Twelve-month prevalence of DSM-5 mental disorders and the psychosocial correlates- a child and adolescent psychiatric epidemiologic survey in Hong Kong SAR

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Summary

Background Childhood and adolescence, as critically important developmental stages, set the premise for the lifelong trajectory of health and well-being. Epidemiologic evidence abounds in purporting that half of all lifetime mental disorders begin in adolescence. Epidemiologic data based on structured clinical diagnostic assessments are disproportionately scarce in Asian countries that host fast-growing youth population along a wide socioeconomic spectrum in the course of globalisation.

Methods A cross-sectional school-based epidemiologic survey was conducted on a representative random sample of children and adolescents aged 6–17 years from September 2019 to June 2023 in Hong Kong Special Administrative Region (Hong Kong SAR). The main diagnostic measures were 31 DSM-5 disorders assessed with Diagnostic Interview Schedule for Children, Version 5 (DISC-5) on the whole study sample. One parent/caregiver of each participant was interviewed for cases from primary schools. Separate parent/caregiver and student interviews were conducted for cases from secondary schools where research diagnoses derived from both sources in the adolescent/caregiver pair were combined at disorder level. A host of developmental and psychosocial factors were also collected. The study sample was reconstituted according to the discrepancy between the study population and official population data (census mid-year 2022 and Education Bureau) in terms of age, sex, ethnicity, household income and school type to give weight-adjusted prevalence estimation of various disorders.

Findings The final weighted sample consisted of 6082 participants. The 12-month prevalence of having only one DSM-5 disorder was 13.5% (95% CI: 12.6–14.3%), while the 12-month prevalence of having two or more DSM-5 disorders was 11.0% (95% CI: 10.2–11.8%). The most prevalent disorders/categories of disorders were attention-deficit/hyperactivity disorder (ADHD) (10.2%, 95% CI: 9.4–11.0%); any disruptive, impulse control and conduct disorders (8.8%, CI:8.1–9.5%); any anxiety disorders (6.1%, 95% CI: 5.5–6.7%); any depressive disorders (5.4%, 95% CI: 4.8–6.0%). The 12-month prevalence rates of suicide ideation, plan, and attempt (not including the non-suicidal self-injury) were respectively 3.9% (95% CI: 3.4–4.4%), 1.9% (95% CI: 1.6–2.3%), 1.1% (95% CI: 0.8–1.3%). Parental anxiety and depressive symptoms, any clinically significant sleep disorder, and major school maladjustments (such as repeating a grade, school suspension, absenteeism) were significant factors associated positively (ORs: 1.1–3.37, p-values < 0.01–0.001) with ADHD, externalizing and internalizing disorders in multivariate logistic regressions that account for a multitude of developmental and environmental factors.

Interpretation This study provides the first comprehensive mental health survey on children and adolescents that might inform other high-income regions in Asia and other robustly thriving economies in the coming decades. The common mental health problems present unmet needs in the school community and yet the related factors are accessible and potentially modifiable. Sustainable mental health initiatives should prioritise an integrated approach

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to the well-being of parent-child dyad, early detection and intervention targeting sleep disorders, and build a holistic learning support environment in school communities.

Research in context

Evidence before this study

Asia is home to the largest body of young population in the mid-low income countries undergoing vast socioeconomic developments amidst globalisation over the past few decades. The pooled estimate of worldwide prevalence of mental disorders in the young population under 18 years was 13.4% from a meta-analytic review based on 41 epidemiologic methodologically varied studies between 1985 and 2012, over-represented by European and North American populations with only eight studies conducted in Asia. Other authoritative reviews based on pre-pandemic studies conducted in predominantly developed countries reported a median prevalence estimate of 25%. No studies in Asian countries (and rarely in other continents) had applied structured diagnostic interviews like Diagnostic Interview Schedule for Children, Version 5 (DISC-5) to elicit the full range of mental disorders in representative samples of both children and adolescents.

A recent epidemiologic household survey conducted in two low-/mid-income Asian countries (Vietnam and Indonesia) found a 12-month prevalence of six DSM-5 disorders among adolescents aged 10–17 years was 3.3–5.5%, while the extent of mental health problems in children under 10 remained unknown.

Added value of this study

Amongst studies from high-income regions of Asia, this study is the first one that used a respondent-based structured interview schedule on the whole study sample with separate parent-informant and adolescent-informant versions, minimising sampling biases in a two-stage approach and under-reporting of symptoms by parents of adolescents. The structured diagnostic tool also tapped into a comprehensive spectrum of 31 DSM-5 child and adolescent psychiatric disorders, permitting an appraisal of a full landscape of mental health problems and the comorbid existence of issues encompassing contemporary socio-economic environment and other developmental factors. The cross-sectional comprehensive scan of mental health issues in school communities permits the exploration of a multitude of associated risk factors in a transdiagnostic manner.

Implications of all the available evidence

Mental health in children and adolescents is the bedrock of all aspects of development, from social interactions to academic attainment. This snapshot taken through a representative and inclusive random epidemiologic sample has shown for the first time the full landscape and burden of mental health problems in this age group in a high-income multi-ethnic city in Asia, ranging from neurodevelopmental to emotional and behavioural disorders reactive to the prevailing environmental adversities. All these problems potentially impact lifelong well-being, capacity to actualise personal potentials, and even transgenerational health outcomes sparing no social class and ethnic groups. Our data have revealed prominent and transdiagnostic associations such as parental mental distress, school-related issues, and early manifestation of sleep-circadian rhythm disturbance in children and adolescents, lending evidence-based targets for actionable policies and initiatives for all. Despite the bidirectional nature of the putative factors and the outcome, it is empirically valid to advocate early intervention with a holistic approach including the care for parental distress, behavioural and lifestyle modification to regulate sleep-circadian rhythm and learning support at school to improve psychological resilience and school engagement beyond the conventional scholastic goals.

The representative epidemiologic data in Hong Kong Special Administrative Region is instructive to other high-income cities in China and other Asian countries where educational coverage and the developmental challenges faced by school-aged share commonalities in terms of peer relationships, family and academic stress. The full mental health landscape and transdiagnostic factors may be instructive beyond the high-income states in Asia, to inform health policymakers in the rapidly developing low/mid-income countries in the process of urbanisation and globalisation in the making of proactive health care planning to sustain the social capitals for the vast socioeconomic growth in Asia.

Introduction

Globally, half of all lifetime mental disorders begin as early as 14 years of age with nearly 80% of adults with a history of depression, anxiety, or substance use disorders dated the onset to ages before 20.[1] World Health Organization (WHO) estimated the prevalence rates of mental disorders in children and adolescents as 10%–20% based on national surveys across the globe.[2,3] A meta-analysis that employed stringent inclusion criteria (original prevalence studies assessing community samples under 18 years on probabilistic sampling strategy and use of standardized assessment procedures deriving DSM or ICD-based disorders) estimated a pooled worldwide prevalence of 13.4%, based on 41 epidemiologic studies conducted in 27 countries between 1985–2012.[4] The developmental trajectories of child and adolescent mental health problems have intricate relationships with diverse psychosocial adversities in the phases of life, experiences and environment.[5] These factors are closely related to low socioeconomic status, poor parental mental health, and deprived support systems across schools and communities.[6–13]

An ongoing rise in mental health problems among teens has been evident for two decades before the COVID-19 pandemic.[14] WHO also reported a rising burden of mental health problems with lasting effects throughout the pandemic, and in its aftermath.[15] Against the under-representation of national mental health data in children and adolescents in Asia, continuing tracking of the burden of mental health problems is compelling to understand the dynamic changes in mental health care needs as Asia is home to a growing youth population from largely low/mid-income countries undergoing vast economic developments.[16] Based on a national-level epidemiologic study conducted shortly before the COVID-19 pandemic, China also saw the prevalence of any psychiatric disorder in children and adolescents aged 6–16 years peaking at 17.5% after 30 years of a steeply growing economy, urbanisation, and widening wealth inequalities under the "Open Reform Era."[17] Hong Kong Special Administrative Region (Hong Kong SAR), a high-income city uniquely positioned in the socioeconomic landscape of China, is home to a stable multi-ethnic population of 7.53 million (over 90% Chinese) where separate legislation, education system and socioeconomic infrastructure under the constitutional scheme of "One Country, Two Systems" is adopted.[18] Without any prior epidemiologic data from a representative sample in Hong Kong SAR, the local health administration had identified a 50% surge in child and adolescent psychiatric service needs from 2011–2015[19] and concurrent alarming rise in adolescent suicide rate from less than 2 per 100,000 to over 4 per 100,000 from 2014–2019,[20,21] necessitating a territory-wide comprehensive psychiatric epidemiological survey in children and adolescents.

Epidemiological studies vary in design where two-stage sampling has been commonly employed to yield a representative study sample at an affordable cost, notwithstanding the inherent sampling biases in selecting cases for second-stage diagnostic ascertainment. Diagnostic Interview Schedule for Children (DISC), a respondent-based diagnostic interview schedule developed by the National Institute of Mental Health of the United States, is capable of generating a full range of over 30 psychiatric diagnoses according to the Diagnostic and Statistical Manual of Mental Disorders (DSM) by American Psychiatric Association (APA) with well-established psychometric properties that can be administered by trained lay interviewers.[22,23] DISC was used in the landmark MECA study in the United States in a single-stage design, demonstrating its acceptability and feasibility yielding accurate prevalence estimates of various child/adolescent psychiatric disorders.[24] A recent multinational epidemiologic study by Erksine and colleagues employed DISC-5 in a cross-sectional household survey to ascertain the prevalence of six mental disorders among adolescents aged 10–17 years from two low-/mid-income Asian countries (Vietnam and Indonesia), observing a 12-month prevalence of 3.3–5.5%.[25] To our knowledge, no studies in Asian countries (and rarely in other continents) have applied DISC-5 to elicit the full range of mental disorders in representative samples of both children and adolescents.

This paper reports the main findings from a government-commissioned school-based epidemiologic study that aimed to: 1) estimate the 12-month prevalence of 31 DSM-5 child and adolescent psychiatric disorders in the Hong Kong population aged 6–17 years; and 2) examine the environmental and developmental factors associated with major categories of DSM-5 disorders.

Methods

Study design, setting and participants
This cross-sectional epidemiologic study was commissioned to the research team by the Health Bureau of Hong Kong SAR in 2019 targeting the population aged 6–17 years. To minimize the sampling bias from the two-stage design, a respondent-based diagnostic interview schedule was adopted to enable a one-stage diagnostic assessment covering a broad spectrum of disorders by lay interviewers. Based on the universal school enrolment of children and adolescents in the target age group enabled by the established education policy and the free provision in the public sector,[26] a school-based sampling was used to recruit a representative sample from the target age group.

Fieldwork was carried out from September 2019 to June 2023. The sampling frame of the study was a territory-wide school-based population aged 6–17 years

3

encompassing all grade levels (primary, secondary), all school funding types (private, subsidised), and curriculum categories (mainstream, international, special needs) in Hong Kong SAR. Based on a complete list of schools provided by the Hong Kong SAR Education Bureau, a random number list was generated for each school category constituting the first stratum. Following the order on the random number list, the research team sent invitations to school principals under each category by email and post, and arranged visits with the senior management of the candidate schools to introduce the study. Inclusion criteria were any students aged 6–17 years enrolled in the selected schools during the study period while no exclusion criteria were set.

After recruiting the individual schools, the next stratum of sampling involved universal class-based recruitment where students from each grade and class membership had an equal chance to be selected. A random number list of anonymised students in each class was generated. The school administrator then issued notices to parents about the school's participation in the study before the research team approached the potential participants' parents on each class list. Those who were unapproachable or rejected the research invitation were replaced by the next student on the list. A sampling ratio of 1:7 in each class was adopted to reach the target sample size.

Measurement - diagnostic assessments and interview procedures

The main objective of this study, the 12-month prevalence of 31 DSM-5 child and adolescent disorders, was ascertained with Diagnostic Interview Schedule for Children Version 5 (DISC-5)[22,23] administered by trained lay interviewers using a computerised scoring algorithm. This paper does not cover autism spectrum disorder (ASD) as it is not included in DISC-4 or 5. The research team has conducted a parallel study that employed a two-stage sampling approach to the current epidemiologic sample to enumerate the prevalence of ASD, for which the results will be reported in another paper.

All trained interviewers were research assistants or undergraduate students majoring in psychology or health sciences. DISC-5 is a respondent-based structured interview schedule with separate parent-informant and adolescent-informant versions covering 31 DSM-5 child/adolescent diagnoses in a 12-month timeframe. The team was authorised to adapt DISC-5 to Chinese based on a locally validated DISC-4.[22] In this study, functional impairment questions were applied to each disorder with the modified impairment criteria that excluded domain 1 (subjective distress of caregiver) and 6 (subjective distress of child/adolescent). A disorder was qualified only if one 'severe' or two 'intermediate' impairments were fulfilled within domains 2–5 on functional impairment perceived by family, teachers and

people in other relationships. The modified criteria were also adopted in a recent regional study in Taiwan reporting the prevalence of DSM-5 mental disorders of primary and secondary students in three selected age bands.[27] DISC-4 was adopted to ascertain schizophrenia spectrum disorders as this module was not included in DISC-5.

For the child participants from primary schools, the diagnostic interview was conducted with only one parent or a legitimate adult caregiver (in cases where children were raised by non-parent caregivers) as the sole informant in every case. For adolescent participants from secondary schools, diagnostic interviews were conducted separately with one parent/legitimate adult caregiver and with the adolescent. "Or rule" algorithm was adopted to combine data at disorder level from parent/adult caregivers and adolescents among the secondary school participants. Under the "or" rule, a disorder was considered present when either the parent or the adolescent endorsed it at the disorder level. For secondary students from Special Education Programmes for intellectual disability, only the parent/caregiver or legitimate adult caregiver was interviewed following the same protocol for primary school participants.

Measures of socioeconomic, family, and personal developmental factors included household income, living condition, family's social and health background, parental current anxiety and depression symptoms respectively with 'Generalised Anxiety Disorder 7' (GAD-7)[28] and 'Patient Health Questionnaire' (PHQ-9),[29] child's medical and developmental histories, childhood adversities, and school maladjustments (repeating a grade, suspension, prolonged absence, and less than 20% class attendance). These non-diagnostic measures were collected through interviewer-administered or self-administered questionnaires within an institutional cyber-secure environment. A single source of information was sought for each questionnaire that was designated to be answered by either parents/caregivers or the student according to the fieldwork protocol for primary and secondary school participants. Clinically significant sleep conditions (e.g., insomnia, delayed sleep phase disorder, nightmares, sleepwalking, bruxism, night terror) were ascertained with Diagnostic Interview for Sleep Patterns and Disorders (DISP), based on the International Classification of Sleep Disorder, 2nd version.[30]

In most cases, each assessment with one interviewee lasted 2–3 h, depending on the number of psychiatric symptoms reported. All completed interviews were compensated with cash coupons of HKD$400–600. Among parents/caregivers who did not understand English or Chinese, interpreters were involved in the interviews (covering Urdu, Hindi, Nepali, and Tagalog). Fieldwork was initially carried out on school campuses outside school hours from September 2019 to January 2020. In view of the subsequent social lockdown

imposed for the COVID-19 pandemic, interviews were conducted via online video-conferencing until the end of the study period. Over the transition of fieldwork protocol from physical meetings to online video-conferencing, interviewers were rigorously re-trained to ensure the standard of online interviews was maintained and coherent with the face-to-face interviews. A consistent supervisory and quality assurance protocol was applied by the senior researchers throughout the two phases of fieldwork.

Sample size estimation and statistical methods

Using the software Epi Info™ provided by the US Center for Disease Control (CDC), it was shown that a sample size of 6000 gave a margin of error for disorders prevailing at 5%, a 95% CI ± 0.55% (i.e., 4.45–5.55%) with 11% margin of error in either direction, assuming the population size of 680,000 in the reference age-group. For broader diagnostic groups with an expected prevalence of 10%, 95% CI was estimated to be ± 0.75% (i.e., 9.25–10.75% with 7.5% margin of error in either direction).

The study sample was reconstituted according to the discrepancy between the study sample and official population data (based on the Census mid-year 2022 and Education Bureau) in terms of age, sex, ethnicity, household income, and school type (proportion of school under "Special Education Programme") to give weight-adjusted prevalence estimation of various disorders with 95% CIs provided.

Multivariate logistic regressions were performed to generate joint odds ratios between pairs of disorders after adjusting for the presence of other categories of disorders. The associations of putative biopsychosocial factors with the index disorder category as a dependent variable were explored with logistic regression. Backward selection with Akaike Information Criterion (AIC) was applied where AIC equals 2k-2ln(L), k is the number of parameters in the model (including the intercept) and L is the maximum likelihood estimate of the model. The AIC value of the reduced model with the AIC value of the previous full model was compared at each step to select the model with a lower AIC value for optimal model fit and complexity until there was no further improvement in the AIC value, yielding the final model.

Ethics approval

Prior to the fieldwork of this study, the research protocol was reviewed and approved by the local institutional review board (Joint Chinese University of Hong Kong-New Territories East Cluster Clinical Research Ethics Committee: CREC Ref. No.: 2018.497) in compliance with the Declaration of Helsinki on July 21st, 2020. All parents gave written informed consent before data collection.

Role of the funding source

The funders of the study had no role in the design and conduct of the study, data collection, management, analysis, interpretation, writing of the manuscript, or decision to submit the manuscript.

Results

Participants and sample characteristics

By systematically approaching candidate schools within the stratified random list of 1291 schools, 83 primary schools and 90 secondary schools were consecutively approached by the order on the random list, among which 62 primary schools (74.7%) and 64 secondary schools (71.1%) enrolled in the final sample. Within 126 enrolled schools, 8492 potential participants were approached through the random number list generated for each class, among which 6092 students ultimately enrolled for assessment. The response rate among potential participants approached through the random number list was 71.7% (details shown in Fig. 1). The final crude sample size (before weighting) was 6084 with valid DISC-5 data as eight parents withdrew from the study without completing the assessments. Table 1 shows the comparison of the study sample's characteristics and the official population data. The effect sizes of the differences between the study sample and the official population in terms of age, sex, and household income were small (0.12–0.26).[31] The effect sizes of the proportion of non-ethnic Chinese and special education schools relative to the official population were moderate (0.38–0.53).[31]

Post-stratification weights for each stratum (age, sex, ethnicity, school type, household income) were calculated where a greater weighting was assigned to the under-sampled. Applying the weight adjustments to the full sample of 6084, the weighted full sample became 6081.77. For simplicity, the weighted full sample was rounded off to 6082 in all tables.

12-month prevalence of DSM-5 child and adolescent psychiatric disorders

Full weighted sample

Table 2 shows the weighted 12-month prevalence of 31 DSM-5 disorders in the full weighted sample (N = 6082) stratified by sex and school levels (primary vs secondary). The weighted prevalence of having any probable DSM-5 psychiatric disorders based on DISC-5 was 24.4% (95% CI: 22.8–26.1%). The weighted prevalence rates of having one diagnosable DSM-5 disorder, and two or more diagnosable DSM-5 disorders were respectively 13.5% (95% CI: 12.6–14.3%) and 11.0% (95% CI: 10.2–11.8%). The five most prevalent DSM-5 disorders or disorder categories in the weighted full sample were: attention-deficit/hyperactivity disorder (ADHD) (10.2%, 95% CI: 9.4–11.0); any disruptive,
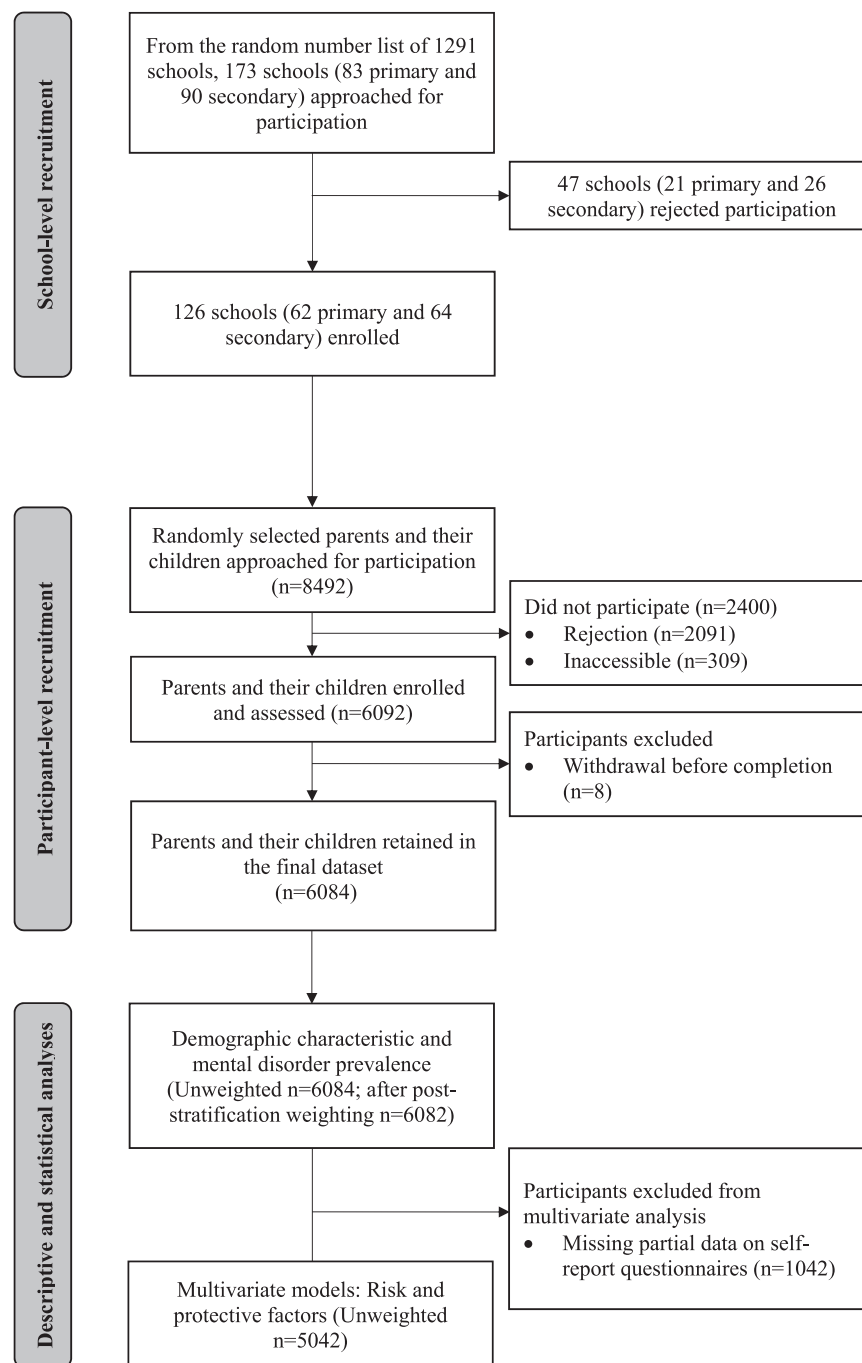
Fig. 1: Participants' enrolment flowchart and data analytic pipeline.

impulse control and conduct disorders (8.8%, 95% CI: 8.1–9.5%); any anxiety disorders (6.1%, 95% CI: 5.5–6.7%); any depressive disorders (5.4%, 95% CI: 4.8–6.0%); any obsessive-compulsive and related disorders (4.8%, 95% CI: 4.3–5.4%). Bipolar and related disorders, schizophrenia spectrum and other psychotic

disorders, and substance-related and addictive disorders had the lowest prevalence rates among all eleven disorder categories, with the following 12-month prevalence rates respectively: 0.2% (95% CI: 0.1–0.4%), 0.0% (95% CI: 0.0–0.1%), and 0.6% (95% CI: 0.4–0.7%). Non-suicidal self-injury, as a separate disorder entity in DSM-

5, had an overall prevalence of 1.2% (CI:1.0–1.5%). The detailed breakdown of the prevalence of 31 DSM-5 disorders and suicidality in specific age bands is given in the Supplementary Table S1. The age trend of 11 categories of DSM-5 disorders and suicidality is shown in Fig. 1 in Supplementary Information.

Primary school sample
The five most prevalent categories of DSM-5 disorders among primary school participants were (weighted N = 3603): ADHD (12.4%, 95% CI: 11.3–13.4%); any disruptive, impulse control and conduct disorders (10.6%, 95% CI: 9.6–11.6%); any anxiety disorders (5.0%, 95% CI: 4.3–5.7%); any obsessive-compulsive and related disorders (2.9%, 95% CI: 2.3–3.4%); and any depressive disorders (2.2%, 95% CI: 1.7–2.7%).

Secondary school sample
Among participants from secondary schools (weighted N = 2479), the five most prevalent categories of DSM-5 disorders were: any depressive disorders (10.0%, 95% CI: 8.8–11.2%); any anxiety disorders (7.8%, 95% CI: 6.8–8.9%); any obsessive-compulsive and related disorders (7.7%, 95% CI: 6.6–8.7%); ADHD (7.1%, 95% CI: 6.1–8.1%); and any disruptive, impulse control and conduct disorders (6.2%, 95% CI: 5.2–7.1%). Table 2 also presents detailed prevalence figures of each disorder by school level (primary and secondary).

Sex-specific prevalence of DSM-5 disorders
The five most prevalent DSM-5 disorders/disorder categories for female participants (N = 2946) were: any disruptive, impulse control and conduct disorders (7.5%, 95% CI: 6.6–8.5%); any depressive disorders (7.4%, 95% CI: 6.5–8.3%); ADHD (7.2%, 95% CI: 6.3–8.1%); any anxiety disorders (6.8%, 95% CI: 5.8–7.7%); and any obsessive-compulsive and related disorders (4.9%, 95% CI: 4.1–5.6%).

The five most prevalent DSM-5 disorders/disorder categories for male participants (N = 3136): ADHD (13.0%, 95% CI: 11.9–14.2%); any disruptive, impulse control and conduct disorders (9.9%, 95% CI: 8.9–11.0%); any anxiety disorders (5.5%, 95% CI: 4.7–6.3%); any obsessive-compulsive and related disorders (4.8%, 95% CI: 4.1–5.6%); and any depressive disorders (3.5%, 95% CI: 2.9–4.2%). Table 2 presents detailed prevalence figures of each disorder by sex.

12-month prevalence of suicidality
As shown in Table 2, the 12-month prevalence rates of suicidality in the fully weighted sample, i.e. suicide ideation, plan and attempt, were respectively 3.9% (95% CI: 3.4–4.4%), 1.9% (95% CI: 1.6–2.3%) and 1.1% (95% CI: 0.8–1.3%). The prevalence rates of suicide ideation/plan/attempt in primary school students were respectively 0.8% (95% CI: 0.5–1.1%), 0.6% (95% CI: 0.4–0.9%), 0.3% (95% CI: 0.1–0.4%), while the

corresponding rates of suicide ideation/plan/attempt in secondary school students were 8.4% (95% CI: 7.3–9.5%), 3.8% (95% CI: 3.0–4.5%), 2.3% (95% CI: 1.7–2.9%).

The detailed breakdown of the prevalence of suicidality across age bands is given respectively in the Supplementary Table S1 and Fig. 1.

Adjusted odds ratio of comorbid DSM-5 disorders
Multivariate logistic regressions were performed to generate adjusted odds ratios between any pairs of disorders after adjusting for the presence of other categories of disorders and suicidality. Only comorbid pairs with statistically significant associations ($p < 0.01$) are

	Work heart sample		Hong Kong population mid-year 2021		Effect size
	N	%	N	%	
Age (years)					
6	446	7.3%	55,333	8.1%	[b]0.264
7	657	10.8%	54,561	8.0%	
8	596	9.8%	60,496	8.8%	
9	664	10.9%	66,254	9.7%	
10	549	9.0%	64,676	9.4%	
11	500	8.2%	51,201	7.5%	
12	730	12.0%	51,624	7.5%	
13	529	8.7%	61,822	9.0%	
14	466	7.7%	60,075	8.8%	
15	379	6.2%	55,235	9.1%	
16	302	5.0%	52,818	7.7%	
17	266	4.4%	51,788	7.6%	
Sex					
Male	3544	58.3%	353,120	51.5%	[b]0.135
Female	2540	41.7%	332,763	48.5%	
Ethnicity					
Chinese	3480	86.1%	645,135	94.8%	[b]0.383
Non-Chinese	564	13.9%	35,478	5.2%	
[a]**Type of School**					
Mainstream school	5649	92.9%	677,064	98.7%	[b]0.521
Special school	435	7.1%	8819	1.3%	
Household income					
Below $4000	225	3.7%	9300	1.7%	[b]0.212
$4000–$5999	66	1.1%	6000	1.1%	
$6000–$7999	91	1.5%	9200	1.7%	
$8000–$9999	143	2.4%	18,300	3.4%	
$10,000–$14,999	464	7.6%	45,800	8.6%	
$15,000–$19,999	624	10.3%	53,400	10.0%	
$20,000–$29,999	733	12.1%	54,100	10.1%	
$25,000–$29,999	460	7.6%	43,300	8.1%	
$30,000–$39,999	777	12.8%	67,400	12.6%	
$40,000–$59,999	1075	17.7%	84,500	15.8%	
$60,000–$79,999	584	9.6%	46,900	8.8%	
$80,000–$99,999	289	4.8%	29,800	5.6%	
$100,000 or above	540	8.9%	65,800	12.3%	

[a]Source of population data on special school students' proportion is based on Education Bureau. Other population data are based on Census 2021. [b]p-value < 0.001.

Table 1: Comparison of study sample and Hong Kong population.

Full sample % (95% CI)	Sex		School level		Overall (n = 6082)
	Female (n = 2946)	Male (n = 3136)	Primary (n = 3603)	Secondary (n = 2479)	
Overall prevalence (Number of DISC-5 disorder)					
None	76.2% (74.7–77.7%)	75.0% (73.4–76.5%)	77.8% (76.5–79.2%)	72.3% (70.5–74.0%)	75.6% (74.5–76.6%)
One	12.8% (11.6–14.0%)	14.1% (12.9–15.3%)	12.0% (11.0–13.1%)	15.6% (14.1–17.0%)	13.5% (12.6–14.3%)
More than one	11.0% (9.9–12.1%)	10.9% (9.8–12.0%)	10.1% (9.1–11.1%)	12.2% (10.9–13.5%)	11.0% (10.2–11.8%)
Anxiety disorders					
Social phobia	3.7% (3.1–4.4%)	3.6% (3.0–4.3%)	3.2% (2.6–3.7%)	4.4% (3.6–5.2%)	3.7% (3.2–4.2%)
Separation anxiety	1.5% (1.1–2.0%)	1.6% (1.2–2.1%)	1.5% (1.1–1.9%)	1.7% (1.2–2.2%)	1.6% (1.3–1.9%)
Panic disorder	1.0% (0.6–1.3%)	0.4% (0.2–0.6%)	0.1% (0.0–0.3%)	1.5% (1.0–2.0%)	0.7% (0.5–0.9%)
Agoraphobia	1.0% (0.6–1.3%)	0.6% (0.3–0.8%)	0.6% (0.3–0.8%)	1.0% (0.6–1.4%)	0.8% (0.5–1.0%)
GAD	2.6% (2.1–3.2%)	1.5% (1.1–1.9%)	1.2% (0.9–1.6%)	3.3% (2.6–4.0%)	2.1% (1.7–2.4%)
Obsessive-compulsive and related disorders					
Trichotillomania	0.1% (0.0–0.1%)	0.0% (0.0–0.1%)	0.0% (0.0–0.0%)	0.1% (0.0–0.2%)	0.0% (0.0–0.1%)
OCD	4.8% (4.0–5.6%)	4.7% (3.9–5.4%)	2.7% (2.2–3.3%)	7.6% (6.6–8.7%)	4.7% (4.2–5.3%)
Excoriation	0.2% (0.0–0.3%)	0.2% (0.0–0.3%)	0.2% (0.1–0.4%)	0.1% (0.0–0.2%)	0.2% (0.1–0.3%)
Trauma-and stressor related disorders					
PTSD	0.3% (0.1–0.6%)	0.2% (0.0–0.3%)	0.0% (0.0–0.1%)	0.6% (0.3–0.9%)	0.3% (0.1–0.4%)
Feeding and eating disorders					
Pica	0.1% (0.0–0.3%)	0.3% (0.1–0.5%)	0.0% (0.0–0.0%)	0.6% (0.3–0.9%)	0.2% (0.1–0.4%)
ARFID	2.4% (1.9–3.0%)	1.9% (1.4–2.4%)	1.4% (1.0–1.8%)	3.2% (2.5–3.9%)	2.1% (1.8–2.5%)
Anorexia nervosa	0.5% (0.2–0.7%)	0.3% (0.1–0.4%)	0.1% (0.0–0.3%)	0.7% (0.4–1.0%)	0.4% (0.2–0.5%)
Bulimia nervosa	0.1% (0.0–0.2%)	0.0% (0.0–0.0%)	0.0% (0.0–0.0%)	0.1% (0.0–0.2%)	0.0% (0.0–0.1%)
Binge eating disorder	0.3% (0.1–0.4%)	0.0% (0.0–0.1%)	0.1% (0.0–0.2%)	0.2% (0.0–0.4%)	0.1% (0.0–0.2%)
Bipolar and related disorders					
Bipolar I disorder	0.2% (0.0–0.3%)	0.1% (0.0–0.2%)	0.1% (0.0–0.1%)	0.2% (0.0–0.4%)	0.1% (0.0–0.2%)
Bipolar II disorder	0.2% (0.0–0.3%)	0.1% (0.0–0.2%)	0.0% (0.0–0.0%)	0.3% (0.1–0.5%)	0.1% (0.0–0.2%)
Neurodevelopmental disorder					
ADHD	7.2% (6.3–8.1%)	13.0% (11.9–14.2%)	12.4% (11.3–13.4%)	7.1% (6.1–8.1%)	10.2% (9.4–11.0%)
Depressive disorders					
DMDD	0.4% (0.1–0.6%)	0.1% (0.0–0.2%)	0.4% (0.2–0.6%)	0.0% (0.0–0.0%)	0.2% (0.1–0.3%)
MDD	2.4% (1.9–3.0%)	0.9% (0.6–1.2%)	0.5% (0.3–0.8%)	3.3% (2.6–4.0%)	1.6% (1.3–2.0%)
PDD	0.0% (0.0–0.1%)	0.1% (0.0–0.3%)	0.0% (0.0–0.0%)	0.2% (0.0–0.4%)	0.1% (0.0–0.1%)
Other specified depressive disorder	4.9% (4.2–5.7%)	2.6% (2.0–3.1%)	1.5% (1.1–1.9%)	7.0% (6.0–8.0%)	3.7% (3.2–4.2%)
Disruptive, impulse-control, and conduct disorders					
IED	3.1% (2.5–3.7%)	4.2% (3.5–4.9%)	4.3% (3.7–5.0%)	2.7% (2.1–3.4%)	3.7% (3.2–4.1%)
ODD	6.1% (5.2–7.0%)	8.4% (7.4–9.4%)	8.8% (7.9–9.7%)	5.1% (4.2–5.9%)	7.3% (6.6–7.9%)
CD	0.3% (0.1–0.4%)	0.2% (0.1–0.4%)	0.2% (0.1–0.4%)	0.3% (0.1–0.5%)	0.3% (0.1–0.4%)
Schizophrenia spectrum and other psychotic disorder					
–	0.0% (0.0–0.1%)	0.0% (0.0–0.0%)	0.0% (0.0–0.0%)	0.1% (0.0–0.1%)	0.0% (0.0–0.1%)
Substance-related and addictive disorders					
Alcohol	0.4% (0.2–0.7%)	0.3% (0.1–0.5%)	0.0% (0.0–0.0%)	0.9% (0.5–1.3%)	0.4% (0.2–0.5%)
Marijuana	0.0% (0.0–0.0%)	0.1% (0.0–0.1%)	0.0% (0.0–0.0%)	0.1% (0.0–0.2%)	0.0% (0.0–0.1%)
Tobacco	0.2% (0.1–0.4%)	0.2% (0.1–0.4%)	0.0% (0.0–0.0%)	0.6% (0.3–0.9%)	0.2% (0.1–0.4%)
Non-suicidal self-injury					
–	1.9% (1.4–2.4%)	0.6% (0.3–0.9%)	0.3% (0.2–0.5%)	2.5% (1.9–3.2%)	1.2% (1.0–1.5%)
Suicidality					
Suicide ideation	5.7% (4.9%–6.6%)	2.2% (1.7%–2.7%)	0.8% (0.5%–1.1%)	8.4% (7.3%–9.5%)	3.9% (3.4%–4.4%)
Suicide plan	2.2% (1.7%–2.8%)	1.6% (1.2%–2.1%)	0.6% (0.4%–0.9%)	3.8% (3.0%–4.5%)	1.9% (1.6%–2.3%)
Suicide attempt	1.4% (1.0%–1.9%)	0.8% (0.5%–1.1%)	0.3% (0.1%–0.4%)	2.3% (1.7%–2.9%)	1.1% (0.8%–1.3%)
Clinically significant sleep disorders by DISP					
Delayed sleep phase syndrome	2.0% (1.5%–2.5%)	0.8% (0.5%–1.1%)	0.9% (0.6%–1.2%)	2.1% (1.5%–2.7%)	1.4% (1.1%–1.7%)
Insomnia	5.2% (4.4%–5.9%)	4.6% (3.9%–5.4%)	5.2% (4.5%–6.0%)	4.3% (3.5%–5.1%)	4.9% (4.3%–5.4%)
Bruxism	1.9% (1.4%–2.4%)	1.8% (1.4%–2.3%)	2.7% (2.1%–3.2%)	0.7% (0.4%–1.1%)	1.9% (1.5%–2.2%)

(Table 2 continues on next page)

Full sample % (95% CI)	Sex		School level		Overall (n = 6082)
	Female (n = 2946)	Male (n = 3136)	Primary (n = 3603)	Secondary (n = 2479)	
(Continued from previous page)					
Sleep-walking	0.6% (0.3%–0.9%)	1.1% (0.7%–1.4%)	1.2% (0.8%–1.5%)	0.5% (0.2%–0.7%)	0.9% (0.6%–1.1%)
Night terror	2.7% (2.1%–3.2%)	2.5% (2.0%–3.1%)	3.7% (3.1%–4.3%)	0.9% (0.6%–1.3%)	2.6% (2.2%–3.0%)
Nightmare	0.6% (0.3%–0.8%)	0.4% (0.2%–0.6%)	0.2% (0.0%–0.3%)	0.9% (0.5%–1.3%)	0.5% (0.3%–0.6%)

Key: ASD: Autism Spectrum Disorder; GAD: Generalized anxiety disorder; OCD: Obsessive-Compulsive Disorder; PTSD: Post-traumatic Stress Disorder; MDD: Major Depressive Disorder; PDD: Persistent Depressive Disorder; DMDD: Disruptive Mood Dysregulation Disorder; ADHD: Attention-deficit/Hyperactivity disorder; IED: Intermittent Explosive Disorder; ODD: Oppositional Defiant Disorder; CD: Conduct Disorder; ARFID: Avoidant/Restrictive Food Intake Disorder. Note: Selective Mutism and Other Substance were not shown as there were no cases under these two categories.

Table 2: Weighted 12-month prevalence of 31 DSM-5 disorders, suicidality and sleep problems stratified by sex and school levels in the weighted full-sample (N = 6082).

listed in Table 3. For instance, the adjusted odds ratio of being diagnosed with 'any anxiety disorder' was 5.09 (95% CI: 1.53–16.94, p < 0.01) if one was having ADHD, after adjusting for the presence of other potential co-occurring categories of DSM-5 disorders and suicidality. ADHD had a significant comorbid association with 'disruptive, impulse control and conduct disorders' (adjusted OR: 13.29, 95% CI: 5.58–31.69, p < 0.001). 'Any depressive disorder' was significantly associated with suicidality (adjusted OR: 171.66, 95% CI: 19.15–1539.28, p < 0.001), 'any feeding and eating disorder' (adjusted OR:18.37, 95% CI: 2.08–162.86, p < 0.001), 'obsessive-compulsive and related disorders' (adjusted OR: 24.13, 95% CI: 2.8–208.28, p < 0.01).

Multivariate logistic regressions on DSM-5 disorders/disorder categories

Table 4 shows multivariate logistic regressions on various index clinical conditions as the dependent variables (namely, any anxiety disorder; any depressive disorder; any disruptive, impulse-control, and conduct disorders; ADHD). The regressions were run using backward selection with Akaike Information Criterion (AIC). Records with missing values were removed due to incompatibility with statistical modelling, yielding only 5042 valid cases. 34 variables encompassing factors on socioeconomic, medical and developmental, school-related difficulties, caregivers' anxiety and depressive symptoms, and clinically significant sleep conditions were included in each initial model. Given the large sample size in this study, a more stringent significance level at p < 0.01 was adopted in reporting the significant associations in the multivariate logistic regression models. The list of variables with the frequency of missing values is shown in Supplementary Table S2.

Common to 'any anxiety disorder', 'any depressive disorder', 'any disruptive, impulse-control and conduct disorders', and ADHD, factors having significant associations (p < 0.01 or p < 0.001) were: impairment or elevated scores on PHQ and/or GAD in caregivers (ORs 1.07–2.23, p < 0.01); clinically significant sleep problems (ORs 1.77–3.37, p < 0.001). School maladjustment issues (such as repeating a grade, school suspension, long

absences, less than 20% classroom attendance) were significantly associated with 'any anxiety disorder' (OR = 1.46; p < 0.01), 'any depressive disorder' (OR = 1.87; p < 0.001) and 'any disruptive, impulse control and conduct disorder' (OR = 1.45; p < 0.01).

Male sex was negatively associated with 'any depressive disorder' (OR = 0.43; p < 0.001) while positively associated with ADHD (OR: 1.83; p < 0.001) and 'any disruptive, impulse control and conduct disorder' (OR: 1.38; p < 0.01).

Language delay at mild to significant levels was significantly associated with 'any anxiety disorder' (ORs = 1.72–2.21, p < 0.01) and ADHD (ORs = 1.79–2.64, p < 0.001). Unique to the model on 'any anxiety disorder', 'being non-ethnic Chinese' remained to be associated with higher odds (OR = 3.12, p < 0.001) for the said clinical condition after adjusting for other covariates.

Discussion

Prevalence in Hong Kong compared with the global trend in the past decades

Individual epidemiologic studies on child and adolescent psychiatric disorders alluded to wide-ranging

Dependent variable	Independent variable	Adjusted OR (95% CI)
ADHD	Any anxiety disorders	5.57 (1.71–18.16)**
ADHD	Any disruptive, impulse control and conduct disorders	13.29 (5.58–31.69)***
Any depressive disorders	Obsessive-compulsive and related disorders	24.13 (2.8–208.28)**
Any depressive disorders	Feeding and eating disorders	18.37 (2.08–162.86)**
Any depressive disorders	Suicidality	171.66 (19.15–1539.28)***

Remarks: **p < 0.01, ***p < 0.001. Clinical conditions included in models: any anxiety disorders, obsessive-compulsive and related disorders, trauma and stress-related disorders, feeding and eating disorders, neurodevelopmental disorder (ADHD), any depressive disorders, any disruptive, impulse control and conduct disorders, bipolar and related disorders, schizophrenia spectrum and other psychotic disorders, non-suicidal self-injury, suicidality (suicide ideation/plan/attempt).

Table 3: Adjusted Odds Ratio (OR) of comorbidity pairs of DSM-5 disorders at broad categorical level after accounting for the presence of 11 categories of DSM-5 disorders and 12-month suicidality.

Variable	Any anxiety disorder adjusted OR (95% CI)	Any depressive disorder Adjusted OR (95% CI)	ADHD Adjusted OR (95% CI)	Any disruptive, impulse control and conduct disorders Adjusted OR (95% CI)
Age	1.14 (1.10–1.19)[c]	1.34 (1.27–1.41)[c]		0.95 (0.92–0.98)[b]
Sex (male)		0.43 (0.32–0.58)[c]	1.83 (1.49–2.27)[c]	1.38 (1.11–1.72)[b]
Ethnicity (non-Chinese)	3.12 (2.15–4.46)[c]			0.41 (0.21–0.72)[b]
Language delay				
Mild	1.72 (1.22–2.42)[b]		1.79 (1.38–2.31)[c]	
Significant	2.21 (1.24–3.85)[b]		2.64 (1.68–4.11)[c]	
Single family				
Divorce/separation			1.76 (1.26–2.42)[c]	
Caregiver's PHQ total score	1.10 (1.06–1.13)[c]			
Caregiver's PHQ impairment				
Mild		2.40 (1.55–3.75)[c]	1.65 (1.16–2.36)[b]	1.85 (1.24–2.8)[b]
Moderate		3.44 (1.39–8.18)[b]		
Caregiver's GAD total score		1.06 (1.02–1.11)[b]	1.06 (1.03–1.09)[c]	1.07 (1.04–1.10)[c]
Caregiver's GAD impairment				
Mild	2.06 (1.44–2.96)[c]			2.23 (1.47–3.42)[c]
Clinically significant sleep problem on DISP	2.86 (2.31–3.54)[c]	3.37 (2.63–4.31)[c]	1.77 (1.46–2.15)[c]	1.93 (1.58–2.36)[c]
[a]Failing school	1.46 (1.09–1.92)[b]	1.87 (1.36–2.53)[c]		1.45 (1.09–1.88)[b]
Special child care centre in preschool years		0.23 (0.07–0.61)[b]		

Backward selection with Akaike Information Criterion (AIC). Variables entered the model including: Age, Sex, Ethnicity, Single family, Education level of father, Under-employment (Father), Unemployment (Father), Education level of mother, Under-employment (Mother), Unemployment (Mother), Type of Housing, Household income per head, Home size per head, Age of father at child birth, Young Father, Elderly father, Age of mother at child birth, Young mother, Elderly mother, Gestational period/age, Birth weight, Birth type, ICU after child was born, Medical history of child, Language abilities, Hearing difficulties, Special educational services, Failing school, Separation from caregiver, Caregiver's GAD total score, GAD impairment, Caregiver's PHQ score, PHQ impairment, Clinically significant sleep problems (by DISP). [a]Failing school: repeat a grade/ suspension/ long absences/ inadequate classroom attendance < 20%. [b]p-value < 0.01. [c]p-value < 0.001.

Table 4: Multivariate logistic regression models showing factors associated with five major categories of clinical outcomes (N = 5094).

prevalence estimates. Earlier authoritative review by Costello and colleagues from more than two decades ago reported the range of prevalence reported was between 8.2% and 42.0%.[32] The same review noted a median prevalence estimate of 25.3–26.0%, which was in a range highly comparable to our finding (24.4%). Polanczyk and colleagues reported a lower pooled estimate of 13.4% in a meta-analytic review that adopted stringent inclusion criteria.[4]

Using a two-stage sampling approach and diagnostic interviews on a wide spectrum of DSM disorders, two contemporary surveys in China[17,33] and Taiwan[27] conducted before the COVID-19 pandemic respectively reported weighted prevalence rates of any disorders were 17.5% and 25%, the latter from Taiwan was highly comparable to our findings.[27] As for individual disorders, there were more variations in the prevalence figures reported across these studies despite the sociopolitical and geographical proximity as in the case of many epidemiologic studies. Nonetheless, the two most prevalent DSM-5 disorders of the Taiwan study, 'any anxiety disorders' (12%) and ADHD (8.7%), were also on the top list in our study. The 6-month prevalence of major depressive disorder was comparably low in the Taiwan study (0.7%) as the 12-month prevalence of MDD in our study (1.6%). Furthermore, the Taiwan study had not included 'other specified depressive

disorder' in its survey, so our prevalence estimate of 'any depressive disorders' was higher (5.4%). On the other hand, the National Survey of China found the most prevalent disorders were Attention Deficit and Disruptive Disorders (10.2%) where ADHD constituted 6.4%, anxiety disorders (4.7%), and depressive disorders (3.0%).[17,33] It appears that a relatively lower overall prevalence with correspondingly lower prevalence for various disorders was reported in China as compared to those of the Taiwanese study and our current study. Yet, the differences are not drastic and are generally expected between studies, given the commonly wide range of prevalence estimates among the majority of studies. Notwithstanding the different sampling approach and research assessment procedures, ADHD was the most prevalent disorder (10.2%) in our study and this prevalence estimate matched well a national survey of parents in 2016–19 by the United States Center for Disease Control and Prevention (CDC) which reported 10–13% of US children from 6 to 17 having a diagnosis of ADHD.[34]

Taken together, the methodologic variations across studies where diagnostic tools, awareness of the clinical problems, and the evolving healthcare system render direct comparisons across studies difficult. Yet, our current prevalence rates of various disorders, particularly the overall prevalence of 'any psychiatric disorders',

were largely within ranges of other recent studies. In other words, despite the inherent differences in study design and socioeconomic environment in Western and Asian regions, as well as the unprecedented COVID-19 pandemic that coincided with almost the entire study period, there are more similarities in terms of the overall high prevalence rate. The global data from epidemiologic studies converge on a common ground where child and adolescent mental health must be regarded as a global health concern.

Comorbidity

Comorbidity was observed in almost half of the children and adolescents with any diagnosable DSM-5 disorder, featuring the complex needs of the affected students. Our findings on the comorbid associations were broadly consistent with the widely accepted fact that children and adolescents frequently present with more than one psychiatric diagnosis irrespective of the diagnostic approaches adopted across studies.[35] This high rate also highlights the challenge to mental health professionals for the assessment and intervention of potentially multiple disorders in one patient as data from the National Comorbidity Survey of the United States showed that adolescents with both internalising and externalising disorders had the highest rate of health service utilisation.[36]

This study reaffirmed a strong comorbid pair of ADHD and disruptive, impulse control, and conduct disorders[35,37] after adjusting for other clinical conditions. However, the cross-sectional design could not address the dynamic interactions of both conditions as data from a Swedish Twin study on 2600 twins showed that externalising traits in middle childhood predicted ADHD-like traits in early adolescence while ADHD-like traits in mid-adolescence predicted externalising traits in early adulthood, an observation challenging the belief that ADHD generally precedes externalising behaviour.[38] The complex dynamic relationships between comorbid ADHD and externalising disorders might be underpinned by shared genetic influences.[39,40]

Our study showed that children and adolescents with ADHD were more likely to develop anxiety disorder after controlling for other conditions, which was consistent with earlier reports from both clinical and epidemiological samples where up to 50% of individuals had one or more comorbid anxiety disorders.[41] Neuroimaging and neuropsychological studies alluded to the negative effects of anxiety on the cognitive functioning of individuals with ADHD,[42–45] translating to the alarming negative impact on the long-term social functioning among ADHD with comorbid anxiety disorder.[46]

The comorbidity model also alluded to increased adjusted odds ratios for 'any depressive disorder' (where most cases were 'other specified depressive disorder' that did not meet criteria for major depressive disorder) co-occurring respectively with suicide ideation/plan/attempt, eating and feeding disorders, or obsessive-compulsive and

related disorder. Such strength of associations with the risky acts indicates major clinical needs despite the apparent milder form of depressive disorder in this age group, warranting early clinical attention and active intervention.[47]

Potentially actionable transdiagnostic factors-portal to building mental health resilience in school community and family

One of the trans-diagnostically associated factors uncovered in this study was high parental emotional distress experienced as states of depression and anxiety. Parenting stress has been well-recognized as a key factor that exacerbates disruptive behaviours or intolerable emotional distress reactionary to environmental risk factors.[48] Certain maladaptive parenting styles driven by parental stress and negative emotions undermine interpersonal competence, coping, and cognitive ability,[49] while more studies support the bidirectional impact of parental stress perpetuating mutually with a wide range of child behavioural and emotional problems.[50] Parents' caregiver stress has been a target for mental health intervention in children and adolescents' mental well-being across many mental disorders. De-stressing and empowering parents with skills and emotional capacity could activate new resources for a more nurturing environment for children and adolescents facing developmental challenges.[51] A strategic approach that aims to consider holistically child and adult well-being in risk detection, intervention, and resilience building at the family level is likely more effective in providing a sustainable and effective approach to mental health treatment and prevention.

Sleep has been well-recognized for its key roles in brain health manifesting in areas of cognitive, emotional, and interpersonal functioning.[52] It was shown to have a trans-diagnostic association with internalising, externalising, and ADHD in this epidemiologic sample. Such overlap is not merely a nosological issue but a significant neurobehavioral dimension to a wide range of common or major mental disorders in children and adolescents as substantial meta-analytic evidence from high-quality cohort studies showed a prospective longitudinal relationship at a modest but significant level between a wide range of sleep disturbances and first onset of a depressive, bipolar or psychotic disorders in adolescence and early adulthood.[53,54] Our data support the potential use of sleep as a non-stigmatising portal for promoting awareness, early detection, and targeted intervention to mitigate the associated psychiatric conditions in children and adolescents. Emerging evidence suggests that cognitive-behavioural sleep interventions improve anxiety and depression in adolescents.[55]

Children and adolescents experiencing school disengagement (absenteeism, repeating a grade or school suspension, less than 20% classroom attendance)

were associated with common internalising and externalising disorders in this epidemiologic study, consistent with the convergent findings from a metanalytic review of 17 original studies that attested to a strong transdiagnostic association of early school drop-out with substance abuse, depression, and externalising problems.[56] Mental health and emotional well-being have intricate ties with motivation, learning, and social relationships in a mutually perpetuating manner. Recent evidence from the longitudinal Swedish birth cohort also substantiated that mental health problems in early childhood and adolescence increased the risk for poor academic performance.[57] In this highly educationally competitive world, schooling failure would bring considerable loss of opportunities, belittlement from others, and consequently distress. Our study lends empirical support for prioritising mental well-being and resilience as a core educational initiative in the school environment where the top-down initiatives might steer reshuffling of resources for building a mental health-friendly and resilience-promoting environment in school.

Limitations and considerations

This study has fully exploited the universal school enrolment of Hong Kong children and adolescents to engage a representative and inclusive sample from all types of schools (including schools providing special education programmes) and diverse ethnic groups through a random sampling process. The response rate (71.7%) was a reasonable level of response for a valid representative epidemiologic sample. The sociodemographic profile of the resultant study sample was highly inclusive and comparable with the contemporary general population within the target age group (6–17 years) encompassing a diverse socio-economic status, and cultural and ethnic backgrounds. Amongst studies from high-income regions of Asia, our study is the first one that used a single-stage approach with a structured respondent-based structured interview schedule with separate parent-informant and adolescent-informant versions, minimising the sampling biases in a two-stage approach. The diagnostic tool also tapped into a comprehensive spectrum of 31 DSM-5 child and adolescent psychiatric disorders, permitting an appraisal of a full landscape of mental health problems along with a comprehensive profiling of developmental and environmental factors in this age group.

Despite the strengths in the study design and conduct of the protocol, there are also inherent methodologic limitations to be considered in interpreting the results. It is worth noting that all research diagnoses were derived from structured diagnostic interviews conducted in an epidemiologic setting without clinician verifications even though stringent impairment criteria were applied to define probable cases with clinical significance. With effort made to include both parents and adolescents in the secondary school sample to yield

diagnostic information, it remained limited in the scope of assessment compared to real-world clinical settings where multiple sources of information complemented by direct clinical observation could be sought longitudinally. Cautions should be taken when interpreting the prevalence and psychosocial correlates of the disorders, as the inherent immeasurable confounders associated with the prevailing pandemic-related social restrictions could not be disentangled from the process of enrolment and data collection, the observed prevalence rates of disorders, and the associated psychosocial factors. Further, it should be noted that the current state of parental psychopathology was only ascertained with self-report and the time-frame of anxiety and depressive symptoms did not match the time frame of 12-month prevalence of DISC-5 disorder of the children and adolescents. Yet, one previous study by Luhmann et al. found that differing timeframes of subjective wellbeing measures (both cognitive and affective) did not significantly moderate their associations as well as their relationship with other psychosocial correlates.[58]

Conclusions

The current study presents unmet mental health needs in the school community of a highly developed Asian city. The mental health needs were tied with risk factors that are accessible and potentially modifiable in the family and school settings. Early detection of risk factors in children and parents or caregivers allows early intervention and resilience building for parent-child dyad partnering with the school communities, potentially changing the trajectory of the generation's mental health resilience and the mental health landscape of the whole community.

Appendix A. Supplementary data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.lanwpc.2025.101533.

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