was association when OR> 1, and that the factor was independent if the boundary-marks of the IC were also >1.

RESULTS

Risk factors of the caesarean section

The multi varied analysis, with conditional logistical regression, had allowed controlling the significant predictive factors (*P*<0.05) and to keep, as independent factors of the caesarean: the adjacent angle to the hypotenuse inferior to 45° at the end of the phase of latency, the BMI 30 kg/m^2, the size <150 cm, age 26 years and the trailing delivery labor.

Table 1 Risk Factors of the Caesarean

Risk factors	*P*-value	OR (IC at 95%)
Age 26 years	0.0008	2.2945 (1.4014-3.7566)
Single	0.0000	0.1124(0.0691-0.1828)
Size <150 cm	0.0010	1.9774 (1.3087-2.9879)
BMI 30Kg/m²	0.0015	1.9044 (1.2752-2.8439)
Baudelocque limit	0.0000	0.3293 (0.2267-0.4783)
Bi-ischiatic limit (8cm)	0.0000	0.4215(0.2858-0.6217)
Angle <45°	0.0000	5.1600(3.4576-7.7005)
Dilatation velocity <1cm/H	0.0000	0.3723(0.2516-0.5511)
Prolonged delivery labor	0.0002	2.2431(1.4520-3.4650)

Risk factors of low score Apgar

The multi varied analysis by conditional logistical regression of the significant predictive factors of low scores of Apgar (*P*<0.05), did have shown that only the angle lower to 45°, the caesarean, the BMI 30kg/m², the prolonged delivery labor was independent of low score of Apgar at the 5th minute (Table 2).

Table 2 Risk factors of low score of APGAR

Risk factors	*P*-value	OR (IC at95%)
Angle < 45°	0.0000	4.1739 (2.4301-7.1691)
BMI 30kg/m²	0.0000	3.2449 (1.8404-5.7213)
Mean dilatation velocity <1cm/H	0.0649	0.6189 (0.3712-1.0319)
Trailing delivery labor	0.0000	11.2186 (6.0669-20.7450)
Caesarean	0.0001	2.9413 (1.6584-5.2164)

Risk factors of trailing delivery labor

The factors of risk kept for the prolonged delivery labor were: the angle <45°, age 26 years, and the size <150 cm, the weight <50Kg and a mean dilation velocity of<1cm/hourat the phase of fast cervix dilation.

Table 3 Risk of trailing delivery labor

Risk factors	*P*-value	OR (IC at 95%)
Age 26 years	0.0000	2.6741 (1.7147- 4.1701)
Size <150 cm	0.0000	3.3481(2.1996- 5.0964)
Height< 50Kg	0.0000	2.7316(1.8023- 4.1401)
Angle <45°	0.0000	2.6419(1.8474- 3.7783)
Velocity of dilatation < 1cm/hour	0.0108	1.5811(1.1103-2.2516)

Adjacent angle to the hypotenuse and obstetric maternal and fetal prognosis

The opening degree of the adjacent angle to the hypotenuse at the end of the phase of latency was a risk factor determining the caesarean section, the low score of Apgar and prolonged delivery labor when this angle was lower than 45° (Table 4).

Table 4 Adjacent angle to the hypotenuse and maternal and fetal prognosis

Risks	*P*-value	OR (IC at 95%)
Velocity of dilatation <1cm/H	0.0000	3.1749(2.2904-4.4009)
Trailing delivery labor	0.0000	5.0334(3.3733-7.5106)
Caesarean	0.0000	5.0231(3.2612-7.7369)
Apgar< 7	0.0000	3.8228(2.4675-5.9225)

DISCUSSION

Risk factors of the caesarean sections

Adjacent angle to the hypotenuse and outcome of the childbirth

We had noted that parturient at whom the adjacent angle to the hypotenuse was <45° to the dilation of 4 cm were, significantlyenoughfor giving birth by caesarean section: 36.4% against 10.3% for those whose angle was 45°. This can be explained by the implications of this angle on the progress of delivery laboritself. Indeed, when the adjacent angle to the hypotenuse was lower to 45°, the mean velocity of dilation stayed lower than 1cm/hour with a consequence of a trailing delivery labor.

Other authors [8,9] had established an correlation between a trailing delivery labor and the tendency to the caesarean section. Chelmow*et al.* [10] had noted that the weak velocity of dilatation prolonging the phase of latency was associated to the dystocia more in the phase of fast dilation of the delivery labor.

Cheng *et al.* [11] had found a strong association between a prolonged latency phase and the intervening of the cesareans sections(OR=2.28) [1.92-2.72].

BMI of parturient before pregnancy and mode of childbirth

Parturient with a BMI 30 kg/m² was significantlyenough in the group of childbirth by caesarean section than the one by eutocic mode (38,6% vs. 26,4%).

Other authors have found also, through the world, a strong association between the BMI > 30kg/m²at the beginning of pregnancy and the raised rates of caesarean section at primiparouscompared to the group in normal BMI [12]. Dzakpasu*et al.* [13], in Canada, had found the relation between the overweight, the obesity and the caesarean section around 20.2%.

Berendzen*et al.* [14], comparing parturientof different BMI had reported the rates of caesareans section as follows in the different categories: 56.6% of caesareans section inthe cases of morbid obesity, 39.1% to 40.8% in case of overweight or simple obesity, 31.4% for a normal BMI and 26% in the case of BMI lower than 18kg/m².

Poobalan*et al.* [15], in a systematic review on the obesity as risk factor of caesarean at primiparous had noted an odds ratio of 1.64 in case of overweight's and 2.23 in case of obesity, compared to the primiparous in normal BMI.

Size of the parturient and mode of childbirth

Parturient with a size lower than 150cm were represented significantly more in the group of childbirth by caesarean section than in the one of childbirth by eutocic mode, either respectively 31.3% against 18.7%.

Diarra*et al.* [16], in Mali, had found that the size was a major factor in the anomaly of the cervical dynamics. 68.75% of their patientswho had a size lower than 150cm had presented a mechanical dystocia with repercussion on the cervical dynamics, what had indicated the caesarean section.

This difference of caesarean rate in relation to the one found by Diarra*et al.* [16], can be explained itself by the size of their sample that was relatively small, either 16 primiparous of size lower than 150cm.

MC Guinness *et al.* [17], had also noted, in New Zealand, that a small size was associated to a raised risk of caesarean section consecutive to a trailing delivery labor.

Age of the parturient and mode of childbirth

We had found that parturient of the age group 26 years had been significantlyenough to give birth by caesarean section (24.3%) than in eutocic mode (12.9%). A similar report had been made by Aghamohammadi*et al.* [18] in Iran. Tebeu*et al.* [19], in Yaoundé, had also noticed that the aged primiparouswas associated to a strong rate of caesarean section.

As Hand *et al.* [20] noticed, there is a correlation between the maternal age and the uterine dysfunction risk, and for that the rate of caesarean section increases significantly at primiparous from the age of 25 years and more.

Risk factors of low scores of Apgar

Score of Apgar and mode of childbirth

In our survey, the caesarean section was associated to a raised rate of newborns with weak score of Apgar at the 5th minute

(78.6%) against (55.4%) for those born by eutocic mode. In Rwanda, Batungwanayo*et al*. [21] had found 52% of low scores of Apgar at the pregnant women whose delivery labor had lasted 11 to 24hours against 1.23% at those of which the duration of delivery labor was lower than 10 hours.

In a survey achieved at 200 parturient distributed in three groups according to the boundary-marks of the partograph, Lakshmidevis*et al*. [22] had put in evidence a strong association between the mode of childbirth and the low scores of Apgar according to the boundary-marks of the partograph. Therefore, 33.3% of the newborn by caesarean section, between the line of alert and the one of action, had a score of Apgar lower than 6. The rate of low scores of Apgar was higher when the caesarean intervened beyond the line of action; it had concerned 97% of newborn.

It is true that in our survey, the caesarean section was often indicated late to respect the boundary-marks of the partograph of the WHO, notably in its line of action. Also the management of newborn between the birth and the 5th minute had not always been well followed, considering the number raised of the simultaneous births and the staff relatively reduced at the motherhood. The trailing delivery labor had also caused low scores of Apgar in our survey. It can be explained, as Fournié*et al.* had affirmed it [23], by the weariness of the reserve in oxygen of the inter-villousroom, also by the maternal overworking, that comes with the unrests of ventilation, ahypocapniaand a major respiratory alkalosis decreasing the placental debit, so acute fetalsuffering.

Score of Apgar and BMI

In our survey, newborns from mothers with aBMI   30 kg/m^2 weresignificantlyenough to have a weak score of Apgar, 57.1% against 26.8%.

Our results are comparable to those raised in literature: authors as Cheng *et al.* [11], Eliasdottir*et al.* [24], skull *et al.* [25], did also have found a strong association between the BMI   30 at the beginning of pregnancy, the raised rates of caesarean section and low scores of Apgar at primiparous compared to the group in normal BMI.

Score of Apgar and adjacent angle to the hypotenuse at dilation of 4 cm

We had noticed a frequency more increased of the lower scores of Apgar to 7 when the adjacent angle to the hypotenuse was <45°in 30.3% at the cases against 10.3% among the controls. The adjacent angle to the hypotenuse inferior to 45° means, on the clinical plan, that the mean velocity of dilation is slow, lower than 1 cm per hour. It is therefore predictive of a trailing delivery labor and hypoxia during delivery labor.

Allen *et al.* [26] had noticed also that the risk of perinatal morbidity, expressed by low scores of Apgar, was raised appreciably when the phase of active dilation of delivery labor was prolonged.

The hypoxia, during delivery labor, had been made responsible, by some authors [27], of neonatal depression; of number raised of neonataldeaths yearly [28] but also of the survivors who could develop neurological troubles as the cerebral motor infirmities, the mental delay, behavior troubles, blindness [10, 26, 28].

Ayangade [29] in Nigéria, had found a significant correlation between a trailing latency phase and a weak score of Apgar at to the 5th minute (*P*<0.05). Cheng [11], in California had found the same type of association also with a *P*-value of 0.02.

Batungwanayo*et al.* [21] in Rwanda had found that parturient of whom the duration of delivery labor was 11 to 24hours had given 52% of newborn with down score of Apgar against 1.23% when this duration was lower than 10 hours. In any case, in their survey, no one of women not having made more than 24hours of delivery labor had given some newborns with good score of Apgar. The rates found by Batungwanayo*et al.* [21] are probably different from ours because in their survey, they had integrated all parturient whatever is the degree of cervix dilation at the admission to the motherhood, whereas we had taken into account only those who had arrived in the beginning of the phase of latency.

CONCLUSION

The adjacent angle to the hypotenuse, calculated at the end of the phase of latency of the cervix, is a determiningrisk factor of the caesarean, low score of Apgar and trailing delivery labor when it stays lower than 45°. Finding to it a corrective factor to this stage of delivery labor could improve the maternal and neonatalprognosis.

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