



## Social and Epidemiological Aspects of Traumatic Brain Injury

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**Abstract:** The review indicates that traumatic brain injury remains one of the most urgent medical problems due to its high prevalence, high level of temporary disability, disability of victims, and significant mortality. Therefore, the study of various aspects of traumatic brain injury has not only medical, but also socio-economic significance. The incidence of TBI varies in different regions of our country and abroad, depending on many factors-age, time of day, and the mechanism of injury. Studying the epidemiology of traumatic brain injury is a necessary basis for organizing rational care for victims and developing adequate measures for the primary and secondary prevention of damage to the central nervous system.

**Keywords:** craniocerebral trauma, epidemiology, social-economic aspects.

Craniocerebral trauma remains one of the urgent problems of medicine both in our country and abroad. This is due to its high prevalence among the population, the high level of temporary disability and disability of victims, significant mortality, as well as the fact that it is more common in young and middle-aged people, i.e. in the most active part of the population in labor and social relations. In the Uzbekistan, death as a result of injuries ranks second, among the working-age population it is the leading cause of death, and among the causes of disability of the population due to injuries it comes out on top, the mortality rate from severe TBI is 60-80% or more.

In developed countries, injuries in the structure of causes of death of the population follow cardiovascular and oncological diseases, and TBI ranks first in terms of total economic, medical and social damage to society [2-4]. The continuing growth of motorization, mechanization, unfavorable criminal situation, bad habits, social and psychological tension in society lead to an increase in the frequency of injuries among the population, and injuries to the skull and brain account for more than a third of all injuries [2, 5, 6] and increase annually, according to WHO, by at least 2 % [1, 3]. Therefore, further study of various aspects of craniocerebral trauma does not make sense not only medical, but also socio-economic significance [3, 4, 7]. To obtain information about the true prevalence of TBI, specially organized population studies are conducted, which allow us to take into account all cases of traumatic brain injury by the population living in a certain territory. The incidence of TBI varies in different regions of our country and abroad, and depends on many factors — It is more often caused by incomplete registration, due to the lack of registration of victims, and various methods of fixing the injury. Most authors indicate that TBI is more common in men than in women. According to various data, the male/female ratio among patients with TBI ranges from 2: 1 to 3:1 [8, 9], 4:1 and more [10]. The greatest disparity in the prevalence of traumatic brain injury between men and women, which exceeds the average, is detected in the age groups of 20-24 years and corresponds to a ratio of 1:4.27 [7], i.e., according to statistics, men receive this type of injury two to four or more times more often than women in almost all age groups, with the exception of groups older than 70 years. The average age of the victims is from 23 to 39.6 years, which is of socio-economic importance due to the temporary or permanent disability of the most active part of the population [9]. It is more often mentioned in the literature that the highest level of injuries is observed in men and women aged 20-40 years, which is up to 65 % of the total number of victims [11]. In recent years, the proportion of patients older than 60 years in the structure of traumatic brain

injury has been increasing [12]. Special attention should be paid to the fact that TBI becomes heavier in elderly and senile patients due to such factors as fragility of the skull bones, reduced hydrophilicity of tissues and reactivity of the vascular wall. Vision and hearing are weakened, orientation worsens, and the reaction to a dangerous situation decreases. All this leads to a slowdown in the psychomotor response, which is reflected in the frequency of injuries in the elderly and senile age. The dynamics of TBI cases over the course of a year, week, or day is important in planning an emergency neurosurgical service. A major impact on the level of domestic, street and transport injuries is caused by the poor organization of children's recreation (in summer), sidewalks and roadways (in winter). In this regard, there are seasonal fluctuations in injuries. The most traumatic period is from May to September. The minimum number of craniocerebral injuries occurs in the winter-spring period: January-March [13, 14]. On different days of the week, the frequency of getting a traumatic brain injury also changes. Thus, according to K. V. Shekhovtsova et al. [13], TBI was more often observed on Saturday, Sunday and Monday. Among the environmental factors that determine the frequency and severity of injury, the time of day is significant. During the day, the maximum (46.9 %) of criminal TBI falls on the time from 20 to 1 hour, transport (44.4 %) — from 15 to 22 hours. The main part (76.7 %) of domestic and other TBI is relatively evenly distributed from 10 to 22 hours. It follows that the most acute period of TBI, when complications most often develop, occurs at night [13]. According to K. V. Shekhovtsova et al. [15] and O. A. Kolesnik et al. [16], it is confirmed that the second half of the day is the most traumatic, with a peak from 20 to 22 hours. Most authors note that the number of people who applied for medical care was minimal from 0 to 6 hours [16, 17]. Alcohol abuse is one of the leading causes of injuries, both isolated and combined. The incidence of injuries in those who abuse alcohol is 2.3 – 3 times higher than in those who rarely use or do not use alcohol at all. People under the influence of alcohol should be considered as a high-risk group in terms of the possibility of getting a TBI, as they often lose control of their actions. The presence of alcohol intoxication significantly worsens the course of TBI and often complicates timely diagnosis, it becomes difficult to conduct anesthetic and resuscitation measures, and there are complications when taking certain groups of medications. As patients recover from alcohol intoxication, the anamnesis and diagnosis are clarified [18]. The occurrence of alcoholism is more associated with socio-psychological factors than with a hereditary predisposition [19]. There is no consensus in the literature about the proportion of TBI victims who were injured while intoxicated. According to both domestic and foreign authors, the combination of alcohol intoxication with injury is from 12.8 to 70 % of cases. However, all authors agree that the data on the presence of alcohol intoxication in TBI are clearly underestimated, since such patients usually seek medical help on the second or third day after injury, when there are no obvious signs of alcohol intoxication [8, 10, 14]. Patients with low social status and alcohol abusers make up the bulk of those who have suffered a traumatic brain injury repeatedly (two or more times), which is explained by more frequent domestic incidents [13]. Repeated severe traumatic brain injury differs from primary severe TBI in more severe clinical manifestations and course, which leads to higher mortality rates for all types of traumatic brain injuries, both during surgical and conservative treatment. The data presented indicate that in males, severe repeated TBI was observed 5 times more often than in women. A characteristic feature is the prevalence of repeated severe TBI at the age of 25-54 years — 75 % of all repeated injuries [20]. Social status analysis shows a higher incidence of TBI in non-working patients — 59.9 % [10]. From the point of view of injury prevention, it is important to analyze the circumstances of injury. The causes of traumatic brain injuries vary significantly depending on social, geographical, weather, demographic and other factors. During transport accidents, quite often several people are injured at once. It is obvious that there is a need for a complete understanding of road neurotrauma and the current level of the system of providing medical care to victims [7, 24]. Polytrauma has become a characteristic category of injuries for modern road traffic injuries. Combined TBI is characterized by simultaneous damage to the brain, which leads to a violation of the highest regulatory activity and internal organs, musculoskeletal system, spinal cord, etc. Currently, in terms of the frequency of occurrence and severity of the course, combined craniocerebral injuries occupy a leading place among peacetime injuries and reach 68-91.6 % of all injuries [6, 24, 25]. A characteristic feature of combined TBI is the atypical clinical course of TBI and extracranial injuries. The presence of traumatic shock and blood loss contributes

to the development of pseudocompression and pseudodislocation syndromes [26]. Worldwide, both the prevalence of this type of injury and its mortality rate continue to increase. At the same time, trends in the prevalence and mortality of TBI in different countries of the world differ significantly. In countries with a high per capita income, as a result of the development and application of national programs to reduce injuries, achievements in the organization of medical care in recent decades, there has been a constant reduction in the number of injuries and deaths from it [22, 23]. In low-income countries, polytrauma continues to grow, adding to already complex medical and social problems [27]. The issues of treatment and reduction of mortality in patients with concomitant traumatic brain injury are one of the urgent problems of emergency medicine [5, 24]. On the first day, it is difficult to differentiate between a traumatic brain injury and establish the predominance of its or skeletal injury in severe concomitant TBI. Patients require constant monitoring, intensive care, diagnostic and therapeutic measures. The outcome of the injury depends on the completeness of the care provided on the first day, and especially in the first 6 hours [28]. All the studies that are being conducted affect the structure of traumatic brain injury. Mild closed craniocerebral injuries, which include concussion and mild brain contusion, make up the main part of cerebral injuries, and concussion in their structure takes 63% of the total number of cases of concussion. 90,5 % [11, 13, 15, 16, 29]. In the United States and Europe, mild brain injury (mild brain injury), which is based on SGM, also accounts for 60 to 90 % of all victims with TBI [30]. Analysis of the main statistical indicators suggests that in recent years there have been quantitative and qualitative changes in the structure of traumatic brain injury, the number of victims with severe, life-threatening injuries is increasing. damage [31]. Thus, Y. Ermolaev et al. [32] report that moderate TBI occurs in 25.1%, severe in 10.3%, and according to S. V Dyadyk et al. [33], severe TBI ranged from 16.9 to 18.1%. According to A. S. Mustafayeva et al. [34], severe traumatic brain injury in 50-100% of cases is accompanied by subarachnoid hemorrhage, but there is no direct relationship between the severity of TBI and the degree of SAH massiveness, so it is impossible to judge the severity of the injury only by the degree of SAH. Among all TBI, closed trauma prevailed (82-91%), less often – open trauma (9-15. 1% of victims) [11, 29]. According to V. G. Valerko et al. [35], closed trauma of the skull and brain reached 95 %. In severe TBI, the frequency of open and penetrating injuries increases, and in 47.5% of patients with severe brain contusions, TBI was open in nature. Upon admission to the hospital, 62.8 – 73.2% of the victims were assessed as having a satisfactory general condition. In the state of moderate severity, 18.2 – 20.7% were hospitalized. In 4.2 – 7.9% of cases, the condition was assessed as severe and extremely severe, and terminal in 0.1 – 1.9% of patients [15, 16]. The level of impaired consciousness at admission of victims with TBI was characterized by the following data: clear consciousness was observed in 70.4 – 79.7 %, moderate deafness in 16 – 14.8 %, deep deafness in 4.9 – 1.9 %, sopor 2.8 – 1.3 %, in coma of various degrees 2.8 – 2.2 % [15]. The socio-economic and political crisis in Russia has affected all aspects of the life of our society, including the state of the health care system and the demographic development of the country, which is characterized by the process of depopulation, primarily due to the excess mortality of working-age men mainly from criminal trauma and accidents. Injuries rank third among all causes of primary disability and mortality, and injuries rank first among the causes of death in people of working age. TBI and other injuries account for almost half of Russia's labor potential losses in terms of the number of people who are under-lived due to premature death, exceeding those from diseases of the cardiovascular system by 4.5 times [7, 17]. According to some authors, among the causes of increased mortality, a special place is occupied by the unsatisfactory state of the health care system, namely, a low level of quality and efficiency of medical care, and the basis for improving it can be the study, control and regulation of the quality of medical care [36]. Traumatic brain injury is characterized by high lethality. One of the reasons is that the nature of craniocerebral trauma has significantly changed in recent years, among which the proportion of severe brain contusions and intracranial hematomas has increased [30]. The mortality rates of the population with traumatic brain injury, obtained by different authors in different regions, may differ several times. According to W. I. Studel et al. [22], in the developed countries of the West and the United States, the mortality rate of the population from TBI ranged from 0.09 to 0.194%. From 0.2-0.3% according to A. Vasquez-B. et al. [37]; up to 0.4-0.61% according to the studies of R. Kh. Karimov, K. V. Shekhovtsova et al. [7, 14, 15]. According to foreign sources, the mortality rate can reach 0.88 %.

The results of the study indicate a constant increase in the mortality rate over the past decades, which is confirmed by data on hospital mortality. If at the end of the 80s of the last century the hospital mortality rate was from 2.3 to 3 %, then in the 90s and in our time it averages from 3.9 to 5,3 % [2, 15, 32]. According to V. G. Valerko et al. [35], hospital mortality in TBI reached 6.23 %. The highest mortality rate in cases of traumatic brain injury is observed in the young working-age group, in the group from 21 to 40 years. According to R. H. Karimov, S. Dyadyketal. [7, 33], the highest mortality from TBI was recorded in the age group of 41-60 years. A relatively large number of TBI with a fatal outcome (up to 18 %) is observed annually in senile age-over 70 years [14, 15]. The significance of age as a factor that significantly worsens the prognosis of the outcome of treatment for patients with severe TBI has been noted by many foreign and domestic authors [38]. In all studies, the mortality rate in men exceeds that in women. Thus, according to G. A. Grigoryan et al. [39], the mortality rate among men was two and a half times higher than that among women. According to the research of R. Kh. Karimov [7], the mortality rate in TBI in men is three times higher than in women; and according to K. V. Shekhovtsova et al. [14, 15], it is four times higher. High mortality from TBI among men is due to the fact that they are more often involved in the field associated with an increased risk of injuries: military, law enforcement officers, transport workers, heavy industry and construction. At the same time, some studies indicate that affected men are more likely to be in a state of alcoholic intoxication [40]. Thus, according to P. Zador [41], the severity of the injury correlates with the alcohol content in the victim's blood. K. V. Shekhovtsova et al. [14, 15] report that the proportion of deaths at the scene and on the way to the hospital was 60.4% of the total number of deaths from TBI. Among those killed at the scene, the first place is occupied by transport injuries — 59.8 %. Among them, motor vehicles predominate — 92.4 %. According to R. Kh. Karimov et al. [7], prehospital mortality in TBI was 60.9%, and among those who died from TBI, 57.8% died without medical assistance. Based on the materials of B. N. Davlatov et al. [24], the majority died at the scene or during transportation to a medical facility (75.7 %). Some of them received injuries that were incompatible with life, and in some cases, first aid measures were required. Analysis of the causes of fatal TBI in general, according to R. Kh. Karimov [7], G. A. Grigoryan et al. [39], shows that the main cause of them is transport trauma, and the mortality rate in transport TBI reaches 26.4 %. Pedestrians are killed 2.33 times more often than victims who were in the car. In the literature, there is rarely information about mortality due to a low level of quality of medical care, both at the pre-hospital and inpatient stages. For a real understanding of the health situation, it is necessary to study the quality of medical care based on an analysis of deaths, complications and their causes that depend on medical professionals or are caused by a lack of necessary resources, lack of organization and lack of medical standards. Among the survivors, disability is significant, up to 30-35 per 100 thousand population [42], the leading causes of which are mental disorders, epileptic seizures, gross motor and speech disorders. Taking into account that more than half of patients operated on for intracranial hematomas may experience various complications and residual phenomena leading to complete or partial disability, the great social significance of the problem becomes obvious. There is a high level of disability after a traumatic brain injury, mainly in people of the most able-bodied age. The patient's quality of life worsens, his ability to work decreases, often leading to permanent disability. At the same time, in the overall structure of injuries, CNS dysfunction accounts for up to 30 – 40%, and in the structure of disability causes up to 25 – 30 %. By the end of the 20th century, the number of disabled people due to brain damage reached 2 million in Russia, 3 million in the United States, and about 150 million people worldwide. These figures are clear evidence of the scale of a formidable social phenomenon. Recently, there has been a steady increase in victims with acute traumatic brain injury and at the same time the number of patients receiving inpatient medical care is decreasing. On the one hand, the mandatory hospitalization of a group of patients with mild traumatic brain injury has led to the fact that in neuro-surgical departments the number of victims with concussion in some regions reaches more than 90% of those hospitalized. On the other hand, there is a lack of unified tactics in relation to patients with mild TBI, underestimation of the degree of possible consequences they lead to a rather high degree of disability. According to some studies, this figure reaches 10-20 % [42]. Studying the epidemiology of traumatic brain injury is a necessary basis for organizing rational care for victims and developing adequate measures for the primary and secondary prevention of damage



to the central nervous system. The development of modern medicine is closely connected with the unification of concepts, terms and classifications, the development of unified protocols for clinical trials, diagnosis, treatment and prognosis. The introduction of treatment standards, a unified diagnostic algorithm, and victims, combined with improvements in the organization of PMT care in Western countries over the past three decades, has reduced the death rate from PMT by about 10% every 10 years. Such results were not given by any medication that appeared during this period of time. Standards and recommendations are guaranteed to provide each patient with this pathology with the optimal treatment for today in order to achieve recovery or the maximum possible positive result [14, 15]. However, a significant part of doctors reject excessive standardization of treatment tactics and advocate the principle of a step-by-step approach to the treatment of victims, taking into account the severity of the condition, as well as the nature of injuries, considering it necessary to develop a tactical treatment regimen individually [6, 27]. It is necessary to provide organizational, technological and financial support for medicine that raises the overall level of care for the population. Introduction and more adequate participation in the development and implementation of international standards and recommendations, primarily on neurotrauma, is one of the priorities of modern Russian neurosurgery. The disadvantages in the organization of neurotraumatological care are: unjustified delays of patients with acute TBI in the emergency departments of hospitals with a delay in additional instrumental studies; unjustified refusals to hospitalize patients with an established diagnosis of acute TBI; unjustified delays in performing intracranial operations; defects in the work of neurosurgeons and anesthesiologists during intracranial operations; insufficient postoperative care for the patient; lack of proper treatment of the patient. monitoring of patients with mental disorders by medical personnel of medical institutions; poor-quality management of medical documentation; insufficient financial and logistical support for neurosurgical departments. Defects in diagnostic and surgical tactics in the treatment of patients with acute TBI are primarily defects in the organization of neurotraumatological care [7, 13, 26, 41]. Modern recognition of the nature and severity of brain injuries in both isolated and combined TBI is extremely difficult, with diagnostic errors reaching 25-30 % [9]. The error rate largely depends on the life expectancy of the affected person: if patients die shortly after admission to the hospital, it is 50% during a clinical examination, and if the life expectancy of patients is up to 24 hours, it decreases to 20 %. At the pre-hospital level at the same stage, the indicator of organizational and medical errors reaches up to 55 %. The occurrence of errors is also associated with the profile of the medical institution where the victims were taken. In urban hospitals and specialized neurosurgical hospitals, concomitant extracranial injuries are most often not diagnosed; a complete coincidence of clinical and forensic diagnoses was noted only in 47.6 % of cases. In this regard, Yu. V. Popov et al. [43] consider it necessary to hospitalize or urgently transfer all victims with TBI to specialized medical institutions. However, the hospitalization of victims in non-core hospitals cannot fully explain the high proportion of diagnostic errors and mortality. Currently, advances in medical and computer technology have significantly changed the possibilities of diagnostic techniques used in modern neurotraumatology, and the practice of hospitalizing patients with mild traumatic brain injury for long-term follow-up is increasingly being questioned due to the spread of such a convenient diagnostic method as computed tomography of the brain. In the absence of any traumatic changes on a CT scan of the brain, there is no need to observe the patient for a long time in a hospital, since the probability of late complications is low.

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