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Traumatic Brain Injuries in Children on the Example of Pediatric Hospital in Georgia

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Abstract

INTRODUCTION: Traumatic brain injury (TBI) is a leading cause of death and permanent disability in children and adolescents. Study of TBI with reliable and high-quality data represents the basis for effective strategies for injury prevention.

METHODS: Georgian National Center for Disease Control database for 2018 was used to identify TBI cases treated at the largest pediatric hospital in Georgia. Cases were included based on the S06 diagnosis coded of ICD-10. Descriptive statistics were used to describe the patients and their traumatic brain injuries.

RESULTS: The Iashvili Childrens' hospital treated 296 pediatric brain injuries in 2018. TBIs were more common in boys (61.1%) than in girls (38.9%), and patients aged 10–14 were most frequent. 4.4% of male patients and 1.7% of female patients required more than 15 days of in-patient treatment. **More** than two thirds of children had suffered TBI due to falling (66.6%), followed by road traffic injuries (18.9%) and other type of blunt force (14.2%). 54.3% of all TBI patients required at least one day of hospital stay. Most of the TBI patients (74.3%) were brought to the hospital by private transportation. In-patient treatment was completed in 98.9% of cases, three male patients (1%) died. In all three cases of lethal outcome, the cause of injury **was road** traffic.

CONCLUSION: Based on existing data, it was possible to study just part of TBI epidemiological properties. TBI national reporting formats do not cover information about location and time of injuries, place of occurrence, therapeutical treatment and severity of the illness.

To study the full epidemiological picture of TBI, retrospective studies based on the medical history in hospitals are needed.

Abstract

თავის ტვინის ტრავმული დაზიანება სიკვდილიანობის და მუდმივი შეზღუდული შესაძლებლობების განმაპირობებელ წამყვან მიზეზს წარმოადგენს ბავშვებსა და

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მოზარდებში. თავის ტვინის ტრავმული დაზიანებების შესწავლა, საიმედო და მაღალი ხარისხის მონაცემების საფუძველზე, პრევენციის ეფექტიანი სტრატეგიების საფუძველს წარმოადგენს.

შესწავლილი იქნა საქართველოს დაავადებათა კონტროლისა და საზოგადოებრივი ჯანმრთელობის ეროვნული ცენტრის 2018 წლის მონაცემთა ბაზა თავის ტვინის ტრავმული დაზიანებების იმ შემთხვევების იდენტიფიცირებისთვის, რომელთა მკურნალობაც მიმდინარეობდა საქართველოს უმსხვილეს ბავშვთა ჰოსპიტალში. შემთხვევების შერჩევა მოხდა ICD-10-ის მიხედვით S06 დიაგნოზის საფუძველზე. აღწერილობითი სტატისტიკური მონაცემები გამოყენებულ იქნა თავის ტვინის ტრავმული დაზიანებების აღწერის მიზნით.

2018 წლის განმავლობაში მ. იაშვილის სახელობის ბავშვთა ჰოსპიტალში მკურნალობდა 296 პაციენტი თავის ტვინის ტრავმული დაზიანებით. თავის ტვინის ტრავმული დაზიანება უფრო ხშირი იყო ვაჟებში (61,1%), გოგონებთან შედარებით (38,9%). ყველაზე მაღალი მაჩვენებელი დაფიქსირდა ასაკობრივ კატეგორიაში 10–14 წელი. მამრობითი სქესის პაციენტების 4,4%-ს და მდედრობითი პაციენტების 1,7%-ს სტაციონარული მკურნალობა დასჭირდა 15 დღეზე ხანგრძლივად. ბავშვების ორ მესამედზე მეტმა (66,6%) თავის ტვინის დაზიანება მიიღო დაცემის შედეგად, შემთხვევათა 18,9%-ის მიზეზი იყო საგზაო-სატრანსპორტო შემთხვევა, ხოლო 14,2%-ის - დარტყმა. პაციენტების 54,3%-ს დასჭირდა ერთდღიანი ჰოსპიტალიზაცია. პაციენტების უმრავლესობა (74,3%) ჰოსპიტალში ტრანსპორტირებული იყო კერძო სატრანსპორტო საშუალებით. სტაციონარული მკურნალობა დასრულდა შემთხვევათა 98,9%-ში, სამი მამრობითი სქესის პაციენტი (1%) გარდაიცვალა. ლეტალური შედეგის მქონე სამივე შემთხვევის მიზეზი იყო საგზაო-სატრანსპორტო შემთხვევა.

არსებული მონაცემების საფუძველზე, შესაძლებელი გახდა თავის ტვინის ტრავმული დაზიანების ეპიდემიოლოგიური მახასიათებლების მხოლოდ ნაწილის შესწავლა. თავის ტვინის ტრავმული დაზიანებების ეროვნული ანგარიშგების ფორმატი არ მოიცავს ინფორმაციას ტრავმის ლოკაციისა და დროის, შემთხვევის მიღების ადგილის, თერაპიული მკურნალობისა და დაავადების სიმძიმის შესახებ.

თავის ტვინის ტრავმული დაზიანების სრული ეპიდემიოლოგიური სურათის შესასწავლად საჭიროა ჰოსპიტლებში სამედიცინო ისტორიებზე დაფუძნებული რეტროსპექტიული კვლევების ჩატარება.

черепно-мозговая травма (ЧМТ) является основной причиной смерти и постоянной нетрудоспособности у детей и подростков. Исследование ЧМТ с достоверными и высококачественными данными является основой для эффективных стратегий профилактики травматизма.

База данных Национального центра контроля заболеваний и общественного здоровья Грузии на 2018 год использовалась для выявления случаев ЧМТ, пролеченных в крупнейшей детской больнице в Грузии. Случаи были включены на основании диагноза S06, кодированного классификатором ICD-10. Описательные статистические данные были использованы для описания пациентов и их черепно-мозговых травм.

Abstract

в течение 2018 г. в детской больнице им. Иашвили прошли лечение 296 пациентов с черепно-мозговой травмой. ЧМТ чаще встречалась у мальчиков (61,1%), чем у девочек (38,9%), а самый высокий показатель наблюдался в возрастной группе 10–14 лет. 4,4% пациентов мужского пола и 1,7% пациентов женского пола нуждались в стационарном лечении более 15 дней. Более двух третей детей перенесли ЧМТ из-за падения (66,6%), за которым последовали дорожно-транспортные происшествия (18,9%) и другие виды травм от удара (14,2%). 54,3% всех пациентов с ЧМТ требовали не менее одного дня пребывания в стационаре. Большинство пациентов с ЧМТ (74,3%) были доставлены в больницу частным транспортом. Стационарное лечение было завершено в 98,9% случаев, три пациента мужского пола (1%) умерли. Во всех трех случаях летального исхода причиной травмы стало **дорожно-транспортные происшествия**.

На основании существующих данных можно было изучить только часть эпидемиологических характеристик ЧМТ. Национальная система отчетности ЧМТ не включает информацию о локации и времени травм, месте возникновения, терапевтическом лечении и тяжести заболевания.

Для изучения полной эпидемиологической картины ЧМТ необходимы ретроспективные исследования, основанные на истории болезни в больницах.

Keywords

Traumatic brain injury; pediatric injuries; epidemiological characteristics; national reporting system

Keywords

თავის ტვინის ტრავმული დაზიანება; პედიატრიული დაზიანებები; ეპიდემიოლოგიური მახასიათებლები; ანგარიშგების ეროვნული სისტემა

Keywords

черепно-мозговая травма; детские травмы; эпидемиологическая характеристика; национальная система отчетности

Introduction.

Traumatic brain injury (TBI) is a leading cause of death and disability worldwide and one of the major problems of Public Health. Mortality from child traumatic injuries is 3–4 times higher in middle-income countries than in high-income countries. Unfortunately, TBI is under-recognized and under-studied, particularly in many low- and middle- income countries [9–11]. Study of TBI reliable and high-quality data represents the basis for elaborating effective strategies for injury prevention [12].

Since 2014 the traumatic brain injury national reporting format for the hospitalized patients is in line with the International E-health standards (ICD-10 codes for each case, including

special codes for external causes of the injury, NCSP codes for health intervention etc.). Since 2019 the country started introducing (piloting) Electronic Health Record (EHR) system, which potentially can collect all TBI related necessary information.

In 2018, the total number of hospitalized 0–17 age patients with TBI diagnosis (ICD-10 - S06) was 2314 in all medical facilities of Georgia. Patients were hospitalized in different hospitals in Tbilisi and regions, and the biggest number (12,8%) was hospitalized in Pediatric hospital. In 33 medical facilities was hospitalized up to 5 patients and in 23 medical facilities 5–10 TBI patients during the year. The aim of the research is to study epidemiological features of pediatric TBI based on the example of data from the biggest pediatric hospital in Georgia.

Materials and Methods.

In this study we used descriptive statistics of NCDC official data.

Results.

The total number of pediatric TBI patients during one year (2018) was 296, among them majority were male patients (61,1%), minority of patients were in 15–17 age group (12,5%) while in other three age group (10–14; 5–9 and 0–4) patients were distributed approximately equally (31,8%, 28,7% and 27,0%).

Falls were the main cause of pediatric TBI (66,6%) cases, followed by RTI (18,9%) and exposure to inanimate and animate mechanical forces (14,2%). The type of addressing for majority of patents is (74,3%) walk-in, ambulance (16,9%) and referral (8,8%). Treatment was completed for 293 (98,9) patients, 3 (1%) patients died.

The total number of hospital days was 1073. In-patient treatment for less than one week was sufficient for 90,8% of treatment, same time, for the majority of patients (54,9%) the number of hospital stay days was one day, for 36,5% 2–6 days, for 6,4% 7–14 days and for 2,7% of patients more than 15 days. 2–6 days of in-patient treatment was needed for more girls rather than boys, while boys prevailed in all the other cases. The longest, more than 15 days of in-patient treatment was needed for 3,9% of TBI affected boys and for 0,9% of girls.

The highest number of one-day hospital stay was found among 5–9 years old patients (63,5%). One-day hospital stay was also required for more than half of cases in 10–14 year and 5–9 year old patient groups (54,3% and 51,4% respectively). Almost equal number of 0–4 year old patients required on-day (46,3%), and up to one week (47,5%) hospital stay.

The 7–14-day in-patient care was required for a biggest number of patients (9,6%) aged 10–14, equally in 5–9 and 0–4 age groups (5,9% and 5,0% respectively). More than 15-days of hospital stay was most required in 15–17 yearage group (8,1%), equally in 5–9 and 10–14 age groups (2,4% and 2,1% respectively).

56,3% of fall cases and 41,1% of RTI cases required one day hospital stay. 2–6 days hospital stay was required almost equally in fall and RTI groups (38,6% and 35,7% respectively).

More than 15 days of hospital stay was required for 7,1% of RTI cases and for 2% of fall cases. Cases of exposure to inanimate and animate mechanical forces required one day hospital stay in 64,3% of cases. All these types of injuries prevailed in boys.

More than 15 days of in-patient care was required for 10 patients only, including 8 patients who were treated for up to 40 days, and two patients treated for 144 days (cause: RTI; Diagnosis: Traumatic cerebral oedema (S06.1)) and 146 days (cause: falling; Diagnosis: Other Intracranial Injuries (S06.8)). In both cases the patient was a male.

Most of the RTI cases were equally found in 5–9 and 10–14 age groups (33,9%); Most of the cases of fall were found in 0–4 age group (31,5%), followed by 10–14 (39,5%) and 5–9 (28,9%) age groups.

One day hospital stay was required for the majority of walk-in patients (57,7%) and for the half of the patients (50%) transported by ambulance. For the referral cases, one day hospital stay and 2–6 days hospital stay was required almost equally (34,6% and 38,5% respectively). More than 15 days of hospital stay was required for referral cases (7,7%) and walk-in patients (2,7%).

84% of cases were diagnosed of Concussion S06.0, followed by Focal brain injury S06.3 (6,1%), Epidural haemorrhage S06.4 (3,7%) and Traumatic subdural haemorrhage S06.5 (3,0%). 63,5% of Concussion cases required one day hospital stay and 36,1% required up to one week hospital stay.

Focal brain injury and Epidural haemorrhage cases equally required up to one week and up to two weeks hospital stay (38,9% and 36,4% respectively). Out of 4 patients with diagnosis of Intracranial injury, unspecified S06.9, 2 patients died and one required hospital care for 144 days.

In-patient treatment was completed in 98,9% of cases and three patients died. All three patients with lethal outcome were males from different age groups (0–4, 10–14 and 15–17). The duration of hospital stay was different - 1 day, 7 days and 19 days. The cause of lethal injury was RTI, the diagnosis were S06.9 Intracranial injury, unspecified, in two cases and S06.2 diffuse brain injury, in one case.

Our research revealed that, based on the data analysis any type of TBIs are generally more common in boys than in girls. More than 15 days of in-patient treatment was also required in boys. TBI cases are highest in children aged 10–14. The TBI's leading cause was falling. Falling was the main cause of injury in children aged 0 to 4 years and RTI in children aged 5 to 14 years. 56,3% of those patients required one day hospital stay. Most of the TBI patients (74,3%) had walked-in in the hospital. In-patient treatment was completed in 98,9% of cases, three male patients (1%) died. In all three cases of lethal outcome, the cause of injury was RTI.

Thus, the statistical data analysis of Georgia's largest children's hospital has made clear how TBI cases are distributed according to sex and age groups, mechanism of injury and type of addressing, as well as diagnosis and hospitalization days, including the reasons for

lethal outcomes. However, based on existing data, it was possible to study just part of TBI epidemiological properties.

Conclusion.

Traumatic brain injury national reporting formats do not cover information about location and time of injuries, place of occurrence, therapeutic treatment and severity of the illness. In official statistics there is no case-based information about patients, which got the care in the emergency department. Accordingly, current official data reflects incomplete picture on the TBI in the country, including pediatric TBIs. It is necessary to conduct TBI retrospective study to evaluate TBI's complete epidemiological properties.

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Table No1

Distribution of cases according Age, gender, mechanism of injury

Variables	Number of cases (296)	
	Number	%
Gender		
Male	181	61.1
Female	115	38.9
Age		
0–4	80	27.0
5–9	85	28.7
10–14	94	31.8
15–17	37	12.5
Mechanism of injury		
RTI	56	18.9
Fall	197	66.6
Assault	0	0.0
Exposure to inanimate and animate mechanical forces	42	14.2
Other	1	0.3
Type of addressing		
Walk-in	220	74.3
Ambulance	50	16.9
Refferal	26	8.8
Discharge status		
Treatment completed	293	98.9
Died	3	1.00

Table No2

Distribution of cases according to the number of hospital days

Variables	Total	Distribution of cases according to the number of hospital days (296 cases - 1073 hospital days)							
		1 day		2–6 days		7–14 days		> 15 days and more	
		Number	%	Number	%	Number	%	Number	%
Gender									
Male	181	100	55.2	61	33.7	12	6.6	8	4.4
Female	115	61	53.0	47	40.9	5	4.3	2	1.7
Age									
0–4	80	37	46.3	38	47.5	3	3.8	2	2.5
5–9	85	54	63.5	24	28.2	5	5.9	2	2.4
10–14	94	51	54.3	32	34.0	8	8.5	3	3.2
15–17	37	19	51.4	14	37.8	1	2.7	3	8.1
Mechanism of injury									
RTI - V01-V99	56	23	41.1	20	35.7	8	14.3	5	8.9
Fall - W00-W19	197	111	56.3	76	38.6	5	2.5	5	2.5
Assault - X85-Y09	0	0	0.0	0	0.0	0	0.0	0	0.0
Exposure to inanimate and animate mechanical forces - W20-W64	42	27	64.3	12	28.6	3	7.1	0	0.0
Other	1	0	0.0	0	0.0	1	100.0	0	0.0
Type of addressing									
Walk-in	220	127	57.7	78	35.5	8	3.6	7	3.2
Ambulance	50	25	50.0	20	40.0	5	10.0	0	0.0
Refferal	26	9	34.6	10	38.5	4	15.4	3	11.5

Table No3

Mechanism of injury by age and sex

Mechanism of injury by age and sex				
RTI - V01-V99	Total	% in total number of RTI	Male	Female
0–4	10	17.9	4	6
5–9	19	33.9	13	6
10–14	19	33.9	10	9
15–17	8	14.3	5	3
All ages	56	100.0	32	24
Fall - W00-W19	Total	% in total number of Falls	Male	Female
0–4	62	31.5	28	34
5–9	57	28.9	46	11
10–14	60	30.5	36	24
15–17	18	9.1	13	5
All ages	197	100.0	123	74
Exposure to inanimate and animate mechanical forces - W20-W64	Total	% in total number of Exposure to inanimate and animate mechanical forces	Male	Female

Table No4

Distribution of cases according to the number of hospital days

Variables	Total	Distribution of cases according to the number of hospital days (296 cases - 1073 hospital days)							
		1 day		2–6 days		7–14 days		> 15 days and more	
		Number	%	Number	%	Number	%	Number	%
ICD Diagnosis									
S06.0 Concussion	249	158	63.5	90	36.1	1	0.4	0	0.0
S06.1 Traumatic cerebral oedema	1	0	0.0	0	0.0		0.0	1	100.0
S06.2 Diffuse brain injury	1	0	0.0	0	0.0	1	100.0	0	0.0
S06.3 Focal brain injury	18	2	11.1	7	38.9	7	38.9	2	11.1
S06.4 Epidural haemorrhage	11	0	0.0	4	36.4	4	36.4	3	27.3
S06.5 Traumatic subdural haemorrhage	9	0	0.0	5	55.6	3	33.3	1	11.1
S06.6 Traumatic subarachnoid haemorrhage	2	0	0.0	1	50.0	1	50.0	0	0.0
S06.8 Other intracranial injuries	1	0	0.0	0	0.0	0	0.0	1	100.0
S06.9 Intracranial injury, unspecified	4	1	25.0	1	25.0	0	0.0	2	50.0

Table No5

Distribution of fatal cases according to the age, gender, ICD Diagnosis

Fatal cases (3)	
Gender	
Male	3
Female	0
Age	
0–4	1
5–9	0
10–14	1
15–17	1
ICD Diagnosis	
S06.2 Diffuse brain injury	1
S06.9 Intracranial injury, unspecified	2
Mechanism of injury	
RTI - V01-V99	3
Type of addressing	
Walk-in	2
Ambulance	1
Length of stay (days)	
1	1
7–14	1 (7 days)
15 and more	1 (19 days)

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