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Factors influencing a child's development in the early years of life and their impact on adulthood

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Abstract

Introduction:

This article reviews a number of studies that have sought to determine how factors that occur in prenatal life and early childhood may lead to psychiatric disorders in adulthood. It focuses on the relationships between the physiology and pathophysiology of the autonomic nervous system and their impact on the child's development, on previously experienced traumas, on living in unfavorable conditions, on factors that have a negative impact on the fetus during pregnancy, and on the existence of two psychopathological dimensions and their connections with specific psychiatric disorders.

Aim of study:

The aim of the study is to present a comprehensive review of some of the most common forms of childhood maltreatment and show how powerful the impact they have on children's development and their later adult life.

Materials and methods:

Materials used in this study were found in the PubMed database, using the following keywords: childhood maltreatment, sexual abuse, physical abuse, mental abuse, alcohol and drug abuse, and psychiatric disorders.

Conclusion:

The work clearly shows that neglect, abuse, and abnormal behavior have a direct impact on psychiatric disorders occurring in children and on the consequences that children have to bear as a result of their adult lives

Keywords: Childhood maltreatment, sexual abuse, physical abuse, mental abuse, alcohol and drug abuse, psychiatric disorders.

Introduction:

It is commonly known that children who experienced maltreatment in the early years of their development, suffer from a wide variety of problems both physical and mental, that have a strong influence on their daily lives as adults. The most common maltreatments that usually occur are mental, physical, or sexual abuse, drug and alcohol abuse, and exposure to various traumas. There are also less known factors that are strongly connected with the quality of life as an adult, such as maternal factors, prematurity, epigenetic mechanisms, nutrition, polyvagal theory, and autonomic nervous system.

1. Epidemiology of neuropsychiatric disorders

Depression, anxiety, behavioral dysfunction, attention-deficit hyperactivity disorder (ADHD), and autism spectrum disorder, have their beginning in childhood (11). Within children and adults age 12 and older, depression escalated about five percent (12). ADHD has an incidence of about 10% (and continues to grow) throughout both childhood and adolescence (13,14) and it is considered to have a connection with adverse childhood experiences (15). In addition to this, ADHD in two-thirds of children consists not only of hyperactivity, concentration disorders, and impulsivity but also emotional disorders and additional mental (28).

2. Pathophysiology of development of neuropsychiatric disorders

The central autonomic nervous system (ANS) plays a critical role in supporting higher cortical functions (1). Imbalance integration between the central autonomic and limbic systems has a huge negative impact on the child's development and very often may result in neuropsychiatric disorders (2). The early disorganization of autonomic development may have a strong influence on the development of the ANS system, as a result, it can reduce its ability to properly respond to physiological changes and the surrounding environment and to adequately process the stimuli coming from it. These disturbances in ANS have a connection with occurring in neuropsychiatric disorders (1, 3). The complex relation between ANS (brain stem) and the limbic system creates a substructure by which we can experience both emotional and physical stimuli and progressively shape our behavior, neuropsychiatric, and emotional health starting from the prenatal period and ending in adulthood (4,5,6). The nuclei of the amygdala and hippocampus also play a significant role in the modulation of emotions and receiving the signals from environment. The hippocampus is responsible for mood regulation, and memory and it can turn off the stress response, whereas irregularities in the functioning of the amygdala and limbic system may result in experiencing anxiety disorders (9,10). Throughout life, connections

in the limbic system strengthen or weaken in response to environmental changes, stress, and other exposure factors (7,8). Other factors that may have a strong impact on the limbic system, mostly its structure and capacity is the intrauterine environment, including the mother's overall health condition before conception and levels of stress during pregnancy (3). It is crucial to mention the Polyvagal Theory which focuses on impairment in vagal balance. The theory was first presented by Porges in 1995, it focuses on the two main branches of the vagal nerve (cranial nerve X) and shows a correlation between the development of the vagal system on both social and emotional development (4,6,16). There is a wide range of neuropsychiatric disorders that are caused by deficient or excessive vagal reactivity (17). This impairment in the autonomic nervous system, mostly decreased parasympathetic tone entails schizophrenia, anxiety, post-traumatic stress disorder (PTS), and depression (5). Other reasons that psychiatric disorders occur are prematurity, epigenetic mechanisms, maternal factors, and nutrition. (1).

2.1 Prematurity

Prematurity is responsible for changes in the mental sphere of life (1). Premature infants are at greater risk of developing depression, reduced social engagement, and anxiety (28). It was observed among premature infants, who stayed in NICU, that stressors that occur in NICU affected DNA methylation of the serotonin transporter gene (SLC6A4) (29). This change was connected with reduced anterior temporal lobe volume and lower Griffith Mental Development Scales at 12 months corrected age (29) and suggested that stress associated with premature birth may lead to altered programming of socio-emotional development by structural changes and mechanisms of epigenetic modification in the developing brain (29). In a group of parents of premature babies, it is common to observe high levels of depression and a worse connection with the infant (18,19). The subsequent argument in favor of the theory that prematurity may be responsible for neuropsychiatric disorders is a meta-analysis of preterm-born adults, who suffered from higher levels of internalizing and avoidant personality problems compared to at-term-born adults (28). The study also shows that preterm-born children may struggle with reduced social engagement, depression, and anxiety in their adulthood (28). Also, ADHD or problems with attention in childhood later may transform into internalizing psychological disorders in adulthood (28). Another research showed significant differences between preterm and ex-term teenagers, it revealed that preterm adolescents presented lower autonomic tone and

extended heart rate recovery after exercise compared to ex-term adolescents, which shows a prolonged autonomic dysfunction due to prematurity (20).

2.2 Maternal factors:

Epigenetic mechanisms both maternal and fetal, may play a role in developing mental health disorders such as bipolar disorder, schizophrenia, and depression (3). Maternal depression during pregnancy also has its influence on the baby, it was revealed by examining the cord blood T lymphocytes of newborns which had distinct DNA methylation patterns and were found to remain in the adult hippocampus. (21). One of the factors that has a strong influence on a mother and her child is stress. It disturbs the mother's hypothalamic-pituitary-adrenal axis, which may lead to disruption of the child's hypothalamic- pituitary-adrenal-axis resulting in interference in pathways responsible for growth, mood regulation, metabolism, and autonomic nervous system development (22). Another dysregulation caused by stress is its toxic effect on the mother's levels of cortisol, which impact directly child's cortisol and as a result, causes impaired response to stress, moreover, it is connected with changes in gray matter volume (23). In the following prospective cohort study of pregnant women, exposure to stress at 16 weeks of pregnancy was connected with high cortisol levels which resulted in premature birth (24). Subsequent stress factors affecting women and newborns in their postpartum period are lack of physical closeness, mother's anxiety, somatic diseases, and iatrogenic factors (25,26). Mother's mood disorders may have a poor influence on a child's amygdala (27).

2.3 Nutrition:

Last, but not least, nutrition influences the occurrence of mental illnesses (30). Studies have been conducted on the impact of substances consumed by the mother during the preconception and prenatal period and actions taken by the mother. It took into account the influence of substances such as folic acid, zinc, phosphatidylcholine, and the entire breastfeeding process. To start with, folic acid is known for its prevention of neural tube defects (31,32), however, other data has shown that supplementing folic acid before 10 weeks of pregnancy may have a huge positive impact on a child's social skills, attention, and behavior at 18 months of age, compared to mothers who did not take supplementation (30). Moreover, maternal low levels of

folic acid have a strong connection with worse emotional development (30). The second microelement crucial for harmonious development is zinc. It is vital for hippocampal and cerebral development and for proper ANS regulation (33). Lack of zinc in animal models was connected with increased impaired social behavior and anxiety (33, 34). Another substance found to have a positive impact on a child's development is phosphatidylcholine. It may ameliorate a child's attention, and emotional development by having an effect on limbic structure and its function (30,35). Lastly, breastfeeding as a whole process is crucial both for mother and infant, it creates a bond between them and improves infant social development (36). Nutritional ingredients of mothers' milk are enormously important for infants, preterm newborns fed with enriched milk formula, have shown better motor function at 18 months and social maturity (37).

3. Childhood emotional maltreatment:

The term childhood emotional maltreatment covers specific factors that contribute to the occurrence of specific neuropsychiatric disorders such as severe depression, dysthymia, mania, all mood disorders, panic disorder, social phobia, generalized anxiety disorder, post-traumatic stress disorder, generalized anxiety disorder, substance use disorders and a wide variety of personality disorders: paranoid, schizoid, schizotypal, antisocial, borderline, histrionic, narcissistic, avoidant, dependent, obsessive-compulsive. All the above-mentioned disorders, along with the factors influencing their development, were meticulously documented on the basis of data contained in the NESARC study conducted between 2004 and 2005. The NESARC study included a representative sample of non-institutionalized civilian adults living in the United States (US), the data used in this study were cross-sectional. This part of the NESARC survey collected information from 34,653 adults aged 20 years and older living in non-institutionalized households and group housing (38). The results clearly supported the negative impact of various forms of maltreatment. What made the main difference was the frequency of specific forms of maltreatment among men and women and their impact on the subsequent occurrence of mental disorders in the examined sample.

3.1 Emotional neglect and abuse:

Emotional abuse during childhood occurred within 14,1%'s most commonly used form was emotional neglect (6,2%), and emotional violence took second place (4.8%). Experiencing during childhood both above-mentioned forms of abuse at the same time was the least common pattern (38). Experiencing only emotional neglect in childhood was associated with a greater risk of dysthymia, major depression, a wide variety of mood disorders, and social phobia, however facing both emotional neglect and emotional abuse was related to an increased risk of occurring social phobia, major depression, dysthymia, mania, panic disorder, post-traumatic stress disorder, generalized anxiety disorder and various mood disorders (38). However relating data to gender, experiencing emotional neglect with emotional violence was more common among females (4%) than males (2%) (38). Moreover, adults who were divorced, separated, or widowed were more vulnerable to all forms of emotional abuse (38). Another interesting observation resulting from the conducted study was the demonstration of the relationship between the level of education and reporting incidents of emotional abuse in childhood. Respondents with lower income and education were more likely to report incidents rather than their more affluent counterparts (38). The question should be asked whether the lower number of incidents of emotional abuse reported by wealthy respondents is due to their actual lower occurrence, or rather to the general belief and false conviction that maltreatment does not occur in wealthy and intelligent families. To dispel doubts, this matter should be examined comprehensively. The subsequent conclusion found in the NESARC study was a direct comparison of emotional abuse and emotional neglect and how these two influence the occurrence of personality disorders. The study clarified that emotional abuse was strongly associated with a greater risk of diagnosing borderline personality disorder, paranoid, schizoid, schizotypal, antisocial, histrionic, narcissistic, avoidant, dependent, and obsessive-compulsive disorder (38). On the other hand, emotional neglect only was associated both with psychiatric disorders such as depression or social phobia, and personality disorders like schizoid or borderline personality disorder (38). Lack of love, and affection, and not paying enough attention to children's feelings and emotions contributes to poor relationships with parents (39), which may result in subsequent dysregulation in personality development and psychopathology (40).

4. Negative childhood experiences and structure of common psychiatric disorders:

Other studies showing the disastrous effects of children's exposure to factors that negatively affect their mental health are an explorative study, which concludes 192 patients from Romania, Switzerland, and Germany, with psychiatric diagnoses such as schizophrenic and personality disorders and alcohol-related disorders. The type of measurement used in this survey was the TAQ scale (Traumatic Antecedents Questionnaire) which assesses personal positive experiences (competence and safety) and negative experiences, participants of this study were divided into two groups: study group (patients diagnosed and treated psychiatrically) and control group (people without psychiatric problems) (41) and nationally representative survey of 34 653 US adults (data comes from the NESARC study), that not only focused on determining the prevalence of child maltreatment and it's consequences, but also on examining the basic psychopathological structure of occurring mental disorders (42). The cited work examines the links between childhood maltreatment and hidden internalizing and externalizing dimensions of psychopathology, taking into account gender and 5 types of disorders: emotional neglect, physical neglect, and emotional, physical, and sexual abuse (42). In order to fully understand the relationship between the occurrence of specific mental disorders, it is necessary to distinguish between two dimensions of the psyche in which the occurrence of specific disorders is more likely.

4.1 internalizing and externalizing dimensions:

The internalizing dimension is associated with a greater likelihood of anxiety and mood disorders, such as generalized anxiety disorder, depression, social phobia, and panic disorder. The externalizing dimension is associated with a tendency to self-destructive and oppositional defiant disorders, such as substance use, antisocial personality disorders, and behavioral disorders. This psychological type is additionally associated with a greater risk of future episodes of breaking the law and entering a criminal path (42). There is a difference in the incidence of physical, mental, and sexual violence among men. Sexual abuse was associated not only with internalizing but also externalizing dimensions. While physical abuse was linked only with the externalizing dimension, and emotional abuse only with the internalizing dimension (42). In the case of women, the above-mentioned disorders are assigned to completely different dimensions than in men. The only disorder that may overlap in both sexes is sexual abuse; in men, it is associated with both dimensions and in women only with the internalizing dimension. However, the study showed that sexual abuse has a stronger tendency to internalize dimension. Additionally, in women, the internalizing dimension is related to emotional abuse, while physical abuse is related to the externalizing dimension (42). This study also has shown that every form of abuse: physical, emotional, and sexual was connected at least with one type of psychopathological dimension, whereas psychical and emotional neglect were not associated with any of the dimensions (42). This study clearly shows that psychopathological dimensions are related to the correlation between childhood abuse and mental disorders, and not to specific disease entities.

4.2 Alcohol and drug abuse:

According to an explorative study (survey of Romanian, German, and Swiss patients) patients suffering from alcohol-related disorders, were more likely to report alcohol and drug abuse, than other studied groups. However,

in comparison with the control group, alcohol and drug abuse was more frequently notified by patients group suffering from schizophrenic disorders,
personality disorders, and affective disorders (41). As previously expected, Romanian patients, regardless of main diagnosis, have shown more common alcohol and drug abuse, than their German and Switzerland counterparts, which shows the relationship between mental state and cultural background (41). Subsequent expectation confirmed by this study was the increase in alcohol and drug abuse during various developmental periods, up to adulthood. This occurred especially in patients who were abusing the above-mentioned substances, this indicated the connection between the developmental period and the mental state (41).

4.3 Physical abuse:

The relationship between the mental state and the developmental period revealed that people undergoing psychiatric treatment and diagnosed with specific diseases were more likely to report experiencing physical violence, compared to people from the control group who were not undergoing psychiatric treatment (41). What's more, among the group of people undergoing psychiatric treatment, the occurrence of psychological violence was much more frequently reported by people with personality disorders (41). It was also observed that patients who suffered from disorders related to schizophrenia and alcohol abuse were much more likely to report physical violence, compared to people in the control group (41). There is also a correlation between different developmental periods and reports of physical violence; the study showed that the period in which the greatest number of such reports occurred was adulthood (41).

4.4 Sexual abuse:

As expected, it was mainly patients who reported sexual abuse, especially people with personality disorders, alcohol disorders, affective disorders, and schizophrenics. It was also observed that when overextension occurred, it most often appeared in later developmental periods and affected females more often than males (41).

Conclusion:

This work proved that many necessary conditions must be met for the proper and harmonious development of a child. Starting with: reliable health education in line with current medical guidelines for women planning pregnancy and women who are already pregnant, and ending with developing assistance, prevention, and early response programs in case of suspicions of the possibility of any form of child maltreatment. This is extremely crucial since we have irrefutable evidence that clearly shows that child maltreatment has a negative impact not only on childhood, but also it affects the child's entire life, often having catastrophic consequences.

Supplementary materials:

Not applicable.

Author's contribution:

Conceptualization, Magdalena Joanna Czeczotka, Marta Skorupska,; methodology, Justyna Śliz, Aleksandra Natalia Popławska and Krzysztof Woźniak; software, Marta Skorupska and Krzysztof Woźniak; check, Natalia Aleksandra Popławska, Justyna Śliz and Magdalena Joanna Czeczotka; formal analysis, Marta Skorupska, Natalia Aleksandra Popławska and Krzysztof Woźniak; investigation, Justyna Śliz and Magdalena Joanna Czeczotka; resources Justyna Śliz, Marta Skorupska; data curation, Magdalena Joanna Czeczotka, Krzysztof Woźniak and Natalia Joanna Popławska; writing- rough preparation, Marta Skorupska and Krzysztof Woźniak; writing- review and editing Justyna Śliz, Natalia Aleksandra Popławska and Magdalena Joanna Czeczotka; visualization, Natalia Aleksandra Popławska, Krzysztof Woźniak and Justyna Śliz; supervision, Marta Skorupska, Magdalena Joanna Czeczotka; project administration Justyna Śliz, Marta Skorupska, Magdalena Joanna Czeczotka and Natalia Aleksanda Popławska; All authors read and agrees with the published version of the manuscript.

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The authors of the paper report no conflicts of interest.

Data Availability Statement

The data presented in this study are available upon request from the corresponding author.

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