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RESEARCH ARTICLE

Relationship of Adverse Childhood Experiences with Essential Hypertension: A Case-Control Study

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ABSTRACT

Background: The mental and physical impacts of adverse childhood experiences persist into adulthood, highlighting their long-term consequences. These physical effects are attributed to psychobiological processes, including anxiety, depression, stress, anger, sleep disorders, which influence inflammatory pathways. In the present study, it was aimed to compare the adverse childhood experiences of essential hypertension (HT) patients with healthy controls.

Methods: The sample of the current study consists of 200 participants, including 100 HT patients who applied to cardiology outpatient clinics and 100 healthy controls. HT was defined in accordance with the European Society of Cardiology guideline. The sociodemographic data form and Adverse Childhood Experiences Questionnaire were applied to the participants who volunteered to participate in the study after obtaining their consent.

Results: The mean age of the participants included in the study was 51.55±8.90 years and 78.5% were women. There was no statistically significant difference in age, gender, marital status, income level, height and weight variables between the healthy control group and HT patients (p>0.05). Body Mass Index (t=-2.558, df=198, p=0.011) and ACE-Q (t=-2.609, df=198, 0.010) scores of HT group were found to be statistically significantly higher than healthy controls.

Conclusion: The present study shows that patients with HT are exposed to more adverse childhood experiences compared to healthy volunteers. This result supports studies showing that psychosocial factors may influence the pathogenesis of HT.

Keywords: Adverse Childhood Experiences, Childhood, Hypertension, Stress, Trauma

Introduction

Adverse Childhood Experiences (ACE) are defined simply any negative event or situation that is experienced by a child which may include different forms of abuse and neglect or other problems such as family dysfunction for instance parental separation, domestic violence or substance abuse.[1,2]

It is well recognized that the psychological and physical effects of traumatic childhood experiences persist into adulthood.[3] According to the current studies, it was found that exposure to ACE increases the likelihood of getting chronic diseases including hypertension, cardiovascular diseases, and mental health disorders.[4]

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Hypertension, affecting over 1.28 billion adults globally is associated with conventional risk factors such as obesity, smoking, and physical inactivity.[5] In contrast, psychosocial elements like ACE involve early-life stressors that disrupt emotional and physiological regulation, contributing to long-term vulnerability to hypertension. Studies have shown that ACE contributes to the development of hypertension through mechanisms involving dysregulation of the HPA (Hypothalamic-Pituitary-Adrenal) axis and chronic low-grade inflammation.[6,7] The altered cortisol responses[8] and persistent inflammatory states[6] associated with early life stressors play a significant role in increasing the risk of hypertension and other cardiovascular diseases. Symptoms such as anxiety, depression, and sleep disturbances exacerbate these effects by intensifying inflammatory processes.[9]

It is believed that the psychobiological impacts of symptoms like anxiety, sadness, stress, rage, and sleep difficulties on inflammatory processes are what create the physical repercussions.[10] Thus, it is evident that further research is required to comprehend the effects of negative childhood events on the body and mind. Nevertheless, there is limited research examining the link between psychosocial processes and conditions such as hypertension, which are frequently seen in clinical settings.[11] The purpose of the current study was to compare the negative childhood experiences of patients with essential hypertension with those of healthy controls.

Materials And Methods

This cross-sectional research was conducted in the Kırıkkale Yüksek İhtisas Hospital Cardiology outpatient facility.

Participant: One hundred hypertension patients who applied to the cardiology outpatient clinic between January 2022 and May 2022 and 100 healthy controls who applied to the health committee make up the study's 200-person sample. Hypertension is defined according to the International Society of Hypertension recommendation.[12] Individuals meeting these criteria, between the ages of 18-65; were at least primary school graduates; applied to the outpatient clinic; participated in the study voluntarily were included in the study. Participants with additional comorbidities and over 65 years of age, who are at higher risk for mental and physical illnesses, were not allowed to participate in the trial, as age-related comorbidities could confound hypertension outcomes. Following their permission, the individuals who consented to take part in the study were given the Adverse Childhood Experiences Questionnaire (ACE-Q) and a sociodemographic data form. The acquired data underwent the proper statistical processing after being rated in accordance with the scale direction.

Procedure: This study was carried out by obtaining informed consent from patients who presented to the cardiology outpatient clinic and were diagnosed with hypertension according to European Society of Cardiology guideline between January 2022 and May 2022. A form was handed out to patients who consented to take part in the study, containing sociodemographic information (such as age, duration of illness, number of hospitalizations) by the clinician. ACE-Q was completed by the participants. Volunteers participating in the study were guided to a tranquil, climate-controlled environment, in which standardized protocols were followed for anthropometric and cardiovascular assessments conducted by trained research personnel. Measurements of height and weight were obtained using a medical scale, calibrated daily, and body mass

index (BMI) was calculated as an indicator of general adiposity. Blood pressure (BP) monitoring was performed using a calibrated device.[13]

The study was conducted in accordance with the ethical guidelines of the Declaration of Helsinki after receiving ethical approval from the Kırıkkale University Faculty of Medicine Non-Interventional Studies Ethics Committee (Date: 15.04.2021, Number: 2021.03.20)

Sociodemographic Data Form: The sociodemographic data form consists of semi-structured questions that inquire about basic demographic information as well as healthcare variables, including chronological age, partnership status, educational status, profession, medical disease record, and the number of years since diagnosis.

Adverse Childhood Experiences Questionnaire (ACE-Q): It developed as part of the Kaiser Permanente study in collaboration with the Centers for Disease Control and Prevention (CDC), is a large-scale epidemiological research conducted between 1995 and 1997.[14] The aim of this study is to look into the long-term physical and psychological effects of childhood maltreatment. The 10-item questionnaire assesses detrimental childhood exposures occurring prior to age 18 using a

Table 1. Comparison of the participants' sociodemographic characteristics and Childhood Adverse Experiences among the study groups

Variable	Health Control (n=100)	Hypertension Patients (n=100)	Statistics		
			t/χ^2	df	p
Age; year, Mean±SD	51.72±8.43	51.38±9.38	0.270	198	0.788
Gender; n (%)			0.267	1	0.606
Female	77	80			
male	23	20			
Marital Status; n (%)			0.112	2	0.945
Single	8	9			
Married	73	71			
Other	19	20			
Income Status; n (%)			2.929	2	0.231
Low	6	7			
Middle	35	46			
High	59	47			
Length; cm, Mean±SD	168.32±7.49	168.32±8.09	1.568	198	0.118
Weight; kg, Mean±SD	74.00±16.29	76.84±14.67	-1.295	198	0.197
Body Mass Index, kg/m², Mean±SD	25.96±4.55	27.57±4.37	-2.558	198	**0.011***
Childhood Adverse Experiences; Mean±SD	1.15±1.62	1.84±2.08	-2.609	198	**0.010****

SD: Standard deviation, t: Independent samples t-test; $\chi 2$: Chi-square test; *: $p<0.05$, **: $p<0.01$.

yes/no format. Gündüz et al. carried out the scale's validity and reliability assessment in Turkey in 2018.[15] There is no set cutoff value for total scores, and they vary from 0 to 10. The reliability coefficient for the ACE-Q, derived via Cronbach's alpha, stood at 0.74.

Statistical Analysis

The data obtained from the study were analyzed using the SPSS 26.0 software package. The Kolmogorov-Smirnov test was applied to assess the normality of distribution for continuous variables (quantitative variables) obtained through measurements. Categorical variables were compared using the Chi-Square test. In the comparison of continuous variables, Student's t-test was used after checking the parametric assumptions. A significance level of $p<0.05$ was considered statistically significant.

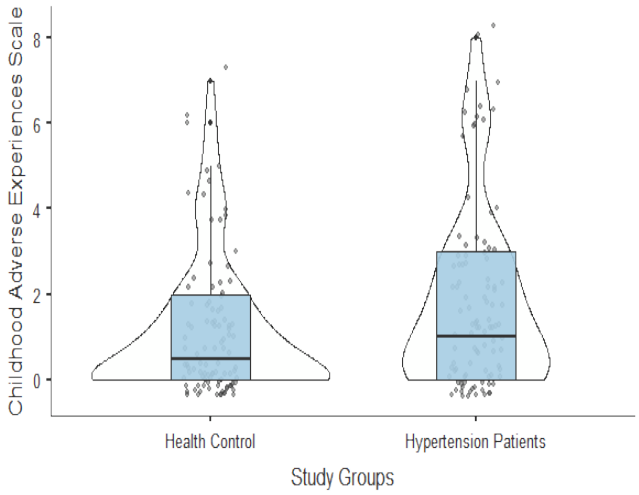

Figure 1. Comparison of study groups' Childhood Adverse Experiences Scale.

Results

The study's participants were 51.55±8.90 years old on average, with 78.5% of them being female. Age, gender, marital status, income level, height, and weight did not differ statistically significantly between hypertension patients group and the healthy control group ($p>0.05$, Table 1). In the hypertension group, both the Body Mass Index ($t=-2.558$, $df=198$, $p=0.011$) and ACE-Q ($t=-2.609$, $df=198$, $p=0.010$, Figure 1) scores were significantly higher than those in the healthy control group (Table 1).

Discussion

The most important result of the current study investigating the ACE of essential hypertension patients compared to healthy controls is that the ACE-Q scores of hypertension patients were higher than those of healthy controls. This finding is consistent with research suggesting that the pathophysiology of hypertension may be influenced by psychosocial factors like developmental trauma. Furthermore, upon examining the relationship between ACE-Q and body mass index, it was determined that individuals with ACE-Q exhibited statistically significantly elevated BMI values relative to the control group. Goodwin and Stein investigated the relationship between childhood trauma and adult physical health outcomes by analyzing data from the National Comorbidity Survey, looking at a sample of 5,877 people. Their findings indicated that individuals who experienced ACE had significantly higher odds of developing conditions such as arthritic disorders, lung disease, peptic ulcer, cardiac disease, asthma, and liver disease later in life.[16] And when it comes to hypertension, while some studies suggest a significant correlation between ACE and adult hypertension, but different results are discussed in the literature.[16–18] Iniguez and Stankowski proposed several explanations for this inverse relationship. The authors of the study discussed potential explanations for the inverse relationship between ACEs and hypertension, including age-related differences in ACE reporting, underdiagnosis

in underserved populations, resilience mechanisms mitigating disease risk, disparities in healthcare utilization patterns, and premature mortality associated with higher ACE scores. These factors underscore the complex link between childhood adversity and hypertension, warranting further study to clarify causality.

The association between ACE and Blood Pressure (BP) trajectories from childhood to young adulthood was investigated in a long-term study by Su and colleagues as part of the Georgia Stress and Heart research. Data were collected over 23 years from 394 participants aged 5 to 38, who underwent up to 16 assessments of systolic and diastolic BP. The findings revealed that people who experienced multiple ACE exhibited a significantly steeper increase in BP levels throughout early adulthood, relative to those with no ACE. The findings also revealed that youngsters who had more adverse experiences displayed a significantly larger increase in both SBP and DBP during young adulthood compared to those without ACE. This pattern points to a long-term cumulative impact of childhood adversities on blood pressure development.[20]

The connection between ACE and BMI has garnered significant attention in research on how childhood traumas influence physical health, particularly the risk of obesity. Pretty and colleagues' study demonstrated a robust positive link between the accumulation of ACE and the two primary obesity measures, namely BMI and waist circumference. The study's findings also revealed that those who had four or more ACE had a significantly increased risk of developing clinical obesity (95th percentile) even after controlling for the other relevant covaries.[21] "Furthermore, the comprehensive review and pooled analysis conducted by Danese and Tan underscore that childhood maltreatment is associated not only with the onset of obesity but also with its persistence over time.[22]

When we evaluate the relationship between ACE, hypertension, and BMI, it becomes apparent that ACE serves as significant determinants of health outcomes, encompassing both near-term and enduring consequences. Integrating ACE screening into holistic clinical practices can enhance patient care by addressing underlying psychosocial determinants. For instance, incorporating trauma-informed care strategies, offering psychological counseling, and implementing stress management workshops tailored to patients with high ACE could help mitigate the long-term impacts of these adversities. Such screenings enable clinicians to identify and mitigate early risk factors for chronic diseases like hypertension. A study by Glowa and colleagues demonstrated that incorporating ACE screening into routine primary care is both practical and valuable, as it provides clinicians with deeper insights into previously overlooked social determinants of health.[23]

The cross-sectional methodology of this study is one of its main drawbacks, as it makes it difficult to determine a clear cause-and-effect link between ACE and hypertension. Furthermore, while the sample size is sufficient for initial observations, it cannot be considered representative of the entire population, thus limiting the generalizability of the results. Self-reported data on ACE may introduce recall bias or underreporting due to the sensitive nature of the experiences.[24] In addition, the study had some limitations that may have affected the results; the study did not include other factors that could have confounded the relationship between hypertension such as genetic factors, dietary habits and physical activity in adulthood, or other stressors. Finally, key exclusions include participants older than 65 years of age, despite their higher

risk of developing hypertension, which may have influenced the study's results. Future research should adopt longitudinal designs, include larger and more diverse samples, and assess additional confounding variables to validate and extend these findings.

Conclusion

Our current research indicates that individuals diagnosed with hypertension encounter a greater burden of early-life adversities relative to those without the condition. These findings align with prior evidence suggesting that psychosocial elements may influence the development of hypertension. When integrated with existing literature, it becomes apparent that negative childhood events and their associated psychological sequelae hold an important position in hypertension's pathophysiology. Within this framework, recommending psychiatric consultation during hypertensive patient evaluations could assist in elucidating and managing underlying factors. Larger-scale randomized trials are needed to confirm these observations. Furthermore, it is important to emphasize that mitigating childhood adversity and implementing early interventions can help avert later physical health complications.

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Ethical Approval: The Kırıkkale University Faculty of Medicine Non-Interventional Studies Ethics Committee (Date: 15.04.2021, Number: 2021.03.20)

Informed Consent: Informed consent was obtained from all participants.

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