



# Psychosocial, Neurobiological and Familial Influences on Children and Adolescents' Alcohol and Substance Use

*Çocuk ve Ergenlerin Alkol ve Madde Kullanımında Psikososyal, Nörobiyolojik ve Ailesel Etkenler*

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## ABSTRACT

Recent studies show that the starting age of alcohol and substance use has dropped to primary school. Many factors play a role in the initiation of alcohol and substance use by children and adolescents. In particular, peer relationships, comorbid mental disorders, socioeconomic levels, the relationships between parents, and the relationships of children and adolescents with their parents are considered risk factors for developing alcohol and substance use disorder. In this review, psychosocial and neurobiological influences playing roles in children and adolescents' alcohol and substance addiction are reviewed. Addiction risks and protective factors of children and adolescents are discussed regarding the results of current studies.

**Keywords:** Addiction, alcohol, substance, child, adolescent, family, neurobiology

## ÖZ

Günümüzdeki çalışmalara bakıldığında alkol ve madde kullanımına başlama yaşı ilkökul çağına kadar düşmüştür. Çocuk ve ergenlerin alkol ve madde kullanmaya başlamalarında birçok etken rol oynamaktadır. Özellikle akran ilişkileri, eşlik eden ruhsal sorunların varlığı, sosyoekonomik düzeyler, ebeveynlerin kendi aralarındaki ilişkisi ve çocuk ve ergenlerin ebeveynleri ile ilişkisi alkol ve madde kullanım bozukluğunun gelişmesi için risk faktörleri olarak değerlendirilmektedir. Bu derlemede, çocuk ve ergenlerin alkol ve madde bağımlılıklarında rol oynayan psikososyal ve nörobiyolojik etkiler gözden geçirilmiştir. Çocuk ve ergenlerin bağımlılık risk faktörleri ve koruyucu faktörleri güncel çalışmaların sonuçları kaynak gösterilerek tartışılmıştır.

**Anahtar Kelimeler:** Bağımlılık, alkol, madde, çocuk, ergen, aile, nörobiyoloji

## Introduction

Substance use disorders (SUD) constitute an emerging global problem. Researchers argue that teenagers who start using alcohol and substances have a greater risk of developing the disorder.<sup>1</sup> There are various explanations of risks and protective factors for alcohol and substance use in terms of genetic susceptibility, sociocultural influences, personality traits, and comorbid mental disorders. Moreover, there are alcohol and substance use motives from different theoretical perspectives, such as learning, cognition, social learning, and expectancy theories.<sup>2</sup> There are interactions between these theoretical perspectives and the family environment. Thus, it is possible to claim that family relations significantly affect children's and adolescents' alcohol and substance use.

SUD includes loss of control over a substance and continuation of its use despite discernible negative consequences while behavioral addictions may include loss of control of a behavior.

To diagnose a person with the misuse of alcohol or substances, one should meet at least two or three of the specific criteria for the past year.<sup>3</sup> These criteria are:

- Using alcohol and substances longer than intended for.
- Unsuccessful attempts at quitting or reducing the amount and frequency of use.
- Spending too much time procuring, using and recovering from the effects of alcohol and substances.
- Feeling powerful urges and cravings to use alcohol and substances.
- Repeated problems in completion of responsibilities at school, work or home.
- Continuing use of alcohol and substances despite recurrent problems in social activities and peer relations.
- Reduced attendance to/complete withdrawal from social, vocational and entertainment activities.

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- Repeated use of alcohol and substances even in physically hazardous situations.
- Continuation of alcohol/substance use despite emergence/continuation/recurrence/relapse of a related physical/psychological problem.

Tolerance development;

- a) The need for a increased amounts of alcohol and substance to achieve the desired effect or intoxication.
- b) Decreasing effects despite using the same amount of alcohol and substance.

Experiencing withdrawal symptoms;

- a) Experiencing withdrawal symptoms specific to alcohol and substance use.
- b) Use of the substance or its analogues (e.g. benzodiazepines for alcohol) to reduce or eliminate withdrawal symptoms.<sup>3</sup>

The criteria listed in the latest iteration of Diagnostic and Statistical Manual of Mental Disorders (i.e. DSM-5) are mentioned above. Accurate diagnosis and evaluation of patients with SUD is a critical stage of treatment.<sup>2</sup> Those stages may be more crucial for children and adolescents due to the importance of prevention and earlier interventions in reducing negative consequences.<sup>4</sup> Various arguments concerning risks and protective factors for alcohol and substance use exist in the literature. This narrative review will evaluate those factors on the basis of a family perspective.

## Alcohol and Substance Use in Children and Adolescents

### Prevalence

According to the Monitoring the Future survey applied to 50,000 American teenagers annually, alcohol is the most commonly used substance in the USA. Binge drinking (i.e. consuming 5-6 standard drinks/ occasion) is declining while illicit drug use is increasing. Marijuana is the most frequently used illegal substance with a rate of 11.4% which remained unchanged since 2003.<sup>5</sup> In contrast, studies conducted in Turkey are limited and mostly cross-sectional. In the first study conducted in 1991; 1,500 high school students were evaluated and 2.6% of the students reported a life-time use of substances at least once.<sup>6</sup>

Further studies of varying methodologies were conducted in the upcoming years. As an example, Ögel et al.<sup>7</sup> evaluated tenth graders' rate of using tobacco, alcohol and other substances in Istanbul, Turkey. In that study, 51.2% of the sample reported trying alcohol at least once while 45.1% reported that a family member provided them with the opportunity for their first trial. The results of this study may support the predictive values of family environment and interactions in future alcohol and substance use.

## Gender Differences, Comorbidity and Cognitive Deficits

Gender and psychiatric comorbidities differentially affect alcohol and substance abuse among children and adolescents.<sup>2,8,9</sup> Yıldız et al.<sup>8</sup> evaluated adolescent inpatients receiving treatment for alcohol and substance abuse and found that 31.4% of the sample were females. Another study evaluated the interactions of specific psychopathologies such as attention deficit/hyperactivity disorder (ADHD), post-traumatic stress disorder, anxiety, depression and self-injurious behaviors with SUD and gender. The results indicated that male participants were more likely to have SUD and ADHD, while female participants were more likely to suffer from anxiety and depression.<sup>10</sup> Also, gender differences in SUD were observed only for alcohol and substances but not for tobacco use. According to the literature, female adolescents tend to smoke more tobacco compared with males.<sup>11</sup> Those studies may support the effects of gender on addictive disorders as well as comorbid psychopathologies and behaviors.

Evren<sup>12</sup> argued that adolescents' alcohol/substance use may interact with and augment emerging signs and symptoms of personality disorders in adulthood. Although, there are no studies in the literature supporting a direct, specific relationship between alcohol and other distinct substances and specific psychopathologies; alcohol/substance use may be viewed as a predictor for various future psychopathologies.<sup>13</sup> Early relations with parents may also influence emergence of future personality disorders, such as borderline personality disorder (BPD).<sup>14</sup> Supporting this view, patients with BPD were found to have worse parental relationships compared to controls.<sup>14</sup> Early problems in relations with parents may be a risk factor for both personality disorders and substance use. Therefore, substance use, comorbidity of other psychopathologies and parental relationship quality may display complex, multi-directional interactions.

From a cognitive perspective, the damage to neurons caused by SUD might be irreversible, considering that the cognitive development continues until 25-year-old.<sup>15</sup> SUD may lead to cognitive problems and interfere with decision making even when people are sober.<sup>16</sup> A systematic review of eleven studies support the presence of decision making deficits in people with SUD.<sup>16</sup> Apart from decision making; learning, attention, memory and other executive functions may be affected in SUD.<sup>17</sup> The breadth of those dysfunctions complicate efforts for abstinence.<sup>18</sup> Cognition may be affected by parental relations as well.<sup>19</sup> Further studies may evaluate the effects of parental relations as a protective factor for cognitive dysfunction related with SUD. Further information on neurobiology will be discussed below.

## Family Relations

Various positions on family influence on SUD exist in the literature. Parental relations, genetic impact, and even the

family's cultural environment have the potency to play a role in developing the disorder. In terms of parental relations, conflicts and discrepancies between parents can be risk factors for adolescents' alcohol and substance use.<sup>20</sup> In another study, adult patients with SUD attribute problems in adolescence, especially parental neglect as sources of their current condition.<sup>21</sup> Further studies supporting the influence of family relations on SUD will be reviewed in upcoming sections.

## Peer Relations and Conformity Concerns

Peer relationships also influence children and adolescents' alcohol and substance use as much as family relations. Engels and Ter Bogt<sup>22</sup> found that firmly attached friendships in their sample of adolescents were related with use of alcohol and substances. Furthermore, friends using alcohol and substances reported greater intimacy and social support in this sample. The authors hypothesized that children and adolescents may engage in substance use due to need of peer intimacy and appreciation.<sup>22</sup> Newcomb and Bentler<sup>23</sup> conducted another study on substance use among youth and found that peer modelling, family dysfunction and adult modelling to be influential factors. According to this study, peers who encourage and model substance use, family disturbance and adult models increase risk.<sup>23</sup>

## Cultural and Socioeconomic Influences

Studies also showed that there are cultural and socioeconomic influences on children and adolescents' behavioral patterns.<sup>24</sup> Those influences may differ based on the substance. For example, alcohol is approved and legal in many cultures compared with other substances. Additionally, marijuana was deviant 30 years ago; now, many countries are legalizing it.<sup>24</sup> Some other cultures also encourage psychoactive substance use due to spiritual ritualistic reasons.<sup>25</sup> Harkness and Super<sup>26</sup> introduced "The development niche" in their article, which suggests that their surroundings influence children while they grow up. The three subsystems (psychology of caretakers, settings, and customs) of the developmental niche figure interact with the children's surrounding culture.<sup>26</sup> Since one of the three subsystems is the psychology of caretakers, caretakers' culture and psychology are also intertwined systems for children behavioral outcomes.

In the literature, lower socio-economic status was supposed to increase risk of substance use among adolescents. However, different studies argue that high levels of income and parental education are associated with binge drinking, marijuana, and cocaine use.<sup>27</sup> Socio-economically disadvantaged communities generally overlap with other disadvantaged communities such as the physically disabled and non-educated communities.<sup>24</sup> This overlap is usually interpreted as a positive correlation between the socioeconomic status of families and substance use. Nonetheless, further research is necessary on this specific topic.

## Genetic Susceptibility and Neurobiology

### Genetic Susceptibility

Various factors affect substance and alcohol use in children and adolescents. One of the most important factors is the family and thus the genetic susceptibility. There are numerous studies on the family and its effects on a child's/adolescent's possible alcohol/substance use. The effects of the parental relationship will be explained in the next section under the title of "Relationships with parents. In this section, we will be focusing on genetic susceptibility and neurobiology. According to Tripathi and Lal<sup>28</sup>, having a family member with substance abuse is the most crucial risk factor for children and adolescents to begin using substances, alongside other family factors like family conflict, an unstable household, and divorced parents. Biederman et al.<sup>29</sup> tried to determine whether parental SUD can predict alcohol and substance use in adolescents in their research. They controlled various factors like the duration of family SUDs, ADHD, social class, and family lifetime history of SUDs, and as a result, they determined that a family SUD increases the possibility of adolescents' SUD.<sup>29</sup>

In Merikangas et al.'s<sup>30</sup> study, the researchers attempted to find the familial transmission of SUDs. The number of participants was 299 and 149 had drug dependence, 89 of them had alcohol dependence, and the remaining 61 participants had no dependence at all. Researchers reached the participants first-degree relatives who accepted to be a part of the study; later on, their family history of drug and alcohol use was gathered. Participants who had parents with opioid abuse showed the most significant dependence/abuse rates, whereas the lowest rate of dependence/abuse was found on the ones with alcoholic relatives. Furthermore, relatives of probands with substance disorders had significantly greater drug use rates than the relatives of adolescents with no drug use history. The results were the same for the alcoholic relatives and probands: The results showed that relatives of the participants with alcoholism had much higher alcoholism than non-user relatives.<sup>30</sup>

According to a study by Kilpatrick et al.<sup>31</sup>, family alcohol use is related to adolescent alcohol and hard drug abuse/dependence but not marijuana use. In contrast, family drug use increased the risk of drug and marijuana use/dependence but not alcohol use. One other finding was that when there is familial alcohol use/abuse, the probability of children's alcohol and drug use/abuse is doubled, whereas marijuana use is not affected.<sup>31</sup> The impact of familial substance use, therefore, is very effective on adolescents' lives.

Abdelrahman et al.<sup>32</sup> studied the epidemiology of substance use among middle school children. They sought to find the impacts of a child's school environment, family, community, and individual risk factors like personality and characteristics. The results indicated that having a family member with a substance abuse treatment history is a powerful and consistent predictor of current substance use. Furthermore, having firm and strict rules against substance use in the family is a very powerful preventive factor for substance use. These rules are even more

effective than the family structure itself (whether one's parents are divorced) and the family conflict (the frequency of fights at the house). The results of this study showed that 31% of the children with a family member who underwent substance abuse treatment smoked cigarettes in the last 30 days, 41% used alcohol, and 18% used drugs. The values drop dramatically for the children with no family members who received treatment; 18% smoked cigarettes in the last 30 days, 28% used alcohol, and 7% used drugs.<sup>32</sup>

In Brook et al.'s<sup>33</sup> study, there is another example of familial influence on a child's/adolescent's alcohol/substance use. Their research tried answering the questions like whether family use of substances, maternal and adolescent personality, parental support, discipline have any influence on adolescents' illegal drug use. For the data sampling process, researchers interviewed 2,837 adolescents and their biological mothers. The results suggested that adolescents' illegal substance use is significantly related to a family member's marijuana and illegal drug use habits. This family member does not necessarily have to be a first-degree relative. Comparing the adolescents who use illegal substances to those who do not, researchers found that alcohol and substance users were three times more likely to have a family member with similar alcohol and substance use behavior. Furthermore, parents' attachment to their child, their support, the amount of time they spend with them, and maternal satisfaction greatly reduce the risk of adolescent's illegal drug use.<sup>33</sup>

In summary, these studies suggest that having a family member or relative with substance and alcohol use increases the risk of adolescent substance and alcohol use. Furthermore, family substance preferences influence adolescents' substance preferences as well. Some factors prevent substance and alcohol use, such as setting up strict rules, attachment style, maternal satisfaction, and family support.

## Neurobiology

SUDs may deleteriously affect central nervous system development which undergoes critical changes such as morphology, fiber architecture and biochemistry in adolescence.<sup>34</sup>

According to Nock et al.<sup>35</sup>, there may be significant structural and functional changes in adolescents' brains if exposed to substances; underlining the importance of adolescence for prevention. Furthermore, it is thought that abnormal structural and functional brain development during childhood may increase the risk of substance misuse during adolescence.<sup>35</sup> Substance use during adolescence can be life-threatening since most adolescent deaths are caused by suicides, homicides, and motor vehicle accidents. These deaths are related to cognitive control (or uncontrol) and impulsive/risky behaviour. Moreover, it is suggested that substance use affects and even exacerbates impulsive/risky behaviors and cognitive (un) control. Furthermore, substance use in time may change the brain's functions, and the brain may become more responsive to substances and less responsive to natural reinforcers/rewards.<sup>34</sup>

Also, the effects of substance use on the human brain do not disappear for an extended period, and all addictive drugs, including alcohol and marijuana, have long-lasting effects on adolescents' brains.<sup>36</sup>

According to the World Health Organization genetic vulnerability is an essential factor for initiation of substances. Moreover, specific genes facilitate development of substance dependence; easing the progression from initiation and trial to dependence among people with underlying genetic vulnerabilities. Additionally, if an individual has a substance addiction due to genetic susceptibility or heritability, risks for addiction to other substances are also increased, suggesting shared genetic vulnerabilities for abuse/dependence.<sup>37</sup> When individual risk factors like environment, family structure, peers, interact with one's developmental state of vulnerability, which is called the sensitive period, adolescents may have a higher tendency to have substance addiction. Furthermore, Jordan and Andersen<sup>38</sup> suggested that adolescents' procedural learning (i.e., habit formation) and stress coping mechanisms may be especially vulnerable to SUD.

There are certain regions of the brain that are involved in substance addiction. According to the surgeon general of the USA, those are the basal ganglia, the extended amygdala, and the prefrontal cortex.<sup>36</sup> These disruptions are explained as followed:

“(1) enable substance-associated cues to trigger substance seeking (i.e., they increase incentive salience); (2) reduce the sensitivity of brain systems involved in the experience of pleasure or reward, and heighten the activation of brain stress systems; and (3) reduce functioning of brain executive control systems, which are involved in the ability to make decisions and regulate one's actions, emotions, and impulses”.<sup>36</sup>

## Relationships with Parents

There are a significant number of studies on the effects of parents on a child's life. Nation and Heflinger<sup>39</sup> suggest that family structural characteristics and communication patterns are some factors that may lead an adolescent to initiate alcohol or drugs. Farrell et al.<sup>40</sup> suggest that parental support (especially maternal nurturance) and monitoring are other factors that would affect adolescent alcohol use. “Support” is nurturance, attachment, acceptance, cohesion, and love, whereas monitoring means discipline, control, supervision, and punishment in this study. Researchers have tried to identify the effects of different factors, such as maternal nurturance and support. The family cohesion is negatively correlated with stressful life events and therefore risk of heavy drinking among adolescents. They also found that parenting practices influence adolescents' drinking behavior.<sup>40</sup> There is another example of parental monitoring in Stewart's<sup>41</sup> research. In this study, the main goal was to determine adolescents' perceptions of various areas such as family characteristics (the existence of family rules), perception of self (self esteem), significant relationships and risk-taking behavior and their relationship to their attitudes. There were

294 questions in the survey trying to gather data like warmth toward mother and father, family rules, and whether curfews happen. According to Stewart<sup>41</sup>, parental monitoring and family rules are two critical factors in adolescents' use of alcohol, cocaine, and marijuana.<sup>40</sup> Parent-adolescent relationship and the quality and type of this relationship are also crucial buffering factors. The results did not vary by gender of adolescent and both males and females are affected by parental monitoring, parent-adolescent relationship, and family rules.<sup>41</sup>

According to Forgays<sup>42</sup> study, social bonding within the family is a significant protective factor for adolescents alcohol initiation. Social bonding consists of 3 different factors: Family conflict/cohesion, family structure, and rationale for non-use of alcohol. If there is not enough social bonding inside of the family, an adolescent may start using alcohol. Family conflict and unstable family structure increase the risk of alcohol use in adolescents.<sup>42</sup> Like Forgays<sup>42</sup> study, Coombs et al.<sup>43</sup> focus on the dynamics of family relationships. They compared alcohol user adolescents to non-alcohol user adolescents and found that non-users (67% of them) feel better understood by their families than by their friends, whereas this number is only 40% of the users. Furthermore, alcohol users feel that they are better understood by their friends than their families (43%) when this number is only 21% for non-users.<sup>43</sup>

Another example suggesting the importance of family cohesion is Duncan et al.<sup>44</sup> study. This study concluded that the initiatives for alcohol, marijuana, and cigarette use are similar: Family cohesion, peer influence, and gender. Researchers also found that adolescents' perceived cohesion levels can buffer initial levels of substance use and when there is a high level of family cohesion, the initial levels of substance use decreases. Furthermore, they found that peers are hazardous initiative factors for adolescent substance use.<sup>44</sup>

Johnson and Pandina<sup>45</sup> focus on the family environment's effect on adolescent's alcohol, marijuana, and other drug use. Family environment in this study includes parental behaviors and attitudes, parenting styles, family harmony, and cohesion. This study shows that younger adolescents' alcohol use is related to the same gender parent's attitudes, whereas older adolescents' fathers are the leading risk factors for alcohol use. There was not a significant relationship between the family environment and marijuana use. However, parenting style, especially father's parenting style (warmth and hostility) and alcohol use, played an essential role for 12 to 15-year-old boys, who are the younger adolescents, whereas, for the girls, it was mothers' parenting style that would influence marijuana use. When we look at alcohol use, until the age of 18, same-gender parents play an important role in adolescent alcohol use, and then, the father plays a massive role in daughters' alcohol use. Furthermore, for the younger adolescents who are 12 years old, the father's alcohol use would influence their alcohol use, along with perceptions of maternal punishment/ strictness for alcohol initiation among girls.<sup>45</sup>

Kung and Farrell<sup>46</sup> found that family structure is a critical risk factor for drug use. Their results showed that healthy, intact

families had a considerable influence on both boys' and girls' drug use. Both genders from intact families showed significantly lower drug use levels, whereas boys in adoptive or girls in single-parent families showed significantly higher levels of drug use.<sup>46</sup> Stoker and Swadi<sup>47</sup> suggest that poor parent-child relationships and disorganized family structure are associated with drug use in teenagers. According to researchers, adolescents with drug abuse had a distant, conflictual, mistrustful relationship with their parents, whereas it is the opposite for the non-users. Moreover, parental separation, divorce, and family loss through death may be common among adolescents with drug use.<sup>47</sup>

Aydođdu and am<sup>48</sup> found that adolescents who have substance abuse are less likely to have secure and preoccupied attachments and more likely to have fearful and avoidant attachment styles. Furthermore, the perception of family support on substance users is lower than that of those who are not, and the acceptance, care, monitoring is also low. They also found that adolescents who are not substance abusers got the highest score on the family support subscale, whereas peers were rated as the greatest sources of support among adolescents that are substance abusers.<sup>48</sup>

According to the qualitative research of Yaman<sup>49</sup>, youth with substance use with substance use, young people report greater problems with their families. Furthermore, the results of this study may support the importance of sincere familial communication as a buffer against substance use.<sup>49</sup>

## Conclusion

Relations with parents inevitably affect alcohol and substance use among youth and multiple studies exist which underline the various facets of this phenomenon. Those relations both directly affect SUDs as well as indirectly affecting comorbid disorders and interacting with socio-economic status. Presence of a family member using substances may be one of the most significant factors for adolescent initiation of substances. Alongside this, family conflict, chaotic households including parental divorce, limited parental supports and lack of communication among family members may be crucial for adolescents to start using alcohol and substances.

In contrast, strict family rules inside the house, authoritative disciplinary style, controlling and monitoring the child, good-enough parental support, family cohesion have buffering effects on substance and alcohol use. Specific genes may increase the risk of addiction, and some people have a higher tendency to become addicted. Both alcohol and substances have deleterious effects on youth: structural and functional features of the brain change when there is a use of substances or alcohol; furthermore, these changes will affect the brain even after the termination of the use. Adolescence may be a crucial period for preventive interventions against SUDs.

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## Ethics

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