Executive summary

The objective of this study was to determine the prevalence of cannabis-induced psychosis and psychotic symptoms, mood, and anxiety disorders in a sample of Hong Kong residents who abused cannabis. Our sample comprised 194 participants who were recruited from the Counselling Centres for Psychotropic Substance Abusers (CCPSAs), the Correctional Services Department (CSD), residential rehabilitation centres, and a local university from August 2019 to October 2023. All participants were interviewed face-to-face for 40–90 minutes each to diagnose their psychiatric condition and to collect their demographic, clinical, and drug use data.

Most of the participants were male and unemployed, with a mean age of 26 and a mean of 11 years of education; 89% were single, and 68% were current smokers. The participants' mean age at first cannabis use was 18, and their mean duration of using cannabis was 5 years. The lifetime mean number of days using cannabis was 877. The lifetime mean total cannabis consumption was 2,568 joints, and the lifetime mean consumption per day was 2.5 joints. Approximately three-quarters of the participants had lifetime cannabis dependence.

Sixty-nine percent of the participants were poly-drug users, with the five most commonly used drugs being cocaine (54%), ketamine (39%), ecstasy (32%), ice (methamphetamine, 29%), and hypnotics (21%). The age at first use of these other drugs ranged from 17 to 20 years, and the duration of use ranged from 2 to 4 years. The mean number of days of other-drug use per month in the participants' regular-use period ranged from 12 to 23. Current dependence on these drugs was rare (range: 1%–14%).

Approximately 87% of the participants reported experiencing withdrawal symptoms, suggesting that these symptoms are very common. The average number of symptoms was five, and the five most common symptoms were, in order, a craving to smoke cannabis, strange dreams, depressed mood, sweating, and restlessness.

Approximately 70% of the participants had lifetime substance-induced psychosis, and a minority (14%) of the participants had a lifetime diagnosis of cannabis-induced psychosis (CIP). The mean duration of CIP was 2 days. A small proportion of the participants had other psychoses such as delusional disorder or schizophrenia. CIP was related to a higher level of education (13 vs 11 years), being non-smoker (15% vs 4%), recruited from non-residential detoxification services (41% vs 22%), and being less likely to have a religion (19% vs 41%). CIP was also related to a higher amount of cannabis consumption and current dependence of cannabis (30% vs. 6%, $p<0.001$). A logistic regression revealed that education (odds ratio OR = 1.3) and current dependence on cannabis (OR = 11.7) predicted the occurrence of CIP. Amongst the cannabis-only users, 35% had CIP, and the mean duration of CIP was 3 days. A small proportion of the participants had other psychoses such as delusional disorder or schizophrenia. Those with CIP and those without CIP did not differ in terms of demographics and pattern of cannabis use.

Seventy-six percent of the entire sample had lifetime psychotic symptoms, and 27% had transient psychotic symptoms (TPS) that lasted for 6 days (range: 1–28 days) after their most recent cannabis use. Four percent had persistent psychotic symptoms (PPS), with the time between their most recent use of cannabis and the day of assessment being a mean of 103 days (range: 24–182 days). In terms of subtypes of psychotic symptoms, more than half of the entire sample reported lifetime delusions (67%) or hallucinations (58%). Delusions of reference (60%) were the most common type of delusion, followed by persecutory delusions (26%) and

grandiose delusions (12%). Auditory hallucinations were the most common type of hallucination (45%), followed by visual hallucinations (35%). Thirteen percent of the entire sample reported thought broadcasting.

Amongst the cannabis-only users, 48% had lifetime psychotic symptoms, and 23% had TPS that lasted for a mean of 1.6 days (range: 1–4 days) after their most recent use of cannabis. Five percent of these participants had PPS, with a mean interval of 80 days (range: 31–152 days) between their most recent use of cannabis and the day of assessment. In terms of subtypes of psychotic symptoms, a third of these participants reported lifetime delusions (33%) or hallucinations (33%). Delusions of reference (32%) were the most common type of delusion, followed by persecutory delusions (12%) and grandiose delusions (5%). Auditory hallucinations were the most common type of hallucination (27%), followed by visual hallucinations (12%). Three percent of these participants reported thought broadcasting.

In the entire sample, the participants with psychotic symptoms had a higher mean age (27 vs 24) and were more likely to be unemployed (75% vs 47%), to have religious beliefs (42% vs 26%), and to have a history of smoking (33% vs 6%) than those without psychotic symptoms. In terms of drug use, the participants with psychotic symptoms had a shorter duration of cannabis use in the past month (2 days vs 6 days) and higher rates of lifetime use of other substances (2.3 vs 0.7 type of drugs) than those without psychotic symptoms. Specifically, the participants with psychotic symptoms were more likely to have used cocaine (61% vs 28%,), ketamine (48% vs 13%), ecstasy (40% vs 9%), ice (35% vs 11%), or hypnotics (26% vs 4%) than those without psychotic symptoms. A logistic regression analysis revealed that age (OR = 1.08), unemployment (OR = 2.69), and the number of other drugs used (OR = 1.69) independently predicted the presence of psychotic symptoms. Amongst the cannabis-only users,

those with psychotic symptoms were more likely to be unemployed (66% vs 32%) than those without psychotic symptoms, and a logistic regression analysis revealed that unemployment (OR = 4.0) independently predicted the presence of psychotic symptoms.

In the entire sample, those with PPS had a lower educational level (9 vs 12 years) and were more likely to reside in public housing (43% vs 30%, p = 0.001) than those without PPS. A logistic regression analysis revealed no independent predictor of PPS. Amongst the cannabis-only users, those with PPS were older (28 vs 22 years), had a lower level of education (10 vs 14 years), were more likely to be recruited from non-residential settings (100% vs 36%), and were less likely to reside in public housing (33% vs 43%) than those without PPS. In terms of cannabis-use patterns, those with PPS had a higher level of cannabis consumption per day in the past year (7 vs 2 joints) than those without PPS. A logistic regression analysis revealed no independent predictor of PPS.

Lifetime substance-induced mood disorders were also common, as they were exhibited by 39% of the entire sample; the most common presentation was depressive episodes, which were experienced by 25% of the entire sample. In addition, cannabis-induced mood disorders (CIMDs) were exhibited by 9% of the entire sample. The prevalence rates of lifetime diagnoses of major depressive disorder and bipolar disorder were 18% and 3%, respectively. Those with CIMDs were more likely to have current dependence on cannabis (41% vs 6%) and higher cannabis consumption in the past one year than those without CIMDs. A logistic regression found that higher daily average use of cannabis (OR = 1.4) and current dependence on cannabis (OR = 6.6) predicted the occurrence of CIMDs.

Amongst the cannabis-only users, 50% had a lifetime diagnosis of mood disorders, with 25% having cannabis-induced anxiety disorders (CIADs). The prevalence rates of lifetime diagnoses of major depressive disorder and bipolar disorder were 25% and 2%, respectively. Individuals with CIMDs did not differ from those without CIMDs in terms of demographics characteristics. Those with CIMDs were more likely to exhibit current dependence on cannabis (46% vs 14%, $p = 0.020$).

Eight percent of the entire sample had a lifetime substance-induced anxiety disorder, with the most common presentation being substance-induced obsessive-compulsive features (8%). The prevalence of CIADs was 1%, and those with CIADs used cannabis more frequently in the past month (21 vs 3 days), and had a higher total consumption (63 vs 5 joints) and consumption per day (2.3 vs 0.3 joints) in the past month, than those without CIADs. A logistic regression found that total consumption of cannabis in the past month predicted the occurrence of CIADs (OR = 1.03). Amongst cannabis-only users, 5% had a lifetime diagnosis of an anxiety disorder, with 3% having CIADs.

In terms of the level of psychopathology of the entire sample, the mean scores on the Beck Depression Inventory (BDI), Hospital Anxiety Depression Scale (HADSA), Severity of Dependence Scale (SDS), and Marijuana Withdrawal Checklist (MWC) were 12.6 ± 10.6, 4.6 ± 4.6, 6.4 ± 3.8, and 7.3 ± 7.1, respectively. In addition, the mean score on the Brief Psychiatric Rating Scale (BPRS) was 18.1 ± 0.4, and all scores were below the respective cut-off point of the scale. Moreover, on the Positive and Negative Symptoms Scale (PANSS), the mean total score was 33.1 ± 0.4; the mean scores on the positive, negative, and general psychopathology (GP) items of the PANSS were 7.0 ± 0.0, 7.0 ± 0.0, and 16.1 ± 0.4, respectively; and no scores were greater than the cut-off points of the scales. Overall, female

sex and cannabis use per day in the past month predicted scores on the BDI; female sex predicted scores on the HADSA; education level predicted scores on the BPRS and PANSS GP; and unemployment and lifetime dependence on cannabis predicted MWC score

In terms of the level of psychopathology of the participants who were cannabis-only users, their mean scores on the BDI, HADSA, SDS, and MWC were 12.0 ± 10.3, 4.6 ± 4.4, 4.3 ± 3.2, and 5.8 ± 6.4, respectively. In addition, their mean score on the BPRS was 18.0 ± 0.0, and all scores were below the respective cut-off points. Moreover, on the PANSS, their mean total score was 33.0 ± 0.0; their mean scores on the positive, negative, and GP items of the PANSS were 7.0 ± 0.0, 7.0 ± 0.0, and 16.0 ± 0.0, respectively, and none of the participants scored higher than the cut-off points (Leucht et al., 2005). Overall, female sex predicted scores on the BDI and HADSA, and lifetime dependence on cannabis predicted scores on the MWC.

In conclusion, in our sample of cannabis users, psychotic symptoms such as delusions and hallucinations were very common. In the majority of users, these psychotic symptoms are short-lasting. On the other hand, a small fraction of users experienced PPS. One in seven individuals in our sample had CIP, the risk of which was increased by cannabis use. One in eleven individuals in our sample had CIMDs, with the predominant presentations being depressive episodes, and total cannabis consumption in the past 2 years predicted the presence of CIMDs. Nevertheless, cannabis-induced anxiety disorders were rare.