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PEDIATRIC INJURIES RELATED TO CHILD MALTREATMENT

Maja Zečević[1] Dragoljub Živanović[1,2] Ana Bosak Versić[3] Patricija Jakljević[3] Tamara Adamović[1] Dragana Lazarević[4] Vesna Marjanović[2,5] Jelena Lilić[5]

[1]Clinic for Pediatric Surgery, University Clinical Center Niš, Niš, Serbia [2]Department of Surgery and Anesthesiology and Reanimatology, University of Niš Faculty of Medicine, Niš, Serbia [3]Department of Pediatric Surgery, Clinical Hospital Centre Rijeka, Rijeka, Croatia [4]Department of Pediatrics, University of Niš Faculty of Medicine, Niš, Serbia; Clinic of Pediatrics, University Clinical Center Niš, Niš, Serbia [5]Clinic for Anesthesiology and Intensive Therapy, University Clinical Center Niš, Niš, Serbia

Violence against children is a complex socio-medical phenomenon with potential lifetime consequences. Therefore, it is very important to recognize the first signs of violence, as medical staff are quite often the only witnesses of child maltreatment. The aim of the study was to determine the types of abuse and neglect in the pediatric population, which children are most susceptible to, the kinds and severity of injuries, and the required management. A retrospective study was conducted on all patients admitted to two different hospitals due to suspicion of abuse and neglect, with the involvement of a social worker, over a six-year period. This study included 473 patients, whose average age was 8.03 ± 6.01 years; the majority of children were aged 0 to 3 years (35.0%), and 67.2% were boys. Of them, 82.4% were hospitalized because of injuries and other medical conditions caused by neglect. A total of 17.6% were hospitalized due to suspected abuse: peer violence was present in 59.3% of the cases, 22.1% of the children were abused by their parents, and the least number of patients were abused by unknown persons—18.6%. Minor injuries were present in 55.39% of the cases. In total, 232 children underwent surgical treatment due to injuries from abuse or neglect. The majority of children were neglected, not abused, and among the abused children, peer violence was predominant. The most susceptible to neglect and abuse were the youngest members of the pediatric population.

Keywords: child neglect, abuse, pediatric surgery

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Correspondence to:
Tamara Adamović
Clinic for Pediatric Surgery, University Clinical Center Niš
Bulevar dr Zorana Djinjića 48, Niš, Serbia
E-mail: tamara.pesic91@gmail.com

INTRODUCTION

Violence against children is a complex socio-medical phenomenon, based on the interaction of several factors, where many more hidden forms last a long time compared to severe, easily noticeable cases (1). Child maltreatment is the abuse and neglect that occurs to children under 18 years of age. It includes all types of physical and/or emotional ill-treatment, sexual abuse, neglect, neglect, and commercial or other exploitation, which results in actual or potential harm to the child's health, survival, development, or dignity in the context of a relationship of responsibility, trust, or power (2). In the USA, at some point in their life, one in four children experience some form of violence or neglect (3). In the Balkan countries, almost 70% of children were exposed to some form of psychological or physical violence during adolescence, more than 8% of children experienced sexual abuse at least once, 38% of children witnessed violence between adults in the household, and a quarter of children said they had been neglected at least once (4). Maltreatment in childhood is linked with the development of depressive and bipolar disorders later in life, even with an increased rate of suicidal ideation and suicide (5,6). Therefore, it is very important to recognize the first signs of violence; to educate medical staff to react because, very often, we are the only witnesses of child maltreatment and the only advocates for those children.

The aim of the study was to determine the types of abuse and neglect that are most present in the paediatric population, which children are the most susceptible to them, the types of the commonest injuries, and how severe injuries are that require management. Also, an additional aim was to define whether there was a change in the number of patients and days of hospitalization during the COVID-19 pandemic compared to other periods.

METHODS

This was a retrospective study of all patients admitted at two different hospitals due to suspicion of abuse and neglect over a six-year period (2015-2020). The first hospital is the Clinic for Paediatric Surgery, University Clinical Center Niš, Serbia, which covers a region of about 1,500,000 people, and the other is Clinical Hospital Center Rijeka, Pediatric Surgery Department in Croatia, with the region of approximately 450,000 inhabitants, but with extreme enlargement of the population during the summer period as it is a tourist destination.

A social worker was engaged in all cases, which was an inclusion criterion for the study. Patients from outpatient clinics were excluded from the study. Medical documentation was retrospectively reviewed, and the following data were first collected and entered into a Microsoft Excel® (Microsoft Office, Microsoft Corporation, Redmond, WA, USA) spreadsheet database: age, gender, place of residence, type of abuse or neglect, type of injury, management of injuries, and duration of hospitalization. The names of the patients and all other information were exclusively available to the researchers, with the aim to ensure the patient's anonymity. The hypothesis was tested at the $p<0.05$ level of significance. The data were analysed statistically: the Kruskal-Wallis test was used for comparison of the numerical value, while the Chi-squared test and Fisher test were used to compare the categorical features between the groups. All statistical analyses were performed using the R program (R Foundation for Statistical Computing, Vienna, Austria).

RESULTS

This study included 473 patients hospitalized in both centers (200 children from Niš and 273 from Rijeka); 318 of them were boys, and 155 were girls. There is a significant difference between the number of patients from Rijeka and Niš; 83.1% vs. 64.5% ($p < 0.001$). The distribution of hospitalized children per year is shown in Figure 1.

The gender and age distribution of abused and neglected children was as follows: aged 0-3 years: n = 166 (92 boys and 74 girls), aged 4-8 years: n = 81 (58 boys and 23 girls), aged 8-13 years: n = 74 (54 boys and 20girls), aged 13-18 years: n = 129 (99 boys and 30 girls). The average age for both genders was 8.03 ± 6.01 (minimum age—1.5months, maximum age—18 years), and the majority of abused and neglected children were aged 0-3 years (35.0%), with the

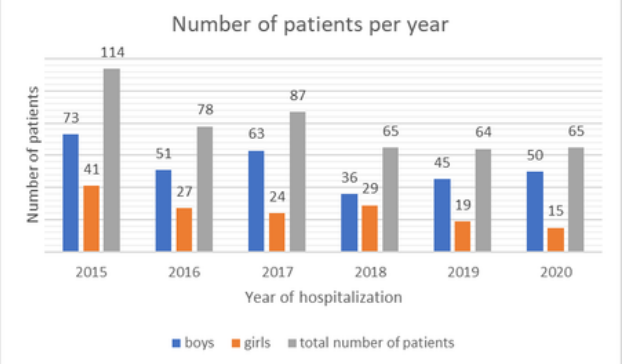

Figure 1. *The average hospitalization rate of children per year*

predominance of male gender in 67.2% of cases. Patients from the University Clinical Center Niš were significantly older—9.1 ± 6.16 compared to patients from the Clinical Hospital Center Rijeka—7.24 ± 5.77 ($p < 0.001$).

The majority of patients (75.1%) were from urban areas (n = 356; boys n = 243, girls n = 113). A total of n = 117 patients were from rural areas (boys n = 76, girls n = 41), while n = 41 children were from the Roma population (boys n = 27, girls n = 14). No patients from the Roma population were recorded at Clinical Hospital Center Rijeka; all were treated at University Clinical Center Niš. The total number of days of hospitalization (pediatric surgery departments and intensive care units) for all cases during the study was n = 2,643 days. The average duration of hospitalization per year is represented in Table 1. Minimal hospitalization was 1 day, and the maximal length of hospitalization was 61days for a neglected two-year-old girl who was severely burned by the open fire with 35% of her body surface covered with second and third-degree burns, including the burns in the throat and respiratory complications. There was no significant difference in the length of hospitalization when comparing the years before and during the COVID-19 pandemic in both centers ($p = 0,073$), or within each center (Niš—$p = 0$ .505, Rijeka—$p = 0.688$). However, the length of hospitalization was significantly longer in Niš compared to Rijeka ($p < 0.001$).

Minor injuries were present in the majority of patients, 262 of them (170 boys and 92 girls), and severe injuries were detected in 212 children (149 boys and 63 girls).Less severe injuries were more frequent in Rijeka than in Niš (59.7% vs 46.6% ($p = 0.007$), while sequelae after injuries were statistically more common in Niš (26.7% vs 3.0%, $p < 0.001$). Two hundred and thirty-two children underwent surgical treatment due to injuries from abuse or neglect—160 were boys and 72 were girls, in both centers. A statistically significantly larger percentage of patients underwent surgical treatment in Niš (66.7% vs 35.5%, $p <$ 0,001). No lethal outcomes due to physical abuse or neglect were reported in this study.

The total number of abused children was 87, and of whom 12 children were not only abused but also severely neglected (7 boys and 5 girls).Peer violence was present in 59.3%, 22.1% of children were abused by their parents, and the least number of patients were abused by unknown persons, 18.6%. The number of abused children divided by age group and gender is given in Table 2.

In the first group, comprising children aged from birth to 3 years of age, there were 9 cases of physical and one case of sexual abuse of a three-year-old girl; all abusers were parents or guardians. In the second group, with children aged from 44 to 7 years, there were four physical and one sexual abuse cases of a four-year-old boy who was forced to take off his clothes and was touched in the genital region by another boy. All abusers were peers, except in one case, where it was a parent. In the third group, aged 8 to 12 years, 9 children were physically abused, and all abusers were peers. In this age group were two cases of sexual abuse: one of a twelve-year-old girl abused by an unknown adult, and the other of an eight-year-old boy abused by his parent. In the fourth group, aged 13 to 18 years, all cases were of physical abuse made by peers in 38 cases, unknown persons in 13, and parents in 7 cases.

In this study, 82.4% of children (n = 390; 255 boys and 135 girls) were hospitalized in both centers because of injuries and other medical conditions caused by neglect. Demographic data are presented in Table 3. Neglect was more present in Rijeka compared to Niš (88.1% vs. 79.7%, $p = 0.019$).

Of the neglected children, 390 of them were injured (255 boys and 135 girls). Isolated injuries were present in 195 patients, and the most common were burns, seen in 93 patients. More than one body region was affected in 53 children, and the largest burn was 35% of the body surface, of the second and third degree. Frostbites (chil-

Table 1. *The average number of days of hospitalization per year*

Year of hospitalization	Both centers in total	Niš	Rijeka
2015	5.27 ± 9.10 2.0 (0.0 – 65.0)	6.54 ± 7.91 2.0 (1.0 - 27.0)	4.86 ± 9.46 2.0 (0.0 - 65.0)
2016	5.67 ± 7.27 3.0 (1.0 - 38.0)	7.88 ± 9.92 3.5 (1.0 - 38.0)	4.56 ± 5.29 3.0 (1.0 - 24.0)
2017	6.56 ± 8.29 3.0 (1.0 - 61.0)	7.39 ± 6.28 5.0 (1.0 - 23.0)	5.83 ± 9.76 3.0 (1.0 - 61.0)
2018	6.00 ± 6.32 5.0 (0.0 - 33.0)	6.41 ± 5.22 6.0 (0.00 - 30.0)	5.14 ± 8.25 2.0 (1.0 - 33.0)
2019	4.73 ± 5.88 3.0 (1.0 - 37.0)	5.79 ± 6.81 4.0 (1.0 - 37.0)	3.61 ± 4.49 2.0 (1.0 - 24.0)
2020	5.17 ± 5.83 3.0 (1.0 - 33.0)	5.57 ± 6.39 3.5 (1.0 - 33.0)	4.86 ± 5.43 2.0 (1.0 - 21.0)
p	0.073	0.505	0.688

Table 2. *The number of abused children divides by age group and gender*

Age groups in years	Total number	Boys	Girls
0-3 years of age	10	6	4
4-7 years of age	5	5	0
8-12 years of age	13	10	3
13-18 years of age	59	45	14

Table 3. *Demographic data of neglected children*

Age groups in years	Total number	Boys	Girls
0-3 years of age	162	89	73
4-7 years of age	74	51	23
8-12 years of age	61	44	17
13-18 years of age	93	71	22

blains) were found in 3 children. In the second place was a head injury (n = 71); 17 injuries were caused by a fall from a bicycle without a helmet, 47 were consequences from the fall from some height bed, chair, arms, tree, window, balcony, etc.), 3 were simple falls, 3 were caused by traffic accident without using a seatbelt or safety seat, and one was caused by a dog. Fractures of the upper extremities were present in 10 children, and in the lower extremities in 11 children; there was only one hip luxation. Semi-amputations of fingers, amputation, and tendon section were found in 7.2, and 7 children, respectively. Simple cuts were seen in 42 patients. Cuts, semi-amputations, amputations, and tendon sections were caused by glass and different tools and machines (knives, axes, saws, circular saws, chainsaws, and other agricultural and machines present in the household). Multiple injuries were detected in 183 children; the most common were multiple contusions seen in 46 children. Twelve children consumed alcoholic drinks, and two mixed alcohol with drugs (diazepam and bromazepam).

During these six years, 56 children were in some way medically neglected. Those were children with previously diagnosed illnesses without regular check-ups or treatment, unvaccinated children, those without medical insurance, which is mandatory and free of charge in both countries, and children whose parents disagreed with further diagnostic and therapeutic procedures and took their children out of hospitals despite medical advice.

In this study, 12 children attempted suicide—4 boys and 8 girls aged from 14 to 17 years. In four cases, there were simple cuts on wrists made by razors or glass. One girl stabbed herself on a chest with a knife, making a partial pneumothorax that did not require thoracal drainage. Three children had deeper cuts with multiple tendon sections, and in one of them, there was also injury to n. medianus and ulnar artery. Jumping from a height was present in three cases, resulting in tibial and L3 vertebral fracture in one patient, and fracture of L1 vertebra and calf in the second case. The third child had the most severe injuries, vertebral fractures from Th6-Th12, serial rib fracture left from VII-X rib and right from IV-VI rib as a result of a 20m high jump. One child who was previously treated for anorexia, when he lost 38kg in a few months, attempted suicide by ingestion of hydrochloric acid. Following surgical treatment, all children were transferred to mental health institutions for further management. There was no significant difference in the number of suicidal attempts between these two centers (p = 0.375).

DISCUSSION

At least, 850 children aged under 15 years die from child maltreatment annually in the WHO European Region, as maltreatment is common but not known to agencies (7). The maltreatment of children has been divided into four major categories: neglect, physical abuse, psychological or emotional abuse, and sexual abuse (8).

This paper provides data on the prevalence of children's exposure to different forms of abuse and neglect over the past six years in two centers with pediatric surgery hospitals/departments in the following countries: Serbia and Croatia. Unlike the majority of studies that could be found in the literature, this study was not based on questionnaires, but on physical evidence of abuse or neglect that required hospitalization and medical help. In the BECAN study, the rates for physical violence and contact sexual violence in Serbia were 46.48% and 3.7%, and in Croatia, 45.54% and 3.26%, respectively. In the same study, no differences could be observed between sexes across these two countries related to lifetime physical and sexual violence exposure, and for experiences of feelings of neglect, differences between males and females could be observed with higher lifetime prevalence among females: Croatia (40.6% vs 29.8%) and Serbia (34.6% vs 23.4%). On the contrary, we found that 67.2% of hospitalized children were boys; however, our study included not only school children but also preschool children (4).

One of the most common forms of child maltreatment is neglect, which could often be associated with other forms

of abuse. Childhood is characterized by progressive physical, emotional, cognitive and social development, and satisfaction of basic needs such as adequate nutrition, hygiene, emotional support, health care, and safe living conditions are necessary for growth and development (9). There is a little evidence base to guide through medical neglect management and research; therefore, medical neglect literature is scarce even though this topic became more significant lately, as medical neglect is associated with significant morbidity and mortality. In this study, 11.8% of children were medically neglected, and most of them had previously been diagnosed with untreated medical conditions. Fortin et al. stated in their research that 91% had a chronic illness; however, our research included only patients hospitalized due to surgical not pediatric conditions, and this could be the reason why this percentage is quite lower in this study. Although the doctor's responsibility is to the child, the management should also involve identifying the cause that led to the medical neglect (10,11).

Peer violence is a complex social problem due to its diversity, and it ranges from 15% to 50% depending on the development of the country (12). Almost 60% of abused children in this paper were victims of peer violence, which indicates how huge this problem is, as it has been proven that youth involved in peer and dating violence as aggressors and victims are at greatest risk for negative sequelae (13).

Diagnosing sexual abuse in children may be challenging, as physical findings are present only in 10% of girls who have been sexually abused and seldom in boys on medical examinations. The reason is that genital area traumas heal quickly in cases when it does occur; therefore, "sexual abuse by history" is the most common medical diagnosis arising from such evaluations. There is no complete agreement on findings and guidelines for interpretation among physicians of suspected child sexual abuse, which makes a firm diagnosis even harder. Commonly, an immediate examination is done if the last instance of penetration occurred within 72 hours (14,15).

Childhood sexual abuse can have far-reaching consequences, and in this study, 4 children aged 3 to 12 years underwent different kinds of sexual abuse. The importance of recognizing it and providing professional mental health help is well emphasized in the paper published by Baytuncaet al., as suicide attempts were significantly more frequent in sexually abused children, especially in adolescent girls, and even 10 times higher among children living in broken families (16,17).

Suicide is the third leading cause of death among adolescents and young people aged 15–35 years, and the second leading cause of death for youth aged 11 to 15. Self-harm is one of the strongest predictors of death by suicide in adolescence. Domestic and peer violence, lack of support, and child maltreatment are known factors that increase the likelihood of self-harm behaviour in adolescents (18). In this research, 2.5% of children aged 14-17 years have attempted suicide. Eight of them were 17 years old, and there were more females compared to males, 8 vs. 4. Steinhof et al. reported that self-injuries were more frequent in females than males, as one in three females and one in five males have self-injured at least once between ages 13 and 20, which correlates with our findings (19,20).

Overall, the findings of this study documented the pediatric population most at risk of abuse and neglect, the types and severity of injuries, and the need for hospitalization due to children's exposure to various forms of maltreatment in the participating centers. Early diagnosis of child neglect or abuse is essential, and care should include not only acute medical treatment but also longer-term, multidisciplinary treatment.

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Authors' contribution

Conceptualization: Z.M., Z.D., and A.B.V.; Methodology, Z.D., A.B.V., T.A., J.L., and D.L.; Investigation, Z.M., A.B.V., T.A., J.L., and D.L.; Data curation, A.B.V., T.A., J.L., and D.L.; Formal analysis, V.M.; Validation, V.M.; Project administration, Z.D.; Supervision, Z.D., V.M., and A.B.V.; Writing – original draft, Z.M.; Writing – review & editing, Z.M., A.B.V., T.A., J.L., D.L., and V.M. All authors have read and approved the published version of the manuscript.

Statement of Ethics

Ethics approval was not required as the retrospective study was performed based on medical documentation without revealing any personal details.

Statement of Competing Interest

The authors declare no relevant conflicts of interest.

Statement of Data Availability

Not applicable. All relevant data are provided in the results section.

Statement of Generative AI Use

No AI was used for writing this manuscript.

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