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YENİDOĞULMUŞUN İNTRANATAL TRAVMALARI: NAZOLOJİ STRUKTURU VƏ RİSK FAKTORLARI

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Təxirəsalınmaz tibbi yardım və fəlakətlər təbabəti kafedrası, Sumı, Ukrayna

Xülasə. Məqalədə intranatal travmatik zədələnmələrin nozoloji strukturunun və onların əmələ gəlməsində iştirak edən risk faktorlarının öyrənilməsinə dair tədqiqatın nəticələri təqdim edilmişdir. Bundan ötrü 456 intranatal travma hadisəsinin retrospektiv analizi aparılmışdır.

Əldə edilmiş dəlillər guman etməyə əsas verir ki, onurğanın boyun hissəsinin intranatal zədələnmələri üzrə hipodiyagnostika halı vardır. Bu, ənənəvi instrumental diaqnostika metodlarının informativliyinin zəif olması, onurğanın boyun hissəsinin bətdaxili inkişaf dövründə anatomik cəhətdən tam yetkinləşməməsi və mamalıq travmaları haqqında hesabatın açıqlanmasının arzu edilən olmaması ilə izah edilə bilər. Müəlliflərin fikrincə, onurğanın boyun şöbəsinin travmalarının diaqnostika üsullarının təkmilləşdirilməsinin perspektivi böyükdür.

Doğuş travmalarının ümumi hədəflərinin qiymətləndirilməsi onların yaranma tezliyinin və ağırlığının azaldılması yönündə prenatal və perinatal yardımın keyfiyyətini yüksəldə bilər. Buna görə doğuş travmalarının profilaktika və müalicə strategiyasının müəyyənləşdirilməsi üçün bu patologiyanın daha geniş miqyasda tədqiqinə ehtiyac vardır.

Açar sözlər: yenidoğulmuş, doğuş travması, nozoloji struktur, risk faktorları

Key words: newborn, birth trauma, prevalence, nosological structure, risk factors

Ключевые слова: новорожденный, натальная травма, распространенность, нозологическая структура, факторы риска

BIRTH TRAUMA OF THE NEWBORN: NOSOLOGICAL STRUCTURE AND RISK FACTORS

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The article presents the results of studying the nosological structure of intrapartum traumatic injuries and risk factors for their occurrence. A retrospective analysis of 456 cases of natal trauma was carried out.

The data obtained suggest that hypodiagnosis of intrapartum injuries of the cervical spine occurs due to insufficient informativeness or inaccessibility of traditional methods of instrumental examination available in the arsenal, anatomical immaturity of the cervical structures, and reluctance to report obstetric trauma. Studies devoted to improving the diagnosis of obstetric trauma of the cervical spine appear promising.

Assessment of common triggers of birth trauma is a key component in providing high quality prenatal and perinatal care to reduce the incidence and severity of birth trauma.

Larger multicentre studies of birth trauma are necessary in the future to identify prevention and treatment strategies.

Perinatal morbidity and mortality is one of the basic demographic indicators, a sensitive indicator of the socio-economic well-being of the country, the health of the population, the level and quality of medical care, and the

effectiveness of obstetric and paediatric services.

Birth traumatism occupies a special place in the structure of perinatal morbidity and mortality. In the ICD 10 revision, birth traumatic

injuries occupy a significant share (headings P10-P15).

A distinction should be made between “birth trauma” and “birth injuries”.

Birth injuries are defined as structural or functional disorders that occur in the newborn's body due to an adverse event that occurred at birth. Birth injuries can occur during labour, before birth or after birth (hypoxic, infectious, toxic, etc.).

Birth trauma is damage to tissues and organs of the child caused by excessive mechanical impact during labour, and a holistic response to these injuries on the part of the organism, accompanied by a violation of compensatory and adaptive mechanisms [1, 2].

Birth trauma can be combined with other perinatal pathologies, including perinatal posthypoxic lesions of the central nervous system, worsening the prognosis and leading to the development of a syndrome of mutual aggravation.

In our study, we focus on the study of the peculiarities of exclusive birth trauma.

Several authors point to the paucity of population-based studies and a number of inconsistencies between published rates of birth trauma and conclude that the level of birth trauma remains unclear. Analysing 3,920,787 hospital deliveries they found that birth trauma occurs in 29 cases of 1000 births [3].

The authors of some scientific publications claim that in recent decades there has been a decrease in the incidence of birth trauma by 1.9-2.6 times, which is explained primarily by an increase in the frequency of abdominal delivery, improved quality of perinatal monitoring and diagnosis [4-6].

At the same time, Ruby Gupta and Erwin Cabacungan, using the Nationwide Inpatient Sample for 2006-2014 (This cross-sectional study of in-hospital births used the Nationwide Inpatient Sample for 2006-2014) and analysing 982,033 cases of birth trauma, concluded that the prevalence rate increased by 23% (from 25.3 to 31.1 per 1,000 hospital births) [7].

Researchers from Ukraine note that the epidemiology of birth trauma is poorly understood, as it depends significantly on diagnostic approaches, examination capabilities, and obstetrician skill, and indicate that, on average, about 2% of children suffer some form of traumatic

injury during labour [8-11].

Information on the nosological characteristics of birth trauma is also quite contradictory. The authors of some scientific publications name the main nosological types of birth trauma as obstetric brachial plexus paresis (70.6%), clavicle fracture (22.5%) and humerus fracture (4.80%) [12-14].

According to other data, 85.5% of all birth traumas are injury to the cervical spine and spinal cord [15].

The risk factors for birth trauma can be conventionally grouped into fetal, pregnancy, maternal, or iatrogenic factors (use of instruments during labour) [16, 17].

Fetal and pregnancy-related factors include: macrosomia (estimated fetal weight greater than 4000 g), macrocephaly, low birth weight and extreme prematurity, congenital fetal anomalies, oligohydramnios and malposition, prolonged or rapid labour.

Maternal risk factors may include: maternal obesity, maternal diabetes, defalcotic disproportion, short maternal stature, primiparity, bad habits.

Iatrogenic factors are the use of vacuum or forceps, difficult extraction and others [18].

During the labour process, the fetus is subjected to a complex of forces, which can be divided into: uterine driving forces directed by the birth canal; forces preventing the fetus from travelling through the birth canal, which are mainly directed at the baby's head and, consequently, at the cervical segment; and forces reducing the resistance of the birth canal, due to which the fetus makes a rotational movement along its longitudinal axis during labour [19].

Three types of birth trauma are distinguished:

1. Traction mechanism of injuries. This injury occurs when a large foetus is pulled by the head with fixed shoulders or when the foetus is pulled by the pelvic end with a fixed head.

2. Flexion-compression mechanism of trauma. These injuries are more likely to occur in rapid and fast labour, especially with a large foetus, when the baby's head encounters a significant resistance of the perineum on its way when performing obstetric protection techniques for the perineum of the woman in labour.

3. Rotational mechanism of trauma. This

type of injury occurs during manual obstetric care or with obstetric forceps during rotational movements of the baby's head [10].

Birth traumas of newborns can have a serious impact on the further physical health and intellectual development of the child [20-23]. All this makes birth traumatism one of the urgent problems of obstetrics and gynaecology, neonatology and paediatrics, paediatric neurology and traumatology.

Despite the exceptional relevance of the problem, a number of issues remain unexplored. Clinical-nosological and clinical-epidemiological characteristics of this pathology need to be studied and systematised. It is necessary to create an effective system of prevention of intrapartum injuries.

Objective of the study: to assess the prevalence, nosological structure and risk factors of natal injuries among newborns in Sumy region, Ukraine.

Material and methods of research. During the analytical literature review, a search for scientific publications on Medline and PubMed servers was performed using the following keywords: "newborn", "natal trauma", "nosological structure", "risk factors". As a result, 116 full-text articles were identified in the databases, of which 18 scientific papers meeting the

inclusion criteria were selected for further analysis.

The study was conducted in compliance with the moral and ethical standards and principles of the Helsinki Declaration, the Council of Europe Convention and relevant laws of Ukraine on the observance of human rights.

The obtained data were processed on a personal computer using the statistical program IBM SPSS Statistics subscription trial for Microsoft Windows 64-bit from 18.09.2023. The nature of distribution of the obtained characteristics was evaluated by the Kolmogorov-Smirnov criterion. Assessment of the statistical significance of quantitative results was carried out taking into account the Student's t-criterion significance value, and qualitative characteristics using chi-square test. The differences were considered statistically significant at $p < 0.05$.

Results and discussion. When analysing the demographic and social characteristics of the total study population, a sharp decrease in the number of births (from 11093 in 2012 to 5484 in 2021) draws attention [24]. One of the main reasons is the decrease in the number of permanent population living in the Sumy region (from 1152.3 thousand in 2012 to 1051.3 in 2021). The results are presented in Figure 1.

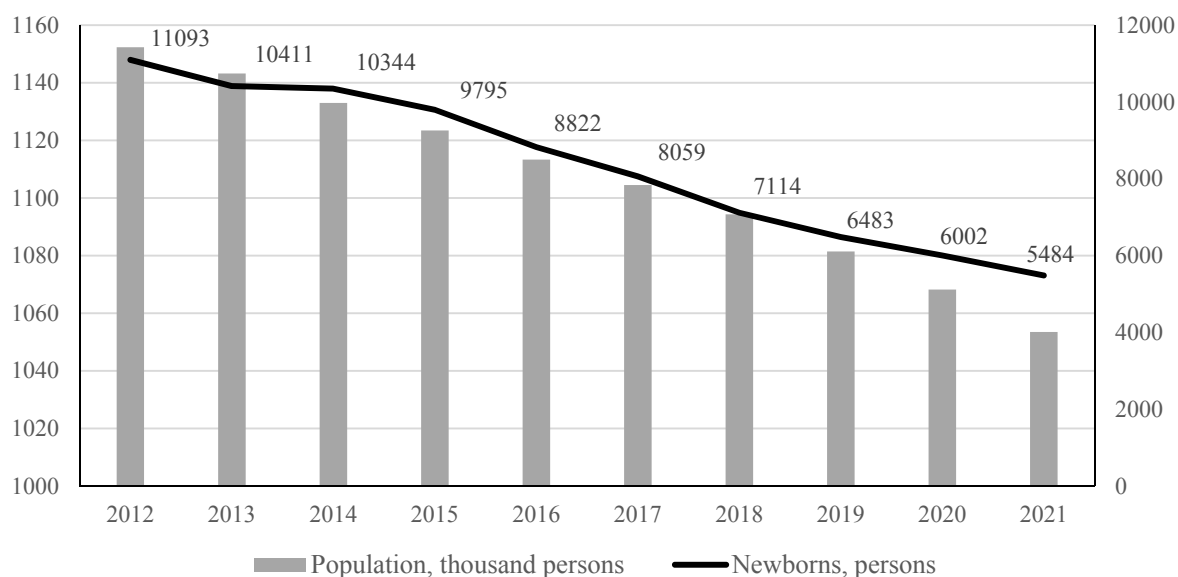


Figure 1. Dynamic ratio of population to the number of newborns in Sumy, Ukraine.

The diagram shows that the number of population decreased by 9.12% and the number of births by 49.43%. The deterioration of the quality of life and the state of reproductive health of the population are not insignificant factors in the decline of the birth rate.

Women giving birth were aged 14 to 40 years, with an average age of (27.8 ± 0.35) years. The mean age of women in the comparison group was (27.3 ± 0.67) years ($p \geq 0.05$). Of these, 65.4% were first-time mothers in the main study group and 51.1% in the control group.

Concomitant somatic pathology was found in 87.2% of women in the main group and 86.7% of women in the control group. According to the data obtained, cardiovascular, endocrine and genitourinary diseases were the most frequent in both the main and control groups.

The number of pregnant women with HIV status ranged from (0.38 to 0.90 per 100 pregnancies).

It should be noted that the proportion of children born to women who are not in a registered marriage ranges from 25.4% in 2012 to 24.3% in 2021.

The proportion of out-of-hospital births ranges from 0.01 to 0.11 per 100 births.

The study found that the mean gestational age of the examined newborns with intrapartum trauma was (39.2 ± 0.12) weeks (in the control

group – (38.6 ± 0.21) ($p < 0.01$).

The mean birth weight of babies in the main study group was (3474.7 ± 43.7) g, of whom 3.6% were born with hypotrophy (less than 2,500 g) and 26.6% with macrosomia (more than 4,000 g). The mean weight of control group neonates was (3346.1 ± 57.9) g ($p \geq 0.05$), of which 11.1% were born with macrosomia.

Duration of labour in the main and control groups of the research is presented in Table 1.

It was found that 7.24% of women in the main study group had prolonged labour (more than 18 hours or more than 12 hours for repeat births), while no prolonged labour was recorded in women in the control group.

In order to further identify and systematise possible risk factors for intrapartum traumatization of the newborn, we studied the frequency of obstetric care and complications that occurred during delivery. The results are presented in Table 1.

The data show that in the main group, fetal vacuum extraction was performed in 2.85% of cases and medical stimulation of labour (7.24%). The rate of abdominal delivery remains consistently high: 26.53% in the main study group and 20.0% in the control group.

It is noteworthy that 12.72% of women in the main study group had premature amniotic fluid discharge, while in the control group there were only 2% of such cases.

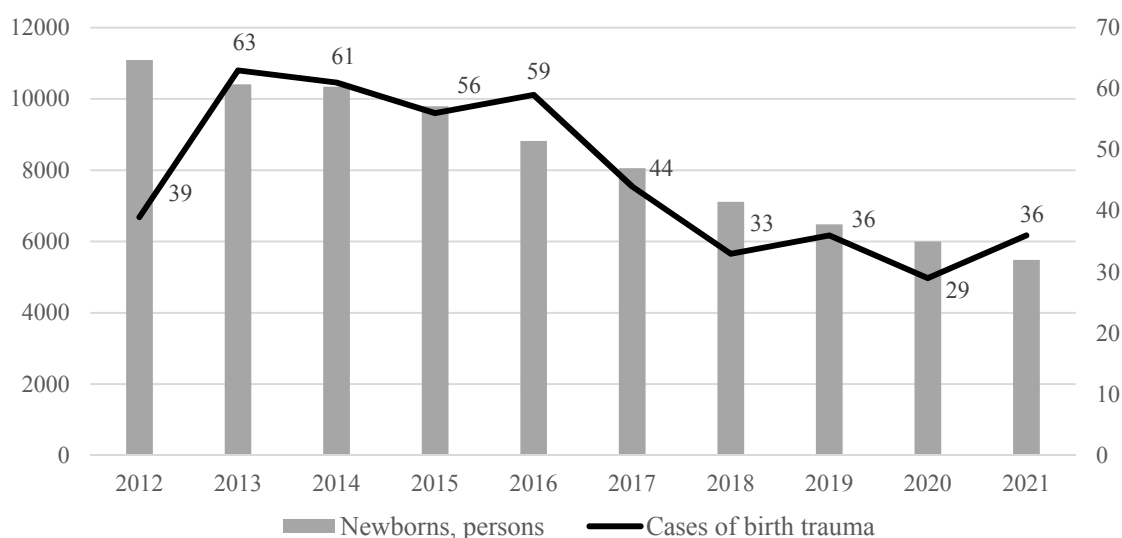


Figure 2. Frequency of birth trauma

Table 1. Duration of labour. Use of obstetric care. Complications during labour

Indication	Women in labour of the main study group (n=456)			Women in labour control group of the study (n=100)		
	n	%	Ri*	n	%	Ri*
Duration of labour						
Rapid (less than 4 hours or less than 3 hours for repeat births)	8	1.75	4	–	–	–
Fast (4-6 hours or 3-5 hours for repeat births)	50	10.97	2	3	3.0	2
Normal (6-18 hours or 5-12 hours for repeat births)	365	80.04	1	97	97.0	1
Prolonged labour (more than 18 hours or more than 12 hours for repeat births)	33	7.24	3	–	–	–
Total	456	100		100	100	
Chi-square test, $p < 0,001$						
Types of obstetric care						
Cesarean section	121	26.53	4	20	20.0	2
Applying the forceps	8	1.75	5	–	–	–
Vacuum extraction	13	2.85	2	1	1.0	3
External rotation of the fetus in the breech position	3	0.66				
Providing manual assistance according to Tsovyanov in case of breech presentation of the fetus	3	0.66				
Medicinal stimulation of labour activity	33	7.24	2	–	–	–
Episiotomy	25	5.48	3	1	1.0	3
Obstetric care was not applied	250	54.82	1	78	78.0	1
Total	456	100		100	100	
Chi-square test, $p < 0,001$						
Complications during childbirth						
Tying the umbilical cord around the fetal neck	99	21.71	2	9	9.0	2
Fetal distress during childbirth	33	7.24	6	5	5.0	3
Fetal shoulder dystocia	42	9.21	4	2	2.0	4
Transverse fetal position	17	3.73	5	–	–	–
Premature amniotic fluid discharge	58	12.72	3	2	2.0	4
Placental abruption with significant bleeding	8	1.75	6	–	–	–
Childbirth without complications	199	43.64	1	82	82.0	1
Total	456	100		100	100	
Chi-square test, $p < 0,001$						
* Rank						

Table 2. Nosological characteristics of intrapartum injuries

ICD-10 code	Disease names	Total for 10 years	%	Rank
P10.2	Intraventricular hemorrhage due to birth injury	1	0.22	7
P10.8	Other intracranial lacerations and hemorrhages due to birth injury	1	0.22	7
P11.3	Birth injury to facial nerve	1	0.22	7
P11.5	Birth injury to spine and spinal cord	1	0.22	7
P12.0	Cephalhematoma due to birth injury	328	71.92	1
P12.2	Epicranial subaponeurotic hemorrhage due to birth injury	2	0.44	6
P12.3	Bruising of scalp due to birth injury	1	0.22	7
P12.9	Birth injury to scalp, unspecified	1	0.22	7
P13.0	Fracture of skull due to birth injury	2	0.44	6
P13.2	Birth injury to femur	2	0.44	6
P13.3	Birth injury to other long bones	7	1.53	5
P13.4	Fracture of clavicle due to birth injury	14	3.07	4
P13.8	Birth injuries to other parts of skeleton	2	0.44	6
P14.0	Erb's paralysis due to birth injury	61	13.38	2
P15.3	Birth injury to eye; traumatic glaucoma due to birth injury	1	0.22	7
P15.8	Other specified birth injuries	30	6.58	3
P15.9	Birth injury, unspecified	1	0.22	7
Total		456	100	

The data presented in the diagram show that the average intrapartum trauma rate is 5.45 and varies from 6.05 per 1000 newborns in 2013 to 4.83 in 2020.

Guided by the International Classification of Diseases (ICD-10), we investigated the nosological characteristics of intrapartum injuries. The results are presented in Table 2.

The table shows that among natal traumatic injuries, cephalohematoma occupies the first rank (67.63%), followed by Erb's paralysis (12.99%) and other unspecified birth traumas (11.34%).

The insignificant share of diagnosed intrapartum spinal cord injuries and craniocervical birth trauma (0.21%) attracts attention, which does not agree with the data of the European Registry.

Conclusion. Data on birth trauma in Ukraine are extremely limited and this study has collected some much necessary epidemiological data. Larger multicentre studies of birth trauma are necessary in the future to identify prevention

and mitigation strategies in the overall interest of maternal and neonatal health.

Birth trauma is a criterion for the quality of inpatient obstetric care. The direct causes of birth trauma are often the inappropriate use of obstetric aids and other traumatic delivery methods. Factors leading to intrapartum trauma include concomitant pathology in labouring women, duration of labour, and gestational age.

The data obtained suggest that hypodiagnosis of intrapartum injuries of the cervical spine is due to insufficient informativeness or inaccessibility of the traditional methods of instrumental examination available in the arsenal, anatomical immaturity of cervical structures, and reluctance to report obstetric trauma. Studies devoted to improving the diagnosis of obstetrical trauma of the cervical spine appear perspective.

Assessment of common triggers of birth trauma is a key component in providing high quality prenatal and perinatal care to reduce the incidence and severity of birth trauma.

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НАТАЛЬНАЯ ТРАВМА НОВОРОЖДЕННОГО. НОЗОЛОГИЧЕСКАЯ СТРУКТУРА И ФАКТОРЫ РИСКА

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В статье представлены результаты изучения нозологической структуры интранатальных травматических повреждений и факторов риска их возникновения. Проведен ретроспективный анализ 456 случаев натальной травмы.

Полученные данные позволяют предположить, что имеет место гиподиагностика интранатальных повреждений шейного отдела позвоночника, это обусловлено недостаточной информативностью или недоступностью имеющихся в арсенале традиционных методов инструментального исследования, анатомической незрелостью структур шейного отдела, нежеланием озвучить акушерскую травму. Перспективными представляются исследования, посвященные совершенствованию диагностики родовой травмы шейного отдела позвоночника.

Оценка общих триггеров родовой травмы является ключевым компонентом для предоставления высококачественной пренатальной и перинатальной помощи для снижения частоты и тяжести родовой травмы.

Необходимо проведение более масштабных многоцентровых исследований родовой травмы в будущем, чтобы определить стратегии профилактики и лечения.

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