

Prevalence of fetal tocotraumatism and associated factors in a reference maternity in the state of Ceará

Prevalência de tocotraumatismo fetal e fatores associados em uma maternidade de referência do estado do Ceará

Prevalencia de tocotraumatismo fetal y factores asociados en una maternidad de referencia en el estado de Ceará

RESUMO

Objetivo: identificar a prevalência de tocotraumatismo fetal e os fatores associados ocorridos em uma maternidade de referência do estado do Ceará. **Método:** Realizou-se um estudo do tipo retrospectivo, transversal e descritivo. Os dados foram coletados por meio de um instrumento. **Resultados:** A maioria 108 (63,1%) dos tocotraumatismos ocorreram em partos por via abdominal. Quanto ao gênero, 101 (59%) eram do sexo masculino. A grande maioria, 136 (79,5%) eram AIG (adequado para idade gestacional). Em relação ao tipo de trauma, a lesão de pele ocorreu em (83,6%) dos traumatismos registrados. Houve cinco (2,9%) fraturas de Clavícula, uma (0,5%) de fratura de úmero, uma (0,5%) lesão de plexo braquial do tipo paralisia de Erb-duchenne. Acerca do manejo a grande maioria (86,5%) dos recém-nascidos foram acompanhados em enfermaria. **Conclusão:** A realização desse estudo permitiu detectar que a prevalência de tocotraumatismo neonatal está associada diretamente ao parto abdominal.

DESCRIPTORIOS: Lesões do Nascimento; Vácuo-Extração; Fórceps Obstétrico.

ABSTRACT

Objective: to identify the prevalence of fetal tocotraumatism and the associated factors that occurred in a reference maternity hospital in the state of Ceará. **Method:** A retrospective, cross-sectional and descriptive study was carried out. Data were collected using an instrument. **Results:** Most 108 (63.1%) of tocotraumas occurred in deliveries via the abdominal route. Regarding gender, 101 (59%) were male. The vast majority, 136 (79.5%) were AGA (adequate for gestational age). Regarding the type of trauma, skin injury occurred in (83.6%) of the recorded traumas. There were five (2.9%) Clavicle fractures, one (0.5%) humerus fracture, one (0.5%) Erb-Duchenne palsy type brachial plexus injury. Regarding management, the vast majority (86.5%) of newborns were followed up in the ward. **Conclusion:** This study allowed us to detect that the prevalence of neonatal tocotraumatism is directly associated with abdominal delivery.

DESCRIPTORS: Birth Injuries; Vacuum-Extraction; Obstetric Forceps.

RESUMEN

Objetivo: identificar la prevalencia de tocotraumatismo fetal y los factores asociados que ocurrieron en una maternidad de referencia en el estado de Ceará. **Método:** Se realizó un estudio retrospectivo, transversal y descriptivo. Los datos fueron recolectados utilizando un instrumento. **Resultados:** La mayoría de los 108 (63,1%) de los tocotraumas ocurrieron en partos por vía abdominal. En cuanto al género, 101 (59%) eran hombres. La gran mayoría, 136 (79,5%) eran AGA (adecuados para la edad gestacional). En cuanto al tipo de traumatismo, la lesión cutánea ocurrió en (83,6%) de los traumatismos registrados. Hubo cinco (2,9%) fracturas de clavícula, una (0,5%) fractura de húmero, una (0,5%) lesión del plexo braquial tipo parálisis de Erb-Duchenne. En cuanto al manejo, la gran mayoría (86,5%) de los recién nacidos fueron seguidos en la sala. **Conclusión:** Este estudio permitió detectar que la prevalencia de tocotraumatismo neonatal está directamente asociada al parto abdominal

DESCRIPTORIOS: Lesiones de nacimiento; Extracción al vacío; Pinzas obstétricas.

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INTRODUCTION

Fetal tocotrauma is defined as structural damage or functional deterioration of a newborn secondary to a traumatic event that occurred during labor, delivery or both, and may range from minor soft tissue injuries to potentially life-threatening intracranial hemorrhages. Can be spontaneous, iatrogenic, preventable or unavoidable.¹

The mechanisms that can cause fetal trauma at birth are mechanical (compression and traction forces) or hypoxic-ischemic. The most important risk factors for birth trauma include: instrumental delivery (use of forceps and vacuum extractor), primiparity, cephalopelvic disproportion, birth weight greater than 4 kg or less than 2.5 kg, oligohydramnios, prolonged or unusually rapid labor, fetal malformations, abnormal presentations, breech presentation, and prematurity.²

The incidence of birth trauma is estimated at two to seven per 1,000 live births worldwide and the prevalence is

9.5 per 1,000 live births. They account for less than 2% of neonatal deaths. These injuries often occur during the second stage of labor, when the fetus moves down the birth canal.³

The occurrence of birth trauma has decreased over time due to improvements in obstetric care and prenatal diagnosis. However, it still occurs even in the presence of highly skilled obstetric and neonatal care.⁴

Delivery and birth care has been marked, worldwide, by the adoption of interventionist practices, with the use of medications, technological devices and other procedures to accelerate or control the parturition process. Considering that childbirth is a physiological event, this care model is characterized as technocratic and medicalized.⁵

Brazil has a technocratic obstetric model, centered on interventions and guided by technologies, evidenced by a scenario with high rates of cesarean sections and by professionals who reproduce the acquired experiences based, for the most part, on the mechanism of nor-

ms and routines.⁶

Conducting the research is justified by the scarcity of studies on the subject, as well as the need to monitor such data from the institution. Therefore, knowing the real prevalence rate of fetal tocotraumatism and the associated factors becomes relevant to promote, when possible, eventual corrections of management and conducts during the provision of assistance during labor and birth.

This study aimed to: Analyze the prevalence of fetal birth trauma that occurred in a reference maternity hospital in the state of Ceará.

METHOD

This is a retrospective, cross-sectional and descriptive study with a quantitative approach to the data obtained. The research was carried out from May to December 2021 at the reference Maternity Hospital in the state of Ceará, located in the city of Fortaleza-CE. All neonates born at the institution in 2020 who had some type of injury resulting from

labor or delivery were included in the research. As well as those who presented duplication of records, medical records not located, incomplete or insufficient documentary information to answer the research question and those wrongly registered as tocotraumatism were excluded.

In 2020, 221 cases of tocotraumatism were recorded in the monitoring/assessment forms of childbirth care. Thus, we chose to use census-type sampling, which consists of analyzing all elements of the population, in order to obtain more representative results for the studied population.

After applying the inclusion and exclusion criteria listed for the present study, the final sample of 171 medical records was reached, corresponding to a 3.32% prevalence rate of neonatal tocotrauma at the institution in 2020.

Data were collected from July to September 2021 from the records of the monitoring/assessment of labor and birth care and then in the medical records where they contained all the information necessary for the development of the research through an instrument composed of maternal variables, fetal injuries, and referring to the type of fetal injury, trauma site and treatments performed on the neonate.

Which contains the following variables: (1) maternal: age (years); parity (number of children born); fetal presentation (cephalic, pelvic and anomalous); mode of delivery (vaginal, vaginal with forceps, vaginal with vacuum, cesarean, cesarean with forceps); indication of cesarean delivery; gestational age; comorbidities (GDM - gestational diabetes mellitus, PE - preeclampsia, SAH - systemic arterial hypertension, obesity, hypothyroidism and others); (2) fetal: date of birth; weight (grams); gender (male and female); Apgar score of 1st, 5th and 10th minutes; fetal weight adequacy (adequate - AGA, small - SGA, and large for gestational age - LGA), (3) type of fetal injury (conjunctival hemorrhage, skin lesions, serosangui-

Brazil has a technocratic obstetric model, centered on interventions and guided by technologies, evidenced by a scenario with high rates of cesarean sections and by professionals who reproduce the acquired experiences based, for the most part, on the mechanism of norms and routines.

nous bump, clavicle fracture, humerus fracture, ecchymotic mask, facial palsy, cephalhematoma, others); (4) trauma site (head, scalp, face, clavicle, humerus, upper limbs, thorax, lower limbs, gluteus, eyes); (5) treatment of fetal injury (immobilization of the affected area, follow-up by stomatherapy, follow-up in wards and outpatient follow-up).

The data obtained in the study were analyzed using simple descriptive statistics, and the results were organized and arranged in tables and charts using the electronic data collection and management tool REDCap1 hosted at the Clinical Research Unit of the UFC University Hospitals Complex.

The association between categorical variables was performed using Pearson's nonparametric chi-square test. In all cases, a Confidence Interval (CI) of 95%, sampling error (e) of 5% and a significance level of $p \leq 0.05$ were adopted, the associations that obtained such p-value were considered statistically significant.

The study complied with the ethical principles of scientific research, ensuring data confidentiality and the absence of physical, financial or emotional harm, as recommended by the National Ethics and Research Commission.⁷ The project was submitted and approved by the Research Ethics Committee under opinion number 4,825,112, on June 22nd, 2021.

RESULTS

After applying the inclusion and exclusion criteria in the study population, it was found that, among the 221 medical records identified, six (2.71%) were not located, two (0.9%) were duplicated, three (1.73%) did not have a description of the lesion and 39 (17.65%) did not have tocotraumatism, configuring themselves in wrongly identified medical records. Thus, 50 (22.62%) medical records were excluded from the research, totaling a final sample of 171 neonates.

Table 1 shows the distribution of tocotraumas according to maternal va-

riables. Regarding the age group, the mean maternal age was 26.7 (SD = + 7.53) years, mainly in the range of (>16 <34). Regarding fetal presentation, the vast majority, 134 (78%) were cephalic. Regarding the mode of delivery, most 108 (63.1%) of tocotraumas occurred in deliveries via the abdominal route. Regarding gestational age, a slight majority 99 (58%) occurred in term deliveries (>37w < 41w 6d). With regard to maternal comorbidities, 81 (47%) of the women had no comorbidity.

Table 2 shows the prevalence of tocotraumas according to fetal variables. Regarding gender, 101 (59%) were male. Regarding fetal weight, the mean was 2.660 (SD=+1.065) kilograms, mainly between >2501<4000g. Regarding the adequacy of fetal weight, the vast majority, 136 (79.5%) were AGA (adequate for gestational age).

The categorization of the tocotraumas found in the present study is described in Table 3. Regarding the type of trauma, the skin lesion occurred in the vast majority (83.6%) of the recorded traumas. There were five (2.9%) Clavicle fractures, one (0.5%) humerus fracture, one (0.5%) Erb-Duchenne palsy type brachial plexus injury. Regarding the trauma site, head and face corresponded to 74 (43.2%) and 61 (35.6%) of the recorded injuries, respectively. Regarding the management of tocotraumatism, the vast majority (86.5%) of the newborns were followed up in the ward.

When associating the variables related to the type of trauma with the mode of delivery, it was noticed that there was a significant relationship between the mode of delivery and the following variables: Serosanguineous hump ($p < .001$), Clavicle Fracture ($p = 0.015$), Ecchymotic Mark ($p < .001$), Facial Palsy ($p < .001$), Cephalohematoma ($p = 0.001$). However, no relationship was found between the variables related to the type of trauma and the mode of delivery in the following variables: Humeral Fracture ($p = 0.419$), Conjunctival Hemorrhage ($p = 0.615$) and

Table 1- Prevalence of tocotraumatism according to maternal variables. Fortaleza, 2021.

Maternal Variables	N	%
Age Group		
<15	8	4,6%
>16 <34	131	76,6%
>34	32	18,8%
Fetal display		
Anomalous	3	2%
Cephalic	134	78%
Pelvic	34	20%
Delivery route		
Cesarean	59	34,5%
Cesarean + Forceps	49	28,6%
Vaginal	35	20,5%
Vaginal + Forceps	8	4,7%
Vaginal + Vacuum	20	11,7%
Gestational age		
< 37w	72	42%
>37w < 41w 6d	99	58%
Comorbidities		
GDM	40	23%
PE/SAH	62	36%
Obesity	9	5%
Hypothyroidism	6	4%
Absent	81	47%

GDM - gestational diabetes mellitus, PE - preeclampsia, SAH - systemic arterial hypertension.
Source: Prepared by the author

Table 2- Prevalence of tocotraumas according to fetal variables. Fortaleza, 2021.

Fetal Variables	N	%
Gender		
Female	70	41%
Male	101	59%
Weight		
< 1000g	29	16,9%
>1001 <1500g	13	7,6%
>1501 <2500g	21	12,3%
>2501 <4000g	108	63,2%
Weight Adequacy		
SGA	17	9,9%
AGS	136	79,5%
LGA	18	10,6%

AGA - adequate, SGA - small, and LGA - large for the gestational age
Source: Prepared by the author

Others** ($p = 0.228$).

No association was found between comorbidities and general tocotraumatism, but when skin lesions and comorbidities are associated alone, it was evidenced that (40%) is associated with SAH/PE ($p = 0.02$).

DISCUSSION

Chavkin shows in his study that the prevalence of tocotraumatism is directly associated with babies who are large for gestational age - LGA.⁸ Another study exhibited a 14-fold increased risk of adverse neonatal outcomes in LGA infants compared with appropriate-for-gestational-age-AGA infants, and increased exponentially with increasing body weight greater than 4000 g.⁹ Although such studies have shown a higher incidence of tocotrauma in macrosomic babies, the present study did not find any association between these variables. In contrast, a higher prevalence of tocotraumatism was found in babies with adequate weight for gestational age - AGA.

According to the cohort study carried out by Linder, which states that cesarean section is a protective factor for the incidence of tocotraumatism. In contrast, the present study showed that the highest occurrence (64%) of neonatal tocotraumas has occurred in abdominal deliveries, especially skin lesions.¹⁰

With regard to instrumental delivery, the present study found that the use of a vacuum extractor is associated with a higher incidence of serous hump (29.7%), Clavicle Fracture (60%), Cephalohematoma (50%). This partially corroborates the study by Mcquivev, which highlights the neonatal complications most frequently associated with vacuum delivery: serosanguineous bump, cephalohematoma, scalp edema and excoriations, and retinal hemorrhage.¹¹

This study is in line with what Ferraz states that the incidence of major neonatal complications was higher in the vacuum extractor group compared to

Table 3 - Categorization of the types of tocotraumas that occurred. Fortaleza, 2021.

Type	N	%
Skin lesion	143	83,6%
Serosanguineous hump	37	21,6%
Clavicle Fracture	5	2,9%
Humerus Fracture	1	0,5%
Ecchymotic Mark	5	2,9%
Facial Paralysis	1	0,5%
Cephalohematoma	10	5,8%
Conjunctival Hemorrhage	3	1,7%
Scalpel cut	2	1,1%
Erb-duchenne palsy	1	0,5%
Facial swelling	1	0,5%
Lower limb in abduction	1	0,5%
Trauma location		
Head	74	43,2%
Scalp	7	4%
Face	61	35,6%
Upper limbs	21	12,2%
Chest	20	11,6%
Lower limbs	32	18,7%
Gluteal	8	5%
Clavicle	5	4,6%
Humerus	1	0,5%
Eyes	5	2,9%
Management of tocotrauma		
Infirmity follow-up	148	86,5%
Immobilization of the affected area	6	3,6%
Stomatherapy follow-up	10	5,8%
Outpatient follow-up	7	4,1%

Source: Prepared by the author

the use of forceps.¹² In the present study, the use of vacuum extractor was associated with a higher prevalence of clavicle fracture. The use of forceps was mostly associated with skin lesions.

Regarding the prevalence of fracture, the clavicle is the most frequently fractured bone during the process of labor and delivery. This study identified an incidence of clavicle fracture of 2.9%, which

is similar to previous studies.^{13,14}

CONCLUSION

This study allowed us to detect that the prevalence of neonatal tocotraumatism is directly associated with abdominal delivery. Furthermore, it is emphasized that the skin lesion represented the most prevalent type of tocotraumatism

among those registered.

In conclusion, this study may serve as a subsidy for improving the qualification of maternal and neonatal care, reducing morbidity and hospitalization time of the neonate. In addition, it can also serve as a basis for the elaboration of Standard Operating Procedures (SOP's), institutional protocols, as well as conducting new research on the topic addressed, especially with regard to care for newborns during cesarean and instrumental delivery, in order to reduce, when possible, the injury rates.

It is also important to emphasize the need to continue monitoring relapses in order to create strategies that can reduce the prevalence of new cases.

Tabela 4 . Associação dos tipos de tocotraumatismos e via de parto. Fortaleza, 2021.

Type	Delivery route					p-value*
	Cesarean	Cesarean + Forceps	Vaginal	Vaginal + Forceps	Vaginal + Vacuum	
Skin lesion	52	48	23	8	12	<0,001
Serosanguineous hump	7	2	13	4	11	<0,001
Clavicle Fracture	1	0	1	0	3	0,015
Humerus Fracture	0	0	1	0	0	0,419
Ecchymotic Mark	0	0	5	0	0	<0,001
Facial Paralysis	0	0	0	1	0	<0,001
Cephalohematoma	2	0	3	0	5	0,001
Conjunctival Hemorrhage	1	2	0	0	0	0,615
Others**	3	0	1	1	0	0,228

*Chi-square test for independent variables.
 ** Scalpel Cut, Erb-Duchenne Palsy, Facial Edema, LL in abduction.
 Source: Prepared by the author

REFERENCES

- Akangire G Carter Brian. Birth Injuries in Neonates. *Pediatr Rev* [Internet]. 2016 [cited 2021 Nov 20]; DOI 10.1542/pir.2015-0125. Available from: <https://pubmed.ncbi.nlm.nih.gov/27803142/>.
- Robert MK. Feto e a lesão do parto neonatal. texto de pediatria de Nelson. Filadélfia: [publisher unknown]; 1998. 561-566 p. 15 vol.
- Leung WC, Chan BC, Ma G, Lam KW, Leung KY, Pun TC, Lao TT, Lee CP. Continued reduction in the incidence of birth trauma and birth asphyxia related to instrumental deliveries after the study period: was this the Hawthorne effect?. *Eur J Obstet Gynecol Reprod Biol* [Internet]. 2006 Mar 29 [cited 2021 Nov 20]; DOI 10.1016/j.ejogrb.2006.02.013. Available from: <https://pubmed.ncbi.nlm.nih.gov/16567034/>.
- PARKER LA. PART 1. *Advances in Neonatal Care* [Internet]. Dez 2005 [citado 23 fev 2022];5(6):288-97. Disponível em: <https://doi.org/10.1016/j.adnc.2005.09.001>
- Vargens OM, Silva AC, Progiante JM. The contribution of nurse midwives to consolidating humanized childbirth in maternity hospitals in Rio de Janeiro-Brazil. *Escola Anna Nery - Revista de Enfermagem* [Internet]. 2017 [citado 23 fev 2022];21(1). Disponível em: <https://doi.org/10.5935/1414-8145.20170015>
- Mendes YM, Rattner D. Structure and practices in hospitals of the Apice ON Project: a baseline study. *Revista de Saúde Pública* [Internet]. 6 fev 2020 [citado 24 fev 2022];54:23. Disponível em: <https://doi.org/10.11606/s1518-8787.2020054001497>
- Norma Operacional nº 001/2013. Diário Oficial da União. Dispõe sobre a organização e funcionamento do Sistema CEP/CONEP, e sobre os procedimentos para submissão, avaliação e acompanhamento da pesquisa e de desenvolvimento envolvendo seres humanos no Brasil. 2013.
- Chavkin Uri, Wainstock Tamar, Sheiner Eyal. Perinatal outcome of pregnancies complicated with extreme birth weights at term. *J Matern Fetal Neonatal Med*. *Pediatr Rev* [Internet]. 2019 [cited 2021 Nov 20]; DOI 10.1080/14767058.2017.1376048. Available from: <https://pubmed.ncbi.nlm.nih.gov/28866958/>.
- Beta J . Maternal and neonatal complications of fetal macrosomia: cohort study. *Ultrasound Obstet Gynecol* [Internet]. 2019, [cited 2021 Nov 20]; DOI 10.1002/uog.20278. Available from: <https://pubmed.ncbi.nlm.nih.gov/30938000/>.
- Linder N. Birth trauma--risk factors and short-term neonatal outcome. *J Matern Fetal Neonatal Med* [Internet]. 2013 Oct 26 [cited 2021 Nov 20];15 DOI 10.3109/14767058.2013.789850. Available from: <https://pubmed.ncbi.nlm.nih.gov/23560503/>.
- Mcquivey RW. Vacuum-assisted delivery: a review. *J Matern Fetal Neonatal Med* [Internet]. 2004 Sep 16 [cited 2021 Nov 20]; DOI 10.1080/1476-7050400001706. Available from: <https://pubmed.ncbi.nlm.nih.gov/15590444>
- Ferraz A. Complicaciones neonatales a corto plazo de los partos por ventosa. Estudio caso-control. *Anales de Pediatría* [Internet]. 2019 Apr 22 [cited 2021 Nov 20];91 DOI 10.1016/j.anpedi.2018.11.016. Available from: <https://www.sciencedirect.com/science/article/pii/S1695403319300773?via%3Dihub>
- Lurie S. Risk factors for fractured clavicle in the newborn. *J Obstet Gynaecol Res*, [Internet]. 2011 [cited 2021 Nov 20]; DOI 10.1111/j.1447-0756.2011.01576.x. Available from: <https://pubmed.ncbi.nlm.nih.gov/21790882/>.
- T Ozdener, Engin-Ustun Y, Aktulay A. . Clavicular fracture: its incidence and predisposing factors in term uncomplicated pregnancy. *Eur Rev Med Pharmacol Sci* [Internet]. 2013 [cited 2021 Nov 26]; Available from: <https://pubmed.ncbi.nlm.nih.gov/23690199>