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POST-TRAUMATIC STRESS DISORDER IN CHILDREN AND ADOLESCENTS: REVIEW OF THE RESEARCH HISTORY, EPIDEMIOLOGICAL DATA AND ETIOLOGICAL FACTORS

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Children and adolescents present a vulnerable group for developing post-traumatic stress disorder (PTSD) after stressful and traumatic events. However, it is evident that the traumatic event is important but insufficient factor for PTSD development in trauma exposure in identical circumstances, and that there are other,indirect factors important for the occurence and maintenance of the disorder in children and adolescents. It is a complex interplay of external events and inner psychological and physiological reactibility, vulnerability and resilience, and external psychosocial support. Statistics confirms that the prevalence is significantly higher in the circumstances of war and conflicts, where children and adolescents are the direct victims or witnesses to the violence. Risk factors for PTSD, as well as pathogenesis are widely understood, but it is still unclear what are the key differences that lead to this disorder in some people, and not in everyone in the same traumatic circumstances. *Acta Medica Medianae 2017;56(2):57-63.*

Key words: *post-traumatic stress disorder, children, adolescents*

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Introduction

In the fifth edition of Diagnostic and Statistical Manual of Mental Disorders of the American Psychiatric Association (further as DSM-5), post-traumatic stress disorder (further as PTSD) is described as a syndrome that appears after direct or indirect exposure to significant physical or sexual violence, threats to the body integrity or death of family members (1). The existence of a traumatic event makes a key difference in comparison to other syndromes. Unlike the depression occurence, where the sense of the loss does not have to be accompanied by a real "loss event", PTSD is always precipitated by a traumatic exposure (2). What exactly defines a traumatic event is still a subject of debate, but it is clear that this has to be an event that goes beyond the everyday stressful experience.

In children and adolescents psychological phenomena that appear as a resault of traumatization may vary or not be fully manifested because of the way the children experience symptoms of re-experiencing the traumatic event, or the emotions toward the traumatic event. The reason is the underdevelopment of abstract thinking and the small capacity for verbal expressiveness, therefore PTSD in children and adolescents may be undiagnosed and inadequately recognized (3). Studies have shown that the criteria must be behaviorally based and developmentally sensitive, especially when it comes to pre-school children (4).

Pre-school children present a particularly vulnerable group and they can be exposed to different types of psychological (emotional), physical and even a sexual trauma. Generally speaking, the term traumatization refers to the physical and emotional reactions caused by events that are life-threatening or the events that caused impairment of physical or psychological integrity of the child and adolescent, or of a person of importance for the child and adolescent. The main precipitating factors for PTSD include: various forms of abuse and neglect (5), including rape, being present to the interpersonal violence, especially family violence (6), traffic accidents, natural disasters (7), exposure to war events, beeing present to the dogfights, animal slaughter, animal attacks, invasive medical procedures (8). Life in multiethnic communities carries the risk of

trauma caused by ethnic conflicts, and the poverty intensifies almost all forms of children abuse.

Adolescents are exposed to a greater risk of traumatization (a larger number of potentially traumatic situations), primarily within the wider social community (9). Schoolchildren (preadolescents) are under an equal risk of being traumatized in the family environment as well as in a wider social community, and the preschoolers are at a greatest risk in the home environment (10).

The history of the research of ptsd in children

The first major study on adolescents came after the accident when a cruise-ship "Jupiter" sank in 1988. Five children were killed and, of 200 survived, about 52% had post-traumatic stress reactions. Most children recovered within the first week, one-third within the first month, while 25% of children continued having symptoms within five years (11). Monitoring studies confirmed that a total of 15% of the surviving children had met criteria for PTSD even eight years after the event. In addition to PTSD, depression and anxiety disorders were common, too (12).

Before the "Jupiter", in the Welsh village of Aberfan in 1966, the local mine collapsed, and a mudslide triggered an enormous amount of earth, that came tumbling down towards the village, where the local school was first to be destroyed. One hundred and sixteen children were killed instantly from the initial blow and suffocation. In the follow-up study after 33 years (13), it was found that 29% of survivors had PTSD. The study itself emphasised the importance of therapy or its absence, that result in long-term and serious consequences for children.

Also, before the disaster of Jupiter, "Chowchilla" hijack was mentioned as an important event which shoke America in 1976. In July, 26 children were kidnapped in their school bus, took to the buried truck trailer and placed into it for 16 hours. Three years after the kidnapping, the follow-up study was carried out and it was found that children were traumatized, had panic attacks and nightmares about the kidnapping. Twenty of them were continuously frightened with a possibility of being kidnapped again, avoiding the bus and car drive, dark places, the wind, the dogs and the „hippie" person (14). Even 25 years after the event, many of them continued to show symptoms of trauma, including depression and drug abuse. Some of them worked in prisons, which was explaned by some psychologists as a need to "do something that lets you control others" (15).

The earthquake in Armenia in 1988, left 500,000 people without their homes. Follow-up studies have shown the importance of a dose-dependent stress, i.e. that the degree of direct exposure to the traumatic event is of significance for PTSD development in children. Thus, it has been shown that children who were 75km away from the epicenter developed PTSD in 26% of cases, children 35km away from the epicenter developed PTSD in 71%, and children at the epicenter developed PTSD in 95% of cases. High prevalence of major depressive episodes went together with PTSD (16). Eighteen months after the earthquake, half of the children ware still meeting the criteria for PTSD (17).

"The school hostage crisis" in Beslan, Chechnya, in 2004, shed a new light on studies of PTSD in children and their parents (18). After the intrusion of 32 terrorists into the school (on a starting school celebration day), the terrorists held 1,300 hostages (children and adults). In the course of three days, hundreds of children had been held in the gymnasium filled with explosive, attending the beating and killing of family members, friends and teachers. On the third day crisis ended in extreme violence and killing of 330 hostages, of whom 186 children. Studies have shown that after this event, as many as 88% of the children showed behavioral problems and very serious acute stress reactions (irritability, aggression, sleep disturbances, loss of appetite, separation anxiety and behavioral regression). Twenty-nine percent of children developed PTSD, and research showed that the most important risk factors were the degree of direct exposure, younger age, the loss of close person and the parents' reaction (19).

UN Children's Fund (UNICEF) during the war in Bosnia collected a sample of 2,976 children aged 9 to 14 years, who were exposed to war crimes. The intensity of the psychological distress was linked to the type of exposure. Girls were more affected with PTSD than boys. Age was of importance only in certain age groups (20).

Epidemiological data

There is an obvious limitation of epidemiological data about PTSD in the general population. It is not a disorder that can be predicted in epidemiological studies and by biological indicators, because it is caused by social circumstances and unpredictable natural disasters.

Car accidents present the main cause of post-traumatic stress disorder (PTSD) in children in industrialized countries (21). The researches show that six months after a car accident, between 25-30% of children met criteria for PTSD diagnosis, and even 78-82% of children that had previously fulfilled diagnostic criteria for acute stress disorder (22, 23).

It is estimated that in the UK at any time 1% of children and young people have PTSD, which represents a significant epidemiological data for each society (24). In The United States, 9 of 1,000 children is registered as traumatized by physical abuse or neglect every year, and a lifetime prevalence of PTSD, based on statistical data from the United States, is 8% (25). Representative studies indicate that up to 68% of

children in the community have at least one potentially traumatic experience to the age of 16, and even 37% more than one (26). However, the incidence in children varies depending on different factors: the type of trauma, presence of stressors (number and intensity), the parents' reactions. Based on meta-analysis, (probable) overall prevalence three years after the traumatic event ranges from 4.5% (the South Asian tsunami in 2004) to 21% twenty years after the earthquake in Armenia in 1988 (27).

There are great differences in the prevalence of PTSD in different world regions. The lowest rate is in Germany (0.4% for adolescents aged 14-24 years) (28), and the highest prevalence (43.8%) is in the Algerian female adolescents over the age of 16 (29). Statistics confirms that the prevalence is higher in the war conflict areas where children and adolescents are the direct victims or witnesses tothe violence. It was found that the younger children, aged 9-11 years, recover more slowly from children aged 15-18 years (30).

Statistical orientations indicate that about one-third of children have a traumatic experience before adulthood (from 14-43%); 3 -15% of girls and 1-6% of boys can be diagnosed with PTSD. However, studies that have been done on the high-risk population of children and adolescents showed significantly higher and more stable prevalence of the disorder. Almost all children who witnessed the murder of their parents develop PTSD; up to 90% of sexually abused children, too (31), 77% of children exposed to gunfire at school, and 35% of children in urban areas exposed to violence in the community.

PTSD affects people of all ages, with children and the elderly being the most vulnerable. PTSD is almost twice as common in females (32), but there are studies that challenge this assertion (33). Men are more often victims of physical, and women of sexual traumatization. Boys who have been sexually abused, instead of PTSD often develop externalized symptoms in the form of behavioral disorder, and girls often develop internalized symptoms in a form of depression or anxiety. PTSD is more common in the lower socio-economic classes where there is an increased risk of repetitive traumatization (abuse, parental personality disorder, parental criminal behavior, multi-member families with conflict relations).

The intensity of PTSD symptoms significantly decreases during the first two years and do not show an upward trend five years after a single traumatic event (32).

Etiology and the risk factors

PTSD is a complex disorder, which is not only a result of traumatic experience, but presents a complex interplay of external events and inner psychological and physiological reactibility, vulnerability and resilience, and again, the impact of external factors, primarily the psycho-social support. It is evident that the traumatic event is important, but insufficient factor for the development of PTSD (34). The key concept of PTSD is that every person, especially child, can develop the disorder. A number of possible impact factors have been reported.

Individual vulnerability. The elevated level of anxiety and neuroticism, low IQ and the existence of other mental health problems are important individual predisposing factors that increase sensitivity to traumatic experiences (35). The exposure to one traumatic event can have a profound and long-term effect, but half of the victims recover within three months. The second half still has PTSD symptomes for one year or longer (32).

Exposure to multiple traumas. Child sexual abuse is the most studied form of multiple traumatization of children. The reactions that follow multiple sexual assaults can be similar to those that accompany any other type of trauma, but they differ from them in a specific loss of trust, because they are commonly abused by close person (36). It has been shown that the multiple traumatized children are more vulnerable to other single trauma (37).

Direct threat (dose-dependent stress). The level of children's belief that their life is directly threatened and the belief that they are going to die affect the level of fear in relation to the traumatic event, and therefore the greater likelihood of developing PTSD. It has been shown that the presence to the traumatic death or mutilation of the body of another person represents a high risk for developing psychopathological manifestation (38).

Developmental level. Younger children are less able to cognitively process the traumatic event, to understand its significance, and to express verbally their understanding of traumatic experience. School children older than eight years can better understand the far-reaching consequences of traumatic events, and, as they grow older, their reactions become more similar to the reactions of adults (39).

The connection with the trauma perpetrator. When the trauma is caused by a person, not an unfortunate event or natural disaster, the greater is the likelihood of PTSD appearing. Being traumatized by the well-known person whom the child had trusted, undermines the child's sense of security and trust (40).

Parent's reaction. The reaction of the child's environment, primarily parents, also carries a risk for secondary retraumatization of the child (41, 34). Parent's emotional stability (the ability of parents and child guardians to control and manage their own emotions and to be emotionaly available to the child after the trauma), is the most important protective factor from developing disorders and retraumatization (33). Child's reaction to a traumatic event may have less importance than the reaction to the change of the mental state of the mother to which the child is

closely related to (42). Extreme reactions of parents who themselves did not participate the event and do understand that their child has been exposed to trauma, can cause a peritraumatic stress or reaction of the parents, with all the characteristics of PTSD (43). The creation of a vicious cycle is possible too, when inadequate emotional and social support to the child, longitudinally enhances emotional and social isolation of adults and the child, as well as the intensity of PTSD symptoms (44).

The existence of previous psychiatric disorder. The existence of symptoms of other psychiatric disorders, during the period of trauma increases the likelihood of PTSD (45). Particularly vulnerable are children with an anxiety disorder (symptoms of fear and avoiding behavior, emotional tension, increased cortical arousal and insomnia), coexisting depression, pre-existing PTSD and substance abuse (45).

Traumatization leads to global physiological dysregulation (neuroendocrinal, biological, psychological, developmental), with high potential for long-term emotional and behavioral consequences. Mechanisms may be different, wheather if the unfavorable circumstances became an integral part of the development, or that thay act over the various conducting neural pathways in the central nervous system, for example by increasing the cortisol level in the brain (46). This kind of disturbed balance, leading to the deprivation of the mother-child relationship, has a bad influence on the development of affective attachment, and further development of emotional security, as well as to the maturating motivational mechanics, self-development, and it can be concluded that there is an extremely adverse effect on the later development of interpersonal relationships (38).

Imaging studies in children have shown no characteristic hippocampus reduction after trauma (47), but they did indicate a reduction of the whole brain mass and the corpus callosum mass, which indicates the impact of trauma in the overall development of the brain. On the other hand, studies on twins suggest smaller premorbid hippocampal volume to be a predisposing factor for developing PTSD after trauma (46).

Psychological learning theories emphasize the information processing through the neural circuits, and the usual ways of learning in the development of PTSD. In patients with PTSD, there is a large number of engrams about the fear stimuli that become easily accessible to external and internal stimuli (48). According to the model of classical conditioning of PTSD, fear becomes associated with the object of trauma and time-spatial stimuli of current trauma, and as time goes by through a process of generalization also with stimulans in symbolic relation to the trauma (49)

Resiliency factors

Resilience or in other words resistance to trauma is the ability of the child to adapt to discomfort. Resilience research in adolescence have identified its essential components: genetic, biological, cognitive, interpersonal (50), i.e. that there is a positive correlation to: the intelligence level, verbal ability to talk about the experience, especially in an emotional way (alexithymia is opposed to it), ability to understand others (general cognitive development, especially empathic abilities), the ability to seek assistance from other s (45).

Conclusion

PTSD is a psychological disorder that cannot be predicted by epidemiological studies and biological indicators, because it depends on the social circumstances and natural disasters. The existence of a traumatic event makes a key difference in comparison to other syndromes. PTSD significantly disables children, regardless of affiliation to the developed or underdeveloped countries. Statistics confirms that the prevalence is significantly higher where millitary conflicts are present, and where children and adolescents are the direct victims or witnesses to violence. Risk factors for PTSD, as well as pathogenesis, is widely understood, but it is still unclear what are the key differences that lead to disorder in some people, and not in the others, in the same traumatic circumstances.

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POSTTRAUMATSKI STRESNI POREMEĆAJ KOD DECE I ADOLESCENATA – PREGLED ISTORIJATA ISTRAŽIVANJA, EPIDEMIOLOŠKIH PODATAKA I ETIOLOŠKIH FAKTORA

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Deca i adolescenti predstavljaju vulnerabilnu grupu za razvoj posttraumatskog stresnog poremećaja (PTSD) nakon stresnog i traumatskog događaja. Međutim, evidentno je da je traumatski događaj važan, ali nedovoljan da bi se razvio PTSD u okolnostima izloženosti traumi u identičnim okolnostima, odnosno, da su i drugi, indirektni činioci, važni za pojavu i održavanje poremećaja kod dece i adolescenata. Radi se o kompleksnoj međuigri spoljašnjeg događaja i unutrašnje psihološke i fiziološke reaktibilnosti, vulnerabilnosti i rezilijentnosti, kao i spoljašnje psihosocijalne podrške. Statistika potvrđuje da je prevalencija značajno veća tamo gde su prisutni vojni konflikti i gde su deca i adolescenti direktne žrtve ili svedoci nasilja. U velikoj meri se razumeju faktori rizika za nastanak PTSD, kao i psihopatogeneza, ali je još uvek ostalo nejasno u čemu su ključne razlike koje dovode do poremećaja kod obolelih i neobolelih u istim okolnostima traumatizacije. *Acta Medica Medianae 2017;56(2):57-63.*

Ključne reči: *posttraumatski stresni poremećaj, deca, adolescenti*