ORIGINAL ARTICLE

MILD CRANIOENCEPHALIC TRAUMA IN THE CHILD POPULATION. EXPERIENCE AT THE BACA ORTIZ HOSPITAL, QUITO-ECUADOR, 2016-2019

Traumatismo craneoencefálico leve en población infantil. Experiencia en el Hospital Baca Ortiz, Quito-Ecuador, 2016-2019

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ABSTRACT

Introduction: The alteration at the anatomical and/or functional level, both motors, sensory and cognitive, a product of the sudden exchange of mechanical energy caused by an external force on the skull, is what defines a traumatic brain injury (TBI). The permanence or transience of these alterations determines the severity of the TBI, with 70 to 80% of a mild type whose neurological symptoms are of little intensity and duration. Clinical observation in mild TBI includes observing children under 2 years of age with trauma without fracture or admission criteria clinically for 2 to 4 hours and observing children with symptoms or mechanism of fall for 4 to 6 hours not known. The objective of the study is to describe mild TBI at Baca Ortiz Pediatric Hospital, a national children's referral hospital in Ecuador, during the period from January 2016 to December 2019.
Methods: Cross-sectional, descriptive, and retrospective study that includes patients diagnosed with mild head trauma evaluated and treated in the Neurosurgery Service of the Baca Ortiz Pediatric Hospital, from January 2016 to December 2019.
Results: During the period 2016 to 2019, 105 children with mild TBI were diagnosed and treated, this being more frequent in males (62.85%) and during the preschool stage (51.42%). Of all of them, 82.85% received specialty medical care in the first 6 hours after the trauma. The main etiology was the fall produced at home (66.66%).
Conclusions: Mild traumatic brain injury is one of the main reasons for pediatric hospital consultation in our setting. It mostly occurs in male patients of preschool age, because of falls at home.

Keywords: *Craniocerebral Trauma, Child, Hospitals, Pediatric, Referral and Consultation (Source: MeSH NLM)*

RESUMEN

Introducción: La alteración a nivel anatómico y/o funcional tanto motora, sensorial o cognitiva, producto del intercambio brusco de energía mecánica causada por una fuerza externa en el cráneo, es lo que define a un traumatismo craneoencefálico (TEC). La permanencia o transitoriedad de estas alteraciones condicionan la gravedad del TEC, siendo el 70 a 80% de tipo leve cuyos síntomas neurológicos son de poca intensidad y duración. La observación clínica en el TEC leve incluye: Observar clínicamente, de 2 a 4 horas, a los niños menores de 2 años con trauma sin fractura ni criterios de ingreso y, observar de 4 a 6 horas a los niños con sintomatología o mecanismo de caída no conocido. El objetivo del estudio es describir el TEC leve en el Hospital Pediátrico Baca Ortiz, hospital de referencia infantil nacional en Ecuador, durante el periodo de enero 2016 a diciembre 2019.
Métodos: Estudio transversal, descriptivo y retrospectivo que incluye a pacientes con diagnóstico de trauma craneoencefálico leve evaluados y tratados en el Servicio de Neurocirugía del Hospital Pediátrico Baca Ortiz dentro del periodo comprendido de enero 2016 a diciembre 2019.
Resultados: Durante el periodo 2016 a 2019, se diagnosticó y trató a 105 niños con TEC leve, siendo este más frecuente en el sexo masculino (62.85%) y durante la etapa preescolar (51.42%). De todos ellos, el 82.85% recibió atención médica de especialidad en las 6 primeras horas posteriores al trauma. La etiología principal fue la caída producida en el hogar (66.66%).
Conclusiones: El traumatismo craneoencefálico leve es uno de los principales motivos de consulta hospitalaria pediátrica en nuestro medio. En su mayoría ocurre en pacientes masculinos en edad preescolar, como consecuencia de caídas en el hogar

Palabras Clave*: Traumatismos Craneocerebrales, Niño, Hospitales Pediátricos, Derivación y Consulta (Fuente: DeCS Bireme)*

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Cranioencephalic trauma (TBI) is a medical-surgical entity, characterized by the presence of permanent or temporary structural damage, both brain tissue and its vascular and nervous components, due to direct trauma to the head. [1,2,3,4]

It should be considered that in the case of pediatric patients, both the etiology and its clinical manifestations will depend on both age and related anatomical factors, such as head size and weight, height, total body water (in greater quantity than it gives greater elasticity to ligaments in the spine), laxity of long bones, less rigidity in the abdomen and the flexibility of the protective structures in the head. [4,5,6]

It is assumed that the majority of head trauma in pediatric age is due to falls, especially in infants and preschool children, while traffic accidents or head trauma caused by running over occur in older patients, especially in adolescents. [7,8]

In the child population, head trauma represents the leading cause of death and permanent disability. An adequate process of categorizing the severity of the patient allows establishing individualized diagnostic and treatment measures that seek to reduce the risk of hypoxia, stages of cerebral hypoperfusion, intracranial hypertension or hyperthermia, modifying factors capable of producing temporary or permanent neurological sequelae and reducing the rates of morbidity and mortality in pediatric patients. [9]

Cranioencephalic trauma represents one of the main causes of hospital care and is associated with a significant number of cases of motor disability, behavioral disturbances, or alteration in the cognitive sphere, which is why it constitutes a real health problem worldwide. [10]

Hence the importance of its study and analysis, taking into consideration its classification as an initial basis since it is to be expected that the greater the impact or injury of the tissue and its components; The greater the repercussions and sequelae on the individual, such as emotional and behavioral disorders: depression, anxiety, irritability. In relation to the affected area, in the case of the frontal or temporal lobes, there are behavioral disorders, memory deficits, and social and physical alterations. [4,11,12,13,14,15]

This is due to primary or secondary damage resulting from head trauma. (González Balenciaga, October 2019).[16] Primary damage occurs at the time of trauma and if it occurs in the lateral axis, it causes extra-axial injuries (epidural and subdural hematoma and subarachnoid hemorrhage; if the trauma occurs in the central axis axial medial or para medial, diffuse axonal damage occurs due to injury to deep structures (common in children). Secondary damage is preventable, it occurs due to the larger cranial surface that the child has, thin and deformable bone plane, higher water content, and lower myelin content. [17] It is produced by intracranial ischemia, hypoxia, or hypertension, there is also vasospasm which leads to cerebral ischemia.

Starting from this point, it should be remembered that the BTI classification is carried out according to the level of consciousness measured according to the Glasgow Coma Scale (GCS), which assesses three types of response independently, the motor response, the response verbal and finally the ocular response, parameters for which different scores have been established whose optimal responses will be scored in the case of the motor component over 6 points, verbal over 5 points and ocular over 4 points. [21]

Cranioencephalic trauma is classified as previously mentioned as Mild TBI: GCS 15-14. Moderate TBI: GCS 13-9. Severe TBI: GCS ≤ 8

In the following study, only cases of mild head trauma will be taken into consideration, leaving moderate and severe trauma as objects of study for the development of other studies.

By definition, mild head trauma is that trauma whose score on the Glasgow Coma Scale is 14 and 15 points at the time of the examination, in which the injury mechanism has been low energy, with no evidence of loss of consciousness, or with loss of consciousness of fewer than 5 minutes with spontaneous recovery, without post-traumatic amnesia, without signs of focalization or neurological deterioration and whose imaging studies show no alterations of any type. In case of symptoms such as headache, vomiting, and/or irritability, these should appear immediately after the trauma, and be mild and transitory. [14,15,21]

METHODS

This study is of a cross-sectional, descriptive retrospective type, for which all patients with a diagnosis of mild head trauma were considered, who were evaluated and treated at the Neurosurgery Service of the Baca Ortiz Pediatric Hospital located in the city of Quito in Ecuador, in the period from January 2016 to December 2019.

Information was collected by reviewing the medical records located in the general archive area of the Baca Ortiz Pediatric Hospital. Based on this information, the data collection sheets for head trauma from the Neurosurgery Service were filled out. The qualitative and quantitative variables were considered such as sex and age, the latter according to the WHO classification that defines the preschool stage to that between 0 months to 4 years, the school stage between 5 to 11 years, and the adolescence stage among the 12 to 17 years.

It was categorized as an urban origin to patients living in the province of Pichincha, and rural origin to those who belong to any other province. Other variables to consider were the mechanism of trauma; the time and place where the head injury occurred (it was considered considering 3 places: home, school, and public places); days of hospitalization, the time elapsed in hours until primary care, which includes evaluation and first aid provided by the paramedical team, health posts, and health centers, and secondary care that encompasses the time elapsed until the management of the patient in a third level Hospital center that has the specialty of Pediatric Neurosurgery.

Finally, within the medical care variables, clinical aspects such as neurological assessment scales, as well as the type of treatment and hospitalization, were considered.

The main objective of this study was to describe mild head trauma at Baca Ortiz Pediatric Hospital during the period from January 2016 to December 2019.

The inclusion criteria were: All pediatric patients treated at the Baca Ortiz Hospital, with a diagnosis of mild head trauma during the period from January 2016 to December 2019. The exclusion criteria were: All pediatric patients at the Pediatric Hospital Baca Ortiz treated with a diagnosis of moderate and severe head trauma in the period from January 2016 to December 2019.

RESULTS

The data obtained after cleaning and analyzing the information allowed us to establish a sample universe of 105 patients with mild head trauma, 5 of them with an initial score of 14 on the Glasgow scale, and 100 patients with Glasgow 15. Of these, 66 (62.85%) were men and 39 (37.14%) were women. *(Fig 1)*

Regarding age, it was found that 54 patients (51.42%) were in preschool, 39 (37.14%) in school, and 12 (11.42%) in adolescence. *(Fig 2)*

Regarding the origin, 99 patients (94.28%) belonged to urban areas and 6 (58.09%) to rural areas.

Regarding the time elapsed from the trauma to their primary care, 95 patients (90.47%) received care in <6 hours, 4 (3.80%) in 6-12 hours, 1 (0.95%) in 12 at 24 hours, and 5 (4.67%) received care after 24 hours. *(Fig 3)*

In the case of secondary care provided by specialists in Pediatric Neurosurgery, 87 patients (82.85%) received care in <6 hours, 11 (10.47%) in 6-12 hours, 2 (1.90%) in 12 at 24 hours, and 5 (4.76%) after 24 hours. *(Fig 3)*

Regarding the place where the mild head trauma occurred, 70 patients (66.66%) presented the trauma at home, 31 (29.52%) in a public place, and 4 (3.81%) at school. *(Fig 4)*

As a mechanism of trauma, falling while using bicycles was the most frequent mechanism, with 75 (71.42%) cases, because of a traffic accident in 18 (17.14%) cases, run over in 9 (8.57). %) cases and by blunt object in 3 (2.85%) cases. *(Fig 5)*

Regarding the time of day (according to the range of hours) in which the mild head trauma occurred, there were 28 cases (26.6%) between 06:00 am-11:59 am, 64 (60.95%) between the 12:00 pm-15:59 pm and 13 cases (12.38%) between 16:00 pm-19:59 pm. No cases of mild head trauma were reported after 20:00 pm.

Regarding the in-hospital destination for medical observation, 61 patients (58.09%) were kept in the emergency area, 18 (18.09%) in the critical area, 16 (15.23%) were hospitalized in neurosurgery, and 0 cases in the intensive care unit. Hospitalization time was 24 hours for 16 (15.23%) patients, 48 hours for 70 (66.66%) patients, and 72 hours for 19 (18.09%) patients *(Fig 6)*.

During this period, 59 (56.19%) patients received clinical therapeutic measures of neurological alarm associated with analgesia and 46 (43.80%) patients without analgesia.

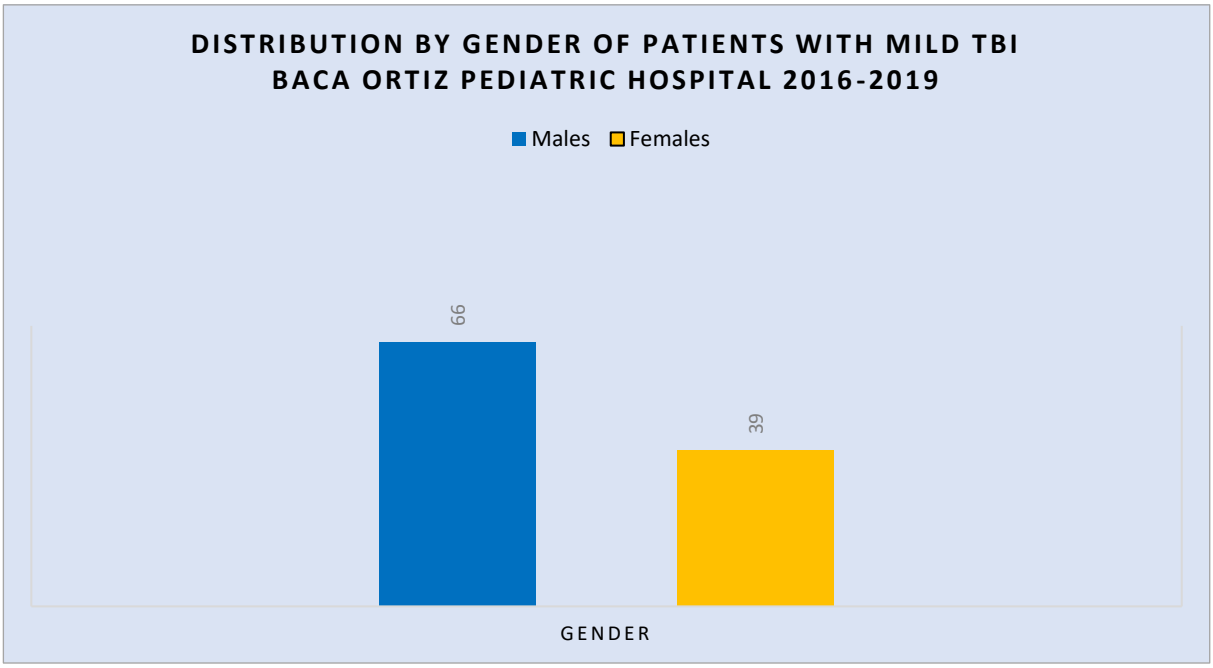


Fig 1. Distribution by gender in patients with mild cranioencephalic trauma in the Neurosurgery Service of the Baca Ortiz Pediatric Hospital, Quito-Ecuador, 2016-2019. *(**Source**: Medical records of the Statistics Department of the Baca Ortiz Hospital)*

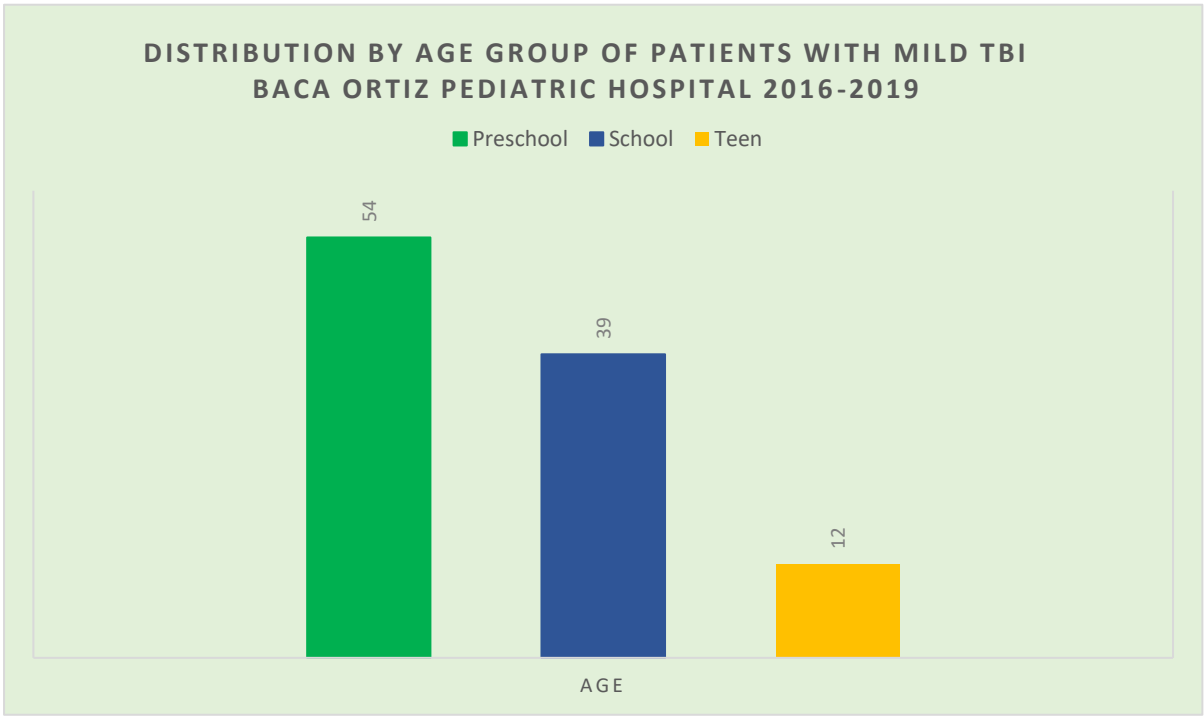
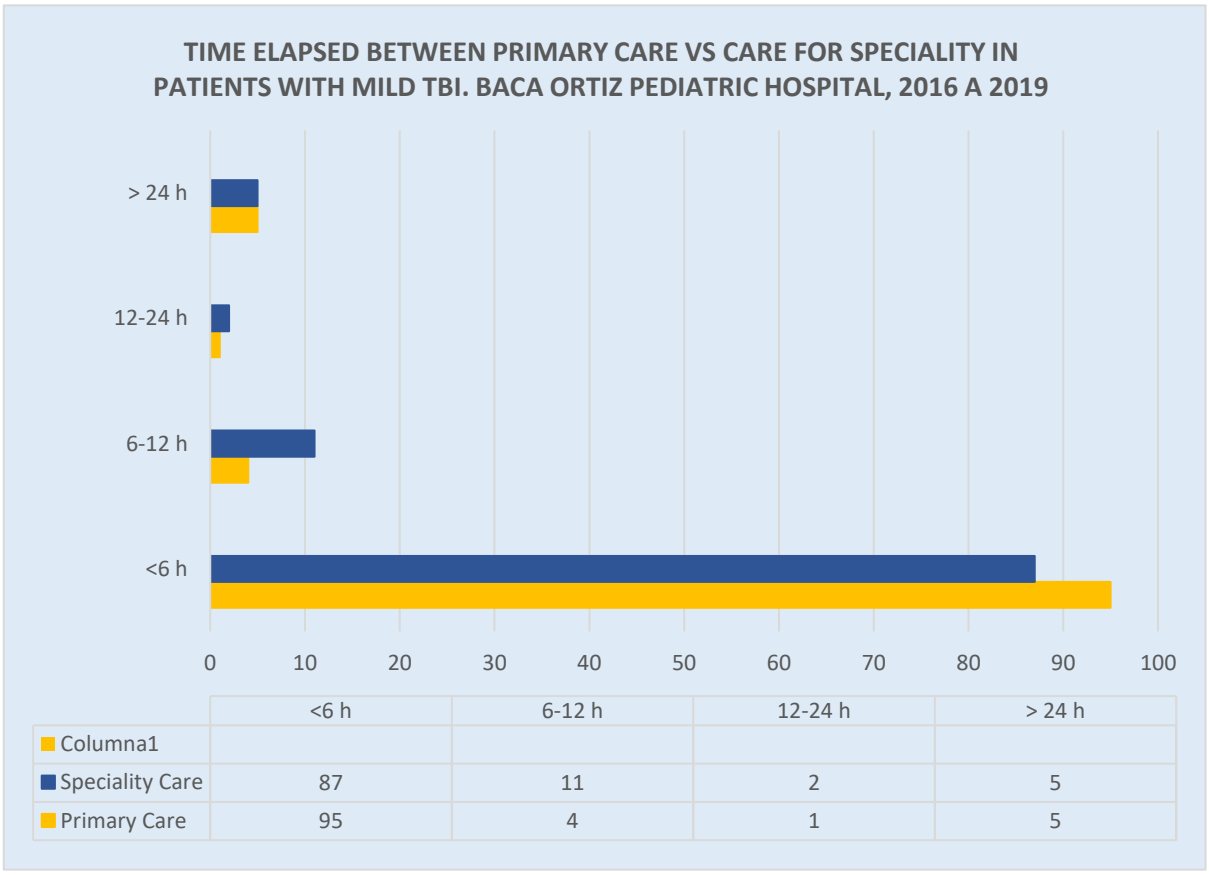


Fig 2. Distribution by age groups of patients with mild head trauma in the Neurosurgery Service of the Baca Ortiz Pediatric Hospital, Quito-Ecuador, 2016-2019. (***Source**: Medical records of the Statistics Department of Baca Ortiz Hospital)*



	<6 h	6-12 h	12-24 h	> 24 h
Columna1				
Speciality Care	87	11	2	5
Primary Care	95	4	1	5

Fig 3. Time elapsed between primary care vs. care for a specialty, in patients with a mild head trauma in the Neurosurgery Service of the Baca Ortiz Pediatric Hospital, Quito-Ecuador, 2016-2020. (***Source**: Medical records of the Statistics Department of Baca Ortiz Hospital)*

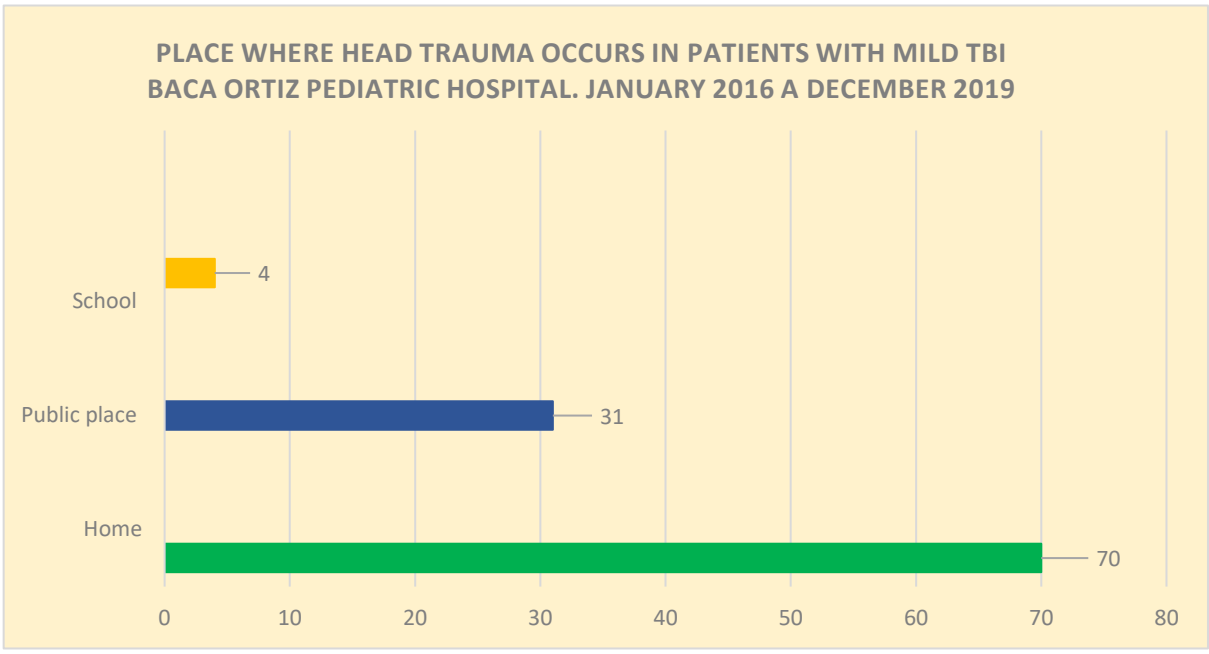


Fig 4. Place where head trauma occurs in patients with mild TBI in the Neurosurgery Service of Baca Ortiz Hospital, Quito-Ecuador, 2016-2019 *(**Source**: Medical records of the Statistics Department of Baca Ortiz Hospital)*

DISCUSSION

Cranioencephalic trauma constitutes, in terms of health, a problem worldwide not only because of its immediate consequences but also because of the complications and consequences it generates in the long term. [22]

The lack of experience in their interrelation with the environment, the need to explore their age, and even the socio-economic condition in low-income countries, which conditions the absence of parents and therefore the lack of necessary care and supervision on the part of they constitute risk factors for pediatric head trauma. [22, 23]

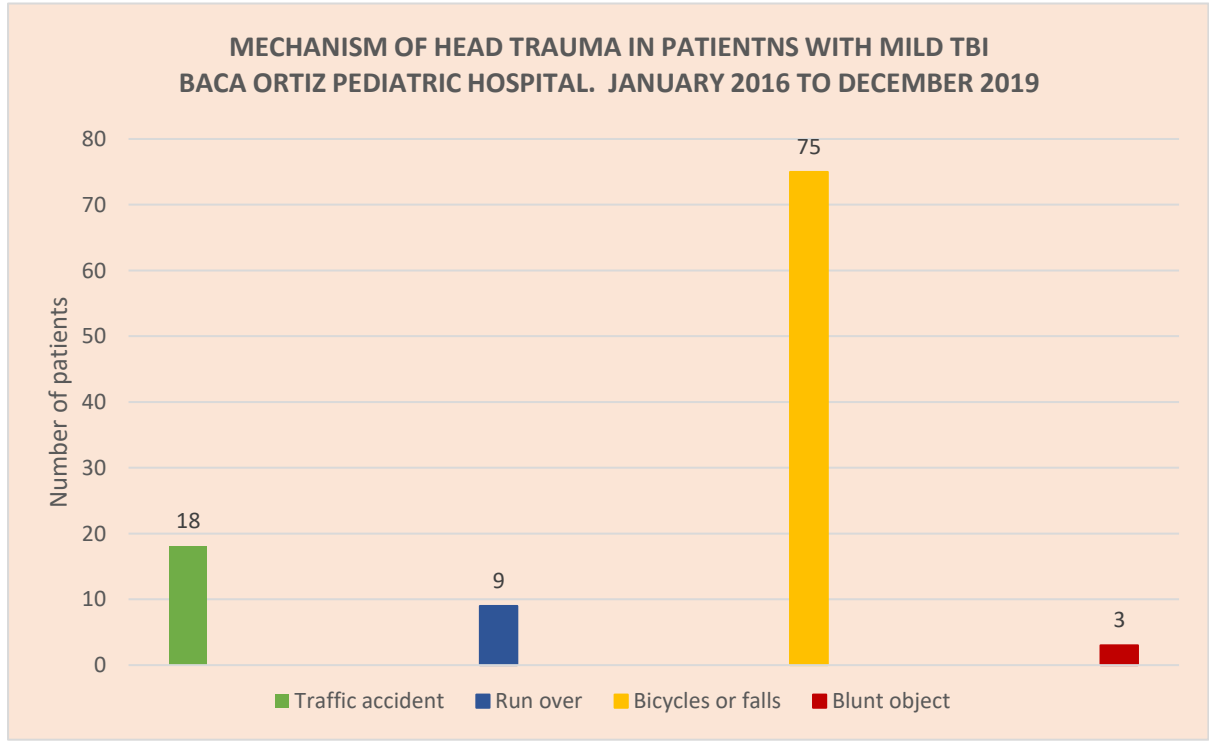


Fig 5. Mechanism of mild head trauma in patients of the Neurosurgery Service of the Baca Ortiz Pediatric Hospital, Quito-Ecuador, 2016-2019. *(**Source**: Medical records of the Statistics Department of Baca Ortiz Hospital)*

Gender has also been shown to be of relevance, as evidenced by studies published both in Bolivia (Carpio-Deheza et al, 2012),[24] Honduras (Cardona et al, 2019) [4] and Colombia (Jiménez et, al. 2020); [25] in which a higher incidence of head trauma was reported in the male pediatric population, being 64%, 70.1%, 64.7% respectively, results that coincide with what was observed during the development of the present study; which when compared with previous national studies such as the one carried out in the third-level hospital's Hospital Vicente Corral Moscoso and Hospital José Carrasco Arteaga belonging to the province of Azuay, between January 2015 and October 2017,[26] allows us to verify that they have not existed changes based on gender in the last 6 years, with the male sex still being the most affected. [27]

In Ecuador, head trauma is a frequent reason for consultation in pediatric emergency areas and the vast majority are mild head trauma, [26] data that coincide with that reported in studies such as the one carried out in Colombia by Morales et al.,[7] in 2019 on head trauma in the pediatric population, where the importance of the management and categorization of the pediatric patient in the emergency service is emphasized; and the work on head trauma in children published in Mexico by Bejarano et al.,[28] in 2008, or even that reported at the national level in the study carried out at the Roberto Gilbert Elizalde Hospital between June 1997 to May 2002, and published in 2003. [9]

The etiology of childhood head trauma is multiple, as documented in the work carried out by the University of Zaragoza (Orden, 2012),[30] where the most frequent causes are falls, traffic accidents, bicycles, and sports, a reality that is similar as what exposed in this study. Additionally, during the aforementioned study, injuries inflicted intentionally (child abuse) were taken into consideration as important etiologies, an aspect not considered in the development of our work since on many occasions the type of trauma that derives from these actions is usually serious and its outcome fatal, which did not meet the inclusion criteria of the present study, as it was exclusively a study of mild head trauma. [30]

Taking as a reference the study of head trauma in children at the Hospital General de Medellín and the Somer de Rionegro clinic published in 2020, [11] concordances with our study were observed in relation to the place of trauma; thus the home was the most frequent with 56.2% of the cases, followed by public places with 24.5%; data that when contrasted with the study carried out in Honduras by Cardona et al. published in 2019,[4] shows differences, the percentage of head trauma in public places being higher for them with 79.2%, while those occurring at home represent 20.8%.

This study allowed identifying that 60.95% of mild head trauma occurred between 12:00 pm to 3:59 pm, that is, the working hours that prevail in our country and during which it is common to find patients pediatric at home. This finding corresponds to the foregoing and agrees with what was found both in the work of the "Hospital General de Medellín" and the "Clínica Somer de Rio Negro" [11] and in the study of Zaragoza,[30] in which it was also identified as the predominant schedule for the development of head trauma in the afternoon, with percentages of 58.4% and 52.2% respectively.

Likewise, in the aforementioned study, it was shown that 60% of the patients were kept under observation in the emergency service, 30% were hospitalized and the remaining 10% were found in intensive and critical care unit areas. When comparing these data with our work, it allows us to find similarities since in our case 58.09% were under observation in the emergency area, 18.09% in the critical area, and 15.23% in the hospitalization area, all of them following the management protocols and being adequately monitored clinically. [30]

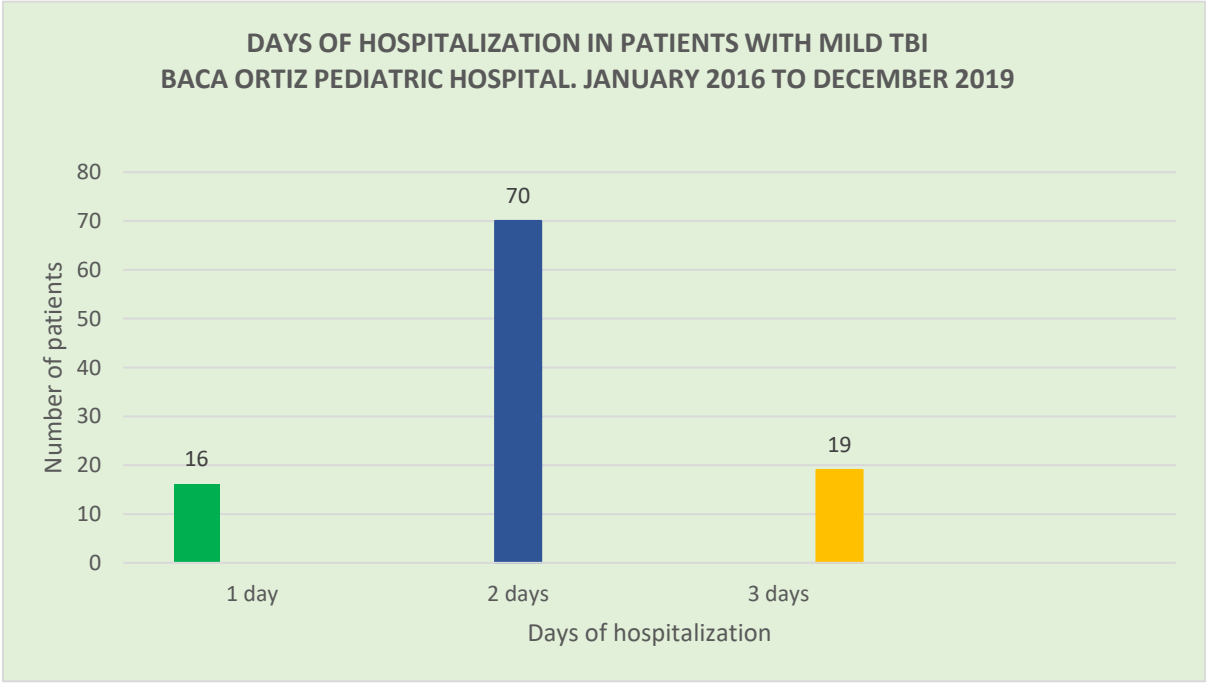


Fig 6. Days of hospitalization for mild head trauma in patients of the Neurosurgery Service of the Baca Ortiz Pediatric Hospital, Quito-Ecuador, 2016-2019. *(**Source**: Medical records of the Statistics Department of Baca Ortiz Hospital)*

The Baca Ortiz Pediatric Hospital is a national reference center for children in Ecuador, and therefore, a hospital where all types of pathologies are treated, which makes it possible to obtain data that allows us to demonstrate the reality of hospital care in our environment, perform its comparison with the countries mentioned throughout this study, and even to contrast them with previous national studies, favoring the identification of problems of a social nature that are related to the incidence of cases.

CONCLUSION

After carrying out this study and based on the data obtained, it is established that mild head trauma is one of the main causes of pediatric hospital consultation in our environment, most of it occurs in male patients of preschool age, as a consequence of falls in the home during the work activity of their parents, times in which they do not have the required care for their children, and they are under the supervision of third parties who perform caregiver functions, which in many situations favor periods of non-observance and therefore condition the development of this kind of trauma.

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Disclosures

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