Clinical correlates of cannabis use among adolescent psychiatric inpatients

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Objectives: This study sought to determine the clinical correlates of adolescents with cannabis use and no additional drug use (CU) compared to adolescents with no drug use (NDU) among a group of adolescent psychiatric inpatients in Israel.

Methods: Two hundred and thirty-six patients consecutively admitted to an adolescent inpatient unit at a university-affiliated mental health center in Israel during a 3-year period were screened. Individuals with polydrug use were excluded from the study.

Results: Prevalence of cannabis use was 13%. In the CU group, 39% were diagnosed with attention deficit and disruptive behavior disorders compared to 16% in the NDU group. Antipsychotics were the most common medications prescribed in both groups. Mood stabilizers were more frequently prescribed to CU than to NDU patients (39% vs 16%, respectively). A higher prevalence of alcohol abuse and criminal behaviors was found among CU compared to NDU patients (61% and 39% vs 6% and 4%, respectively).

Conclusions: The high prevalence of disruptive behaviors and frequent treatment with antipsychotics and mood stabilizers in the CU group may be related to the strong association between externalizing behavior and cannabis use and the non-specific pharmacological treatment of disruptive behaviors. Formal screening for cannabis use should be considered in psychiatric facilities. Specifically, adolescents with disruptive behaviors could benefit from early interventions, before and after cannabis initiation.

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1. Introduction

Psychopathology is increasingly recognized as a risk factor for the use of psychoactive substances [59]. Conversely, strong evidence suggests that substance use can be a risk factor for psychiatric disorders [7] and might significantly influence the course, treatment and outcome of psychiatric illness [53]. Recent epidemiological studies in different countries report an increase in substance-related problems among adolescent users [34,16] and rates of psychiatric comorbidity with substance use disorders among adolescents has generally been reported to be high (though this varies widely depending on the setting [52,56]).

The developmental phase of adolescence is regarded as a time of vulnerability to the adverse effects of substance use on neuropsychological functioning [33]. Drugs may interfere with learning, social and personal development and may aggravate preexisting emotional distress [55]. Both emotional problems and conduct disorders have long been recognized to co-occur with substance use disorders [29,28]. In addition, adolescent substance use has been associated with suicidal behavior [12,15,22,37]. Some studies have further reported family disruption and dysfunction associated with substance use in adolescent psychiatric inpatients [26,41,58].

Cannabis is the most widely used illicit substance worldwide, for both adults and adolescents [36,39]. In addition to substance-related risks, increasing levels of cannabis use among adolescents have been associated with affiliations with delinquent and substance-using peers, unconventional lifestyles, poor educational performance, increased school dropout rates, and difficulties in interpersonal relationships [38]. In addition, cannabis use has been associated with psychiatric disorders, such as depression, suicidal behavior, and psychosis, to which adolescent users may be especially vulnerable [17,51,54].

Thus, it is important to delineate the clinical and sociodemographic characteristics of cannabis-using adolescent psychiatric patients. To date, the majority of studies have tended to cluster various substances, including polydrug use, among adolescent psychiatric inpatients, without specifically addressing cannabis use. This is despite the knowledge that those substances operate through different mechanisms of action with differential effects on mental health (i.e. psychomotor stimulants that increase dopamine activity and potentially increase the risk of psychosis;
effects of opiates on the stress axis via activity in the norepinephrine-containing locus coeruleus [63]). Furthermore, there are reported differences in the psychopathology of individuals that use cannabis only and those with polydrug use. The latter are more strongly associated with psychopathology than cannabis-only users [64]. The main objective of the current study was to explore the sociodemographic and clinical correlates of adolescents hospitalized in an inpatient psychiatric ward that use cannabis only.

2. Patients and methods

2.1. Subjects

Two hundred and thirty-eight charts (n = 238) of patients consecutively admitted to the adolescent inpatient unit at a university-affiliated mental health center in Israel during a 3-year period were screened. During this period (between Jan 1, 2003 and Dec 31, 2006), there were no changes in the hospital's criteria for admission (that could potentially influence or confound the distribution of patients admitted to the unit). Of these, 12 patients were excluded from the study due to polydrug use. Ninety-six (42.5%) of the subjects were boys and 130 (57.5%) were girls. The mean age at admission was 15.8 (± 4.3) years. The median duration of hospitalization was 66.5 days. Thirteen (5.8%) of the subjects had a previous psychiatric admission. Of these, two (15.4%) were diagnosed with eating disorders, three (23%) were diagnosed with psychotic disorders, four (30.8%) were diagnosed with mood disorder and four (30.8%) were diagnosed with attention deficit and disruptive behavior. In all but one case, the previous and current diagnosis at discharge was identical; one subject had a previous admission to an eating disorder unit due to Anorexia Nervosa and her present admission was due to a major depressive episode. The study was approved by the Institute's Ethics Review Board. Since the study was based entirely upon analysis of retrospective data obtained from medical records, the need for informed consent was waived by the board.

2.2. Measures

Relevant clinical and demographic data were collected from the hospital's electronic medical records. These records were designed to contain fields that had to be completed by the psychiatrist at admission and during hospitalization, thus preventing the loss of data regarding the history and current status of the patient. Demographic data included age, gender, living arrangements, marital status of parents, country of birth of parents, and psychiatric diagnoses of parents and siblings. Clinical data included age at first admission (which commonly serves as a measure for onset of illness [32,50]), duration of hospitalization, diagnoses, medications prescribed, alcohol abuse, criminal acts (not directly related to possession or acquisition of cannabis), violent acts, and history of trauma and suicide attempts.

All diagnoses at discharge were based on the diagnostic and statistical manual of mental disorders, 4th edition (DSM-IV) [2] criteria using data that had been collected throughout subjects' hospitalization in the following manner: Patients were assessed at admission using a structured psychiatric interview; additional bi-weekly assessments were conducted throughout their hospitalization; recurrent clinical team discussions were conducted and prior to discharge final diagnosis was confirmed and signed by the unit director (G.R.), a certified child and adolescent psychiatrist. Similar diagnostic procedures have been used and previously reported by members of our group [5,6] and by members of the same health organization [55].

Diagnoses referred to in the study included diagnosis at discharge, following all above mentioned procedures. All diagnoses were clustered into the following five groups: psychotic disorders, mood disorders, anxiety disorders, attention deficit and disruptive behavior disorders and other diagnoses. In the one case in which there was discordance between previous and current diagnosis at discharge, we used the recent diagnosis at discharge (in this case “mood disorder”).

Information regarding lifetime cannabis and additional drug and alcohol use was based on detailed history as reported by the subjects, parents/caregivers and other professionals that have been involved in the subject's case. This included direct questioning of the subjects at initial assessment during admission; information retrieved from repeated psychiatric assessments throughout the hospitalization; data from the subject's file within the health service (including previous hospitalizations, outpatient treatment and assessments); direct information initially provided through parents and validated through questioning of the subjects. Self-report of cannabis has been shown to be reliable in a cohort of psychiatric subjects [31], and this method of collecting data on substance use among inpatients is commonly used [60]. It has also been shown that careful history taking may be superior to drug screening for cannabis use [47]. In addition, hospital policy requires a urine analysis when there is suspicion of recent (e.g. last week) psychoactive drug use. Accordingly, in cases of high suspicion of recent cannabis use, a urinalysis (5-pannel urine drug card including metamphetamines/amphetamines, cocaine, cannabis, opiates and phencyclidine) (Innovacon, USA) was performed upon admission and results documented. Cannabis use using this method can be detected for periods lasting from days to weeks, after last use, depending on frequency and intensity of use [65].

Cannabis use was defined as lifetime exposure to cannabis as reported through any of the above methods. Using dichotomous categories of lifetime cannabis use/no use and clustering lifetime users into a single “cannabis using” category are common methods in studies of adolescents [40,23].

2.3. Statistical analysis

Cannabis users (CU) and individuals with no drug-use (NDU) were compared using independent sample t-tests for comparison of parametric variables. As length of hospitalization was not distributed normally, median values are provided and comparisons between the CU group and the NDU group were conducted using the Mann-Whitney test. For non-parametric variables, information was coded into binary variables (i.e. yes/no) and the two groups were compared using Chi2 analyses. Fisher’s exact test was used when appropriate.

3. Results

No significant differences were found in sociodemographic variables between individuals in the CU group and those in the NDU group. These data are summarized in Table 1.

In addition, no significant between group differences were found in age at admission or length of hospitalization. The mean age at admission in the CU group was 16.3 (± 1.2) years and in the NDU group was 15.7 (± 4.6) years [t(224) = −0.617, P = 0.49]. A Mann-Whitney test indicated that there was no difference between the length of hospitalization in the CU group (median = 43 days) and the NDU group (median = 70 days), [U = 1956, P = 0.2, r = -0.08]

Several significant between group differences were found in clinical characteristics. A significant difference was found in the relative prevalence of different diagnoses at discharge.
with disruptive behaviors; two individuals (22%) in the CU group diagnosed with attention-deficit and disruptive behavior disorders were discharged with a diagnosis of attention deficit and hyperactivity disorder (ADHD).

Individuals in the CU group were more prone to engage in criminal acts or have a criminal record; 39.1% of the CU patients reported previous criminal acts vs 3.9% of the NDU patients ($\chi^2 (1, 226) = 36.77, P < 0.001$). Individuals in the CU group reported a higher prevalence of alcohol abuse than individuals in the NDU group (60.9% and 5.9%, respectively); ($\chi^2 (1, 226) = 61.29, P < 0.001$).

Individuals in the CU group had a higher prevalence of treatment with a mood stabilizer during their hospitalization than individuals in the NDU group ($\chi^2 (1, 226) = 7.07, P = 0.008$). In both groups, antipsychotic medications were the most commonly prescribed medications; 52.2% of the cannabis users and 61.1% of non-cannabis-users were prescribed antipsychotic medications.

### 4. Discussion

Prevalence of cannabis use among adolescent psychiatric inpatients in this study was roughly 13%. These rates are lower than those reported in studies from other western countries [13,43]. As rates of substance use among Israeli adolescents have generally been reported to be lower than in other western countries [61], these findings should be reviewed in relation to the prevalence of substance use among Israeli adolescents. Lifetime prevalence of cannabis use among Israeli adolescents has been reported to be between 7% (among adolescents in school) and 23% (among detached youth) [4]. Thus, prevalence of cannabis use in our inpatient study sample was found to be in the range of the general adolescent population in Israel.

Individuals in the CU group were more liable to have engaged in criminal acts than those in the NDU group. This is in line with the finding that the most common diagnosis among cannabis users was attention deficit and disruptive behavior disorders. Disruptive behavioral disorders have been previously linked to early experimentation of cannabis in population-based studies [3]. These include conduct disorder (CD) and oppositional-defiant disorder (ODD), which are characterized by persistent patterns of rule breaking. Though there is a high overlap of disruptive behaviors and ADHD, a growing body of evidence shows that adolescent cannabis use is mainly driven by behavioral disorders; ADHD seems to have little or no independent effect [18,21,67]. Indeed, in our sample, disruptive behaviors were significantly more prevalent among individuals in the CU group than ADHD. The association between externalizing behavior and consequent cannabis use which was revealed in population-based studies [11,25] was also recently found among adolescent inpatients [27]. Though it was not possible to find a causative effect, in the majority of cases, the behavioral problems preceded cannabis use in both samples.

Antipsychotic agents accounted for the medications most often prescribed in both groups. The high prevalence of antipsychotic use in adolescents is well recognized and in addition to psychotic disorders, current uses include disorders such as bipolar disorder, aggression/disruptive behavior, depression, anxiety disorders, tic disorders, delirium and eating disorders [20]. The gradual increase in prescription of antipsychotics in adolescents has been previously reported [44], and a recent study shows that up to 70% of adolescent inpatients are treated with an antipsychotic medication during their hospitalization [24]. Our findings are in line with these reports.

The many current uses of antipsychotic medications may explain why this category of medications was the most prevalent not only in the NDU group (where the most common diagnosis was

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**Table 1**

Sociodemographic and clinical correlates of adolescents with cannabis use and no additional drug use (CU) compared to adolescents with no drug use (NDU) in an inpatient adolescent psychiatric ward.

<table>
<thead>
<tr>
<th>demographics</th>
<th>Cannabis users</th>
<th>Non drug users</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>8 (34.8%)</td>
<td>88 (43.3%)</td>
<td>0.43</td>
</tr>
<tr>
<td>Female</td>
<td>15 (65.2%)</td>
<td>115 (56.7%)</td>
<td></td>
</tr>
<tr>
<td>Residency</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Home</td>
<td>21 (91.3%)</td>
<td>177 (87.2%)</td>
<td>0.175</td>
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<tr>
<td>Boarding school</td>
<td>2 (8.7%)</td>
<td>26 (12.8%)</td>
<td></td>
</tr>
<tr>
<td>Mother born in Israel</td>
<td>Yes</td>
<td>11 (47.8%)</td>
<td>129 (63.5%)</td>
</tr>
<tr>
<td>Father born in Israel</td>
<td>Yes</td>
<td>13 (56.5%)</td>
<td>127 (62.6%)</td>
</tr>
<tr>
<td>Parent status</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Both parents</td>
<td>15 (64.6%)</td>
<td>117 (57.6%)</td>
<td>0.76</td>
</tr>
<tr>
<td>Separated/divorced</td>
<td>6 (26.1%)</td>
<td>68 (33.5%)</td>
<td></td>
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<tr>
<td>Widowed</td>
<td>2 (8.7%)</td>
<td>18 (9.0%)</td>
<td></td>
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<tr>
<td>Parent history of mental illness</td>
<td>Yes</td>
<td>7 (30.4%)</td>
<td>67 (33%)</td>
</tr>
<tr>
<td>Sibling history of mental illness</td>
<td>Yes</td>
<td>5 (21.7%)</td>
<td>33 (16.3%)</td>
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<tr>
<td>Alcohol use</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>14 (60.9%)</td>
<td>12 (5.9%)</td>
<td></td>
</tr>
<tr>
<td>History of violence</td>
<td>Yes</td>
<td>8 (34.8%)</td>
<td>63 (31%)</td>
</tr>
<tr>
<td>History of criminal acts</td>
<td>Yes</td>
<td>9 (39.1%)</td>
<td>8 (3.9%)</td>
</tr>
<tr>
<td>History of childhood trauma</td>
<td>Yes</td>
<td>5 (21.7%)</td>
<td>30 (14.8%)</td>
</tr>
<tr>
<td>Suicide attempts</td>
<td>Yes</td>
<td>11 (47.8%)</td>
<td>63 (31%)</td>
</tr>
<tr>
<td>Self-injurious behavior</td>
<td>Yes</td>
<td>4 (7.4%)</td>
<td>39 (19.2%)</td>
</tr>
<tr>
<td>Previous psychiatric admission</td>
<td>Yes</td>
<td>1 (4.3%)</td>
<td>12 (5.9%)</td>
</tr>
<tr>
<td>Prescribed antipsychotics</td>
<td>Yes</td>
<td>12 (52.2%)</td>
<td>124 (61.1%)</td>
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<tr>
<td>Prescribed antidepressants</td>
<td>Yes</td>
<td>7 (30.4%)</td>
<td>66 (32.7%)</td>
</tr>
<tr>
<td>Prescribed mood stabilizers</td>
<td>Yes</td>
<td>9 (39.1%)</td>
<td>33 (16.3%)</td>
</tr>
<tr>
<td>Prescribed ADHD medications</td>
<td>Yes</td>
<td>2 (8.7%)</td>
<td>14 (6.9%)</td>
</tr>
<tr>
<td>Psychotic disorder at discharge</td>
<td>Yes</td>
<td>6 (26.1%)</td>
<td>73 (36%)</td>
</tr>
<tr>
<td>Mood disorder at discharge</td>
<td>Yes</td>
<td>7 (30.4%)</td>
<td>51 (25.1%)</td>
</tr>
<tr>
<td>Anxiety disorder at discharge</td>
<td>Yes</td>
<td>2 (8.7%)</td>
<td>42 (20.7%)</td>
</tr>
<tr>
<td>Attention deficit and disruptive behavior disorder at discharge</td>
<td>Yes</td>
<td>9 (39.1%)</td>
<td>33 (16.3%)</td>
</tr>
<tr>
<td>Other diagnosis at discharge</td>
<td>Yes</td>
<td>2 (8.7%)</td>
<td>27 (13.3%)</td>
</tr>
</tbody>
</table>

**ADHD:** attention deficit and hyperactivity disorder.

* Fisher’s exact test.

** P < 0.01.

*** P < 0.0001.

($\chi^2 (1, 226) = 18.43, P = 0.01$). The most common diagnosis in the CU group was attention deficit and disruptive behavior disorders (39.1%), and in the NDU group, psychotic disorder (35.9%). Among individuals in the CU group diagnosed with attention deficit and disruptive behaviors, the majority (78%; n = 7) were diagnosed...
psychotic disorders) but also in the CU group (where the principal diagnosis was attention deficit and disruptive behavior). The high prevalence of treatment with antipsychotic medication in the CU group and the low prevalence of treatment with ADHD medications may be attributed to the high proportion of individuals within this category diagnosed with disruptive behaviors and low proportion of individuals with ADHD in this group. In addition, it may be accounted for by the fact that there is currently no pharmacotherapy approved specifically for disruptive behavior, and evidence shows that antipsychotic agents may be useful for this indication [19]. The significantly higher prevalence of mood-stabilizers prescribed to patients in the CU group than in the NDU group, may similarly be explained by the finding that mood stabilizers have also demonstrated efficacy in treating disruptive behavior [1].

It should be noted that as there are currently no clear guidelines for medical treatment of disruptive behaviors, most available research refers to treatment of co-morbid disruptive behavior and ADHD. Medications used to treat these co-morbidities include stimulants, atomoxetine, antidepressants, alpha-2 agonists, mood-stabilizers and antipsychotics [62] as well as combinations of these medications. Studies reporting that co-morbid ADHD and disruptive behaviors are associated with more severe psychiatric outcomes compared to ADHD alone, point to the potential deleterious effect of disruptive behaviors. This commonly requires early detection and combinations of medications [30], or increased doses of medications [62]. Effective treatment may reduce the risk of more malignant conditions in adolescent and adult years such as conduct disorder, substance dependence, antisocial personality disorder, borderline personality disorder and possible bipolar disorder [30,57].

Individuals in the CU group were significantly more liable to report alcohol abuse. Previous research has linked alcohol and illicit substance abuse in adolescents within the general population [45]. Prior studies have also shown that a sizeable proportion of adolescents who use cannabis have used the drug together with alcohol consumption [14]. Thus, it has been proposed that, at least with respect to adolescents, one should consider the harm caused by simultaneous alcohol and cannabis use rather than the harm caused by the separate intake of each substance. Because adolescent use of cannabis commonly occurs in association with alcohol consumption, their drug use may be more detrimental than initially assumed. As noted, when alcohol and cannabis are used simultaneously the impairing effects seem to be compounded [35,49]. In fact, there are indications that the combination may be more than twice as harmful as intake of each substance alone [48].

As for the effects of cannabis on future mental health, the most robust findings from current literature point to an association between cannabis use and future psychotic disorders [42]. Specifically, it has been shown (in the Dunedin cohort) that cannabis use in adolescents, particularly before age 16, is associated with increased risk of future psychosis [3]. A further report from this cohort for individuals who initiated cannabis use before age 18 described a potential genetic predisposition for this association: a stronger effect of cannabis on the risk of future psychotic disorders was seen in people homozygous for the valine allele at Val158Met within the catechol-O-methyltransferase (COMT) gene with no apparent effect in methionine homozygotes and an intermediate effect in heterozygotes [10]. In addition, prior studies have reported that cannabis use during adolescence predicts anxiety [8,46] and depression [3] in young adulthood. This may explain the lack of differences in psychotic, mood and anxiety disorders among CU and NDU in the current sample, as disorders in young adulthood were beyond the scope of this cross-sectional study.

It should be noted that individuals in the CU group in our study did not receive specialized treatment for substance use or substance use disorders during the length of their hospitalization. None of the individuals in the CU group were referred to a substance-use program following discharge. This may be attributed to low regard to addressing substance use and substance use disorders in adolescent psychiatric settings [60], though it can, in part, be attributed to the scarcity of dual-diagnoses services for adolescents in Israel.

Limitations of this study are common to most retrospective studies of this nature [66]. First, the populations are relatively small and geographically confined, suggesting the need for caution in generalization of the findings. Second, information provided here does not include reasons for admission to psychiatric hospitalization (and potential differences between CU and NDU subjects), as this is routinely entered in patients’ charts in free verbal form, and could not be systematically categorized or quantitatively analyzed. Finally, data collected for this study are correlative, with the attendant caveats concerning attribution of causality. The available evidence regarding causality and the direction of the relationship between psychopathology and cannabis use is inconsistent. A longitudinal study has shown that a psychiatric disorder at age 15 led to a small but significantly elevated risk of cannabis use at age 18; by contrast, cannabis use at age 18 elevated the risk of psychiatric mental disorder at age 21 [40]. This most probably differs among disorders; though the evidence showing that cannabis use in adolescence can trigger psychotic episodes and worsen outcomes in established psychosis is well established (see [3]) causative effects of cannabis on other psychiatric disorders is not as clear. For example, Ferguson et al. [18] reported that cannabis use at age 15 to 16 years was not associated with more depression or suicide attempts at age 16 to 18 years. In contrast, Brook et al. [8] found that early onset cannabis use was associated with an increased risk of major depression by age 27 years [9] and a recent Australian cohort study found that frequent cannabis use in adolescent girls predicts later higher rates of depression and anxiety though depression and anxiety in adolescents does not predict cannabis use [46]. More longitudinal studies are clearly needed in order to establish a causative effect between early onset cannabis use and the specific psychiatric disorders.

The findings in this study highlight the correlates of cannabis use among adolescent psychiatric inpatients. Assessment for drug use, particularly cannabis use should be standard practice. Appropriate diagnosis and treatment may reduce recidivism and improve outcome in this vulnerable patient-population. Detecting cannabis use and diagnosing cannabis use disorders may assist clinicians in planning discharge and follow-up. Formal screening may facilitate early detection and treatment of cannabis use among adolescents with psychiatric disorders. Adolescents with disruptive behaviors, who are at an increased risk for early initiation of cannabis, could particularly benefit from early medical and psychosocial interventions, before and after cannabis initiation. Further in-depth investigation of cannabis use among adolescents with psychiatric disorders is warranted.

Disclosure of interest

The authors declare that they have no conflicts of interest concerning this article.

References


