

Adolescent self-harm and suicide attempts: An analysis of emergency department presentations in Singapore

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ABSTRACT

Introduction: The rising rate of adolescent suicide, and the burden of self-harm and mental health disorders, pose significant threats to Singapore's future health outcomes and human potential. This study sought to examine the risk profile and healthcare utilisation patterns of Singaporean adolescents who presented to the emergency department (ED) for suicidal or self-harm behaviour.

Method: A retrospective review of medical records for patients aged 10 to 19 years who visited Singapore's KK Women's and Children's Hospital ED for suicidal or self-harm attempts from January to December 2021 was conducted.

Results: A total of 221 patients were identified, with a predominance of female patients (85.5%) over males (14.5%). The mean age was 14.2 ± 1.4 years. Intentional drug overdose (52.0%) was the most commonly used method. Significantly more females presented for intentional paracetamol overdose (46.6% versus [vs] 28.1%, $P=0.049$), whereas jumping from a height was more common among males (18.8% vs 5.8%, $P=0.022$). The most frequently observed mental health challenges were stress-related and emotional coping difficulties (50.7%), followed by mood and anxiety symptoms (53.4%). A history of self-harm and suicidal behaviours were the most common psychosocial risk factors. Within the year prior to their ED presentation, 15.4% had accessed healthcare services for mild medical ailments, 19.5% for medically unexplained symptoms, and 17.2% for previous self-harm or suicide attempts.

Conclusion: Most cases involved psychosocial and emotional regulation difficulties, some of which displayed sex-specific patterns, rather than complex psychiatric disorders. The identified predictive factors can help inform Singapore's National Mental Health and Well-being Strategy, to guide targeted and transdiagnostic interventions in schools and community settings.

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Keywords: emergency medicine, mental health, paediatrics, psychiatry, psychology

CLINICAL IMPACT

What is New

- This study provides insights into the nature of adolescent suicide attempts and self-harm behaviour that confronts Singapore today.

Clinical Implications

- Although the cases presented during the COVID-19 restrictions, the identified psychosocial stressors, risk profiles and associations can guide strategies for early recognition and targeted intervention for this vulnerable age group in this post-pandemic era.
- Findings provide justification for mental healthcare strategies to harness the resources in schools, and youth social services to provide psychosocial support and interventions.

INTRODUCTION

Within 3 years from 2019 to 2021, adolescent suicide rates in Singapore almost doubled from 5.35 to 9.14 per 100,000 population.^{1,2} This is against a backdrop of a silently brewing adolescent behavioural and mental health crisis locally and globally, which started before the COVID-19 pandemic but has since been further exacerbated by the disruptions associated with it.^{3,4} According to the Burden of Disease in Singapore report in 2017, self-harm contributed to over 35% of years of life lost in adolescents.⁵ These statistics are gravely concerning because they signal a threat to population health and human potential.

Suicidal attempts and self-harm behaviour in adolescents are often contributed by a myriad of behavioural and mental health factors such as

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mood disorders and eating disorders, as well as psychosocial factors such as home conflict, and peer and romantic relationship problems.^{6,7} It is important to elucidate the unique risk factors in Singapore's adolescent population when they present for suicide or self-harm to the ED to identify strategies for early intervention.

This study aims to identify the demographics, psychosocial risk factors, psychiatric comorbidities and prior healthcare utilisation patterns of adolescents in Singapore who present to a paediatric ED for suicidal and self-harm attempts.

METHOD

The study was approved by the SingHealth Centralised Institutional Review Board (reference 2022-2291). A retrospective review of the electronic health records of adolescents who presented for suicidal or self-harm attempts to the ED of KK Women's and Children's Hospital from January to December 2021 was conducted.

Patients aged 10 to 19 years old were identified using a combination search of ED triage complaints and diagnosis codes for "drug overdose", "ingestion of toxic substance", "paracetamol overdose", "self-harm", "laceration", "fall from height" and "suicide attempt".

Data collected include patient demographics; ED clinical presentation; and inpatient evaluation and management including psychosocial and psychiatric evaluations, past medical history and healthcare utilisation of EDs and SingHealth polyclinics in the past 1 year prior to the episode of suicide or self-harm attempt. Descriptive statistics for the demographic and psychosocial risk profiles were based on the first presentation of patients in 2021 (n=221) as the denominator.

Frequencies and percentages were used to describe categorical data, while mean and standard deviation (SD) were used for continuous data. Secondary analysis was done to compare the demographic and psychosocial risk profiles between the 2 sexes as the approaches to interventions may differ by sex. Univariate analysis for continuous variables was assessed using t-test for parametric data, and chi-square or Fisher's Exact test for categorical and binary variables. STATA Standard Edition version 18.0 (Stata Corp, College Station, TX, US) was used for statistical analysis.

RESULTS

From January to December 2021, there was a total of 221 patients who presented to the ED. Among them, 27 had subsequent repeated attendances for suicide or self-harm in the same year.

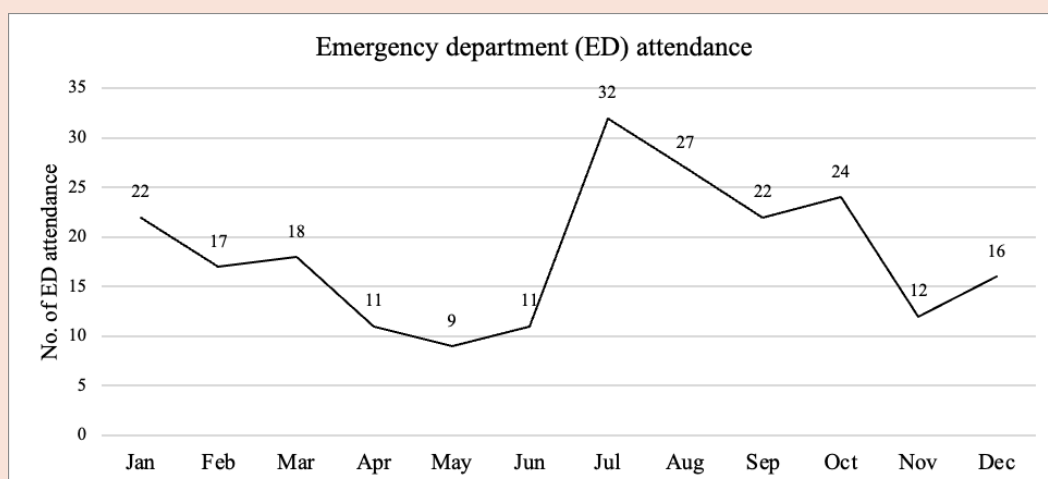
Demographics

Among the 221 patients, there were more females at 189 (85.5%) than males at 32 (14.5%). The mean age among females was 14.2 ± 1.4 (range 10.0–16.2) years and 13.9 ± 1.3 (range 11.0–17.0) years among males. There was no statistically significant difference in age between the sexes (95% CI -0.892 to 0.166; $P=0.178$). The racial distribution between males and females was not statistically significant (Table 1).

Seasonality

ED attendance was the highest in July, after the lowest troughs from April to June in 2021. The incidence remained high from July onwards before markedly decreasing in the last 2 months of November and December 2021 (Fig. 1).

Fig. 1. Emergency department attendances for self-harm and suicide attempts from January to December 2021.



Intent and method of suicide or self-harm attempt

More than one-third of cases had suicidal intent (35.3%), while the majority had ambivalent intent (52.0%). There was a higher proportion of males who had suicidal intent (46.9% versus [vs] 33.3%), but this difference did not reach statistical significance. The most common method of attempt was through intentional drug overdose (72.4%), with majority using paracetamol (44.1%), followed by psychotropic drugs (15.9%) (Table 1).

Less common methods employed included self-laceration, jumping from a height and others (e.g. suffocation). Of note, more common among females compared to males were self-laceration (15.3% vs 9.4%) and intentional drug overdose (74.1% vs 62.5%). In fact, females were more likely than males to present with intentional paracetamol overdose (46.6% vs 28.1%, $P=0.049$). In contrast, jumping from a height was more common among males (18.8% vs 5.8%, $P=0.022$).

Mental health issues

The most common mental health issues noted were stress-related and emotional coping difficulties (e.g. acute stress reaction, emotional dysregulation and maladaptive coping) (50.7%), and mood and anxiety difficulties (e.g. major depressive disorder and anxiety disorder) (53.4%) (Table 1). There were 27.1% of cases that had both emotional coping and mood problems, while 21.7% only had emotional coping difficulties with no other psychopathology. Neurodevelopmental and conduct disorders (e.g. attention deficit hyperactivity disorder, autistic spectrum disorder and oppositional defiant disorder) were more common in males (21.9% vs 6.3%, $P=0.01$), whereas eating disorders were higher in females (18.0% vs 3.10%, $P=0.033$). None of the cases had any substance abuse problems.

A total of 107 (48.4%) patients had already been receiving mental health care by either psychiatrists or psychologists, and 63 (28.5%) had been receiving psychosocial support from their school or community prior to their presentations.

Healthcare services utilisation 1 year prior to suicide or self-harm attempt

In the 1 year prior to their suicide or self-harm attempt, 43 (19.5%) had presented to a hospital ED or polyclinic in the SingHealth healthcare cluster at least once for a medically unexplained symptom that could possibly be due to somatisation. Thirty-four (15.4%) had sought healthcare for common mild illnesses like upper respiratory tract infection or gastroenteritis, and 38 (17.2%) had sought healthcare services for deliberate self-harm or suicide attempt. A previous history of deliberate

suicide or self-harm attempt was shown to be statistically significant, with more females having this risk factor (19.6% vs 3.1%, $P=0.023$) (Table 1).

Psychosocial stressors

Home, Education, Activities, Drugs, Sexuality, Suicidality, Safety (HEADSSS) is an internationally recognised approach in paediatric and primary care settings to conduct a bio-psychosocial assessment and facilitate rapport with an adolescent. Disclosures from psychosocial assessment using the HEADSSS framework are categorised in Table 2.

Family conflict, and anxieties related to academic performance are separately associated with approximately one-third of the cases. Sleep was a problem in 40.3% of the adolescents. There were significantly more males who had problems with excessive recreational screen time beyond the recommended 2 hours (37.5% vs 18.5%, $P=0.015$).⁸ Peer relationship problems like bullying caused distress in more than one-quarter of cases.

There were 17.6% of cases who experimented with vaping, cigarette smoking or alcohol. In addition, 4.1% of cases were sexually active and 16.7% of them had gender identity issues.

For 18.6% of the cohort, there had been a history of being abused. Significantly more females disclosed problems with non-suicidal self-injury (80.4% vs 37.5%, $P<0.001$) and previous suicide attempts (45.0% vs 18.8%, $P=0.005$).

DISCUSSION

Our study describes the 221 patients who presented to the ED for suicide/self-harm attempts in 2021. We have identified the population's demographic profiles, ED presentation details, mental and general health issues, healthcare utilisation patterns in the 1 year prior to presentation and psychosocial risk factors. The identified factors have both confirmed prior studies on adolescent risk behaviour and unveiled new risk profiles that could inform future strategies for early recognition and early intervention.⁹

The higher proportion of females than males in this population is consistent with previous studies, which report that females are more likely to attempt suicide or engage in self-harm behaviour.^{6,10} Possible attributable risk factors include higher prevalence of sexual abuse and depression.^{11,12} Comparing sexes, significantly higher proportion of females presented with intentional paracetamol overdose (46.6% vs 28.1%), while higher proportion of males attempted jumping from a height (18.8% vs 5.8%). In terms of accessibility, paracetamol is widely available without prescription. Similarly, high-rise buildings are ubiquitous in Singapore. The

Table 1. Risk profile of adolescents presenting to the emergency department for suicide or self-harm attempt; factors evaluated include demographics, intent and method of suicide or self-harm attempt, mental health issues and prior healthcare service utilisation.

		Total	Male	Female	P value
Race, no. (%)	No. of patients	221	32	189	NA
	Age (mean ± SD)	14.2 ± 1.4	13.9 ± 1.3	14.2 ± 1.4	NA
	Chinese	126 (57.0)	24 (75.0)	102 (54.0)	0.103
	Malay	48 (21.7)	3 (9.4)	45 (23.8)	
	Indian	26 (11.8)	4 (12.5)	22 (11.6)	
Intent, no. (%)	Others	21 (9.5)	1 (3.1)	20 (10.6)	
	Suicidal	78 (35.3)	15 (46.9)	63 (33.3)	0.189
	Ambivalent	115 (52.0)	12 (37.5)	103 (54.5)	
	Non-suicidal	28 (12.7)	5 (15.6)	23 (12.2)	
Method of suicide/ self-harm attempt, no. (%)	Intentional drug overdose	160 (72.4)	20 (62.5)	140 (74.1)	0.176
	Nature of medicine ingested	Paracetamol	9 (28.1)	88 (46.8)	0.049
		Psychotropic drugs	7 (21.9)	28 (14.9)	0.318
	Ingestion of toxic substance	7 (3.2)	2 (6.3)	5 (2.6)	0.268
	Jumping from height	17 (7.7)	6 (18.8)	11 (5.8)	0.022
	Self-laceration	32 (14.5)	3 (9.4)	29 (15.3)	0.586
	Others	5 (2.3)	1 (3.1)	4 (2.1)	NA
Mental health issues from psychiatric evaluation, no. (%)	Stress-related and emotional coping difficulties	112 (50.7)	17 (53.1)	95 (50.3)	0.765
	Mood and anxiety difficulties	118 (53.4)	14 (43.8)	104 (55.0)	0.237
	Psychosis or psychotic-like symptoms and disorders	8 (3.6)	3 (9.4)	5 (2.6)	0.093
	Neurodevelopmental and conduct disorders	19 (8.6)	7 (21.9)	12 (6.3)	0.01
	Personality difficulties and disorders	3 (1.4)	0 (0)	3 (1.6)	0.624
	Eating disorders	35 (15.8)	1 (3.1)	34 (18.0)	0.033
	Post-traumatic stress disorder	14 (6.3)	1 (3.1)	13 (6.9)	0.698
	Somatoform disorders	2 (0.9)	0 (0)	2 (1.1)	0.731
	Obsessive compulsive disorder	4 (1.8)	1 (3.1)	3 (1.6)	0.468
	Bipolar disorder	7 (3.2)	2 (6.3)	5 (2.6)	0.268
	Substance abuse	0 (0)	0 (0)	0 (0)	NA
Prior mental health support before ED presentation, no. (%)	Receiving help by psychiatrist/ psychologist	107 (48.4)	12 (37.5)	95 (50.3)	0.181
	Receiving psychosocial support from school counsellor/ community youth worker	63 (28.5)	7 (21.9)	56 (29.6)	0.369

Table 1. Risk profile of adolescents presenting to the emergency department for suicide or self-harm attempt; factors evaluated include demographics, intent and method of suicide or self-harm attempt, mental health issues and prior healthcare service utilisation. (Cont'd)

		Total	Male	Female	P value
Healthcare service utilisation 1 year prior to ED presentation, no. (%)	At least 1 visit for a mild medical ailment ^a	34 (15.4)	4 (12.5)	30 (15.9)	0.428
	At least 1 visit for medically unexplained symptoms	43 (19.5)	5 (15.6)	38 (20.1)	0.554
	At least 1 visit for deliberate self-harm/suicidal attempt	38 (17.2)	1 (3.1)	37 (19.6)	0.023

ED: emergency department; SD: standard deviation; NA: not available

^a Examples include upper respiratory tract infection and gastroenteritis.

P values in bold are statistically significant.

Table 2. Psychosocial factors identified in adolescents who presented for suicide or self-harm attempt. Domains for HEADSSS include home, education, activities and peer relationships, sexuality, suicidality, safety.

	Total (n=221)	Male (n=32)	Female (n=189)	P value
Home, no. (%)				
Parental separation/conflict	75 (33.9)	12 (37.5)	63 (33.3)	0.645
Family financial difficulties	5 (2.3)	1 (3.1)	4 (2.1)	0.546
Sibling relationship problems	12 (5.4)	2 (6.3)	10 (5.3)	0.687
Parent-child relationship problems	77 (35.0)	11 (34.4)	66 (35.1)	0.906
Family history of psychiatric issues/suicidal attempts	13 (5.9)	3 (9.4)	10 (5.3)	0.409
Education, no. (%)				
Academic stress	75 (33.9)	9 (28.1)	66 (34.9)	0.453
Absence from school more than 1x per month	63 (28.5)	9 (28.1)	54 (28.6)	0.959
Activities and peer relationships, no. (%)				
Sleep difficulties/deprivation	89 (40.3)	11 (34.4)	78 (41.3)	0.462
Excessive recreational screen time	47 (21.3)	12 (37.5)	35 (18.5)	0.015
Peer relationship conflict (including bullying and cyberbullying)	58 (26.2)	10 (31.3)	48 (25.4)	0.486
Romantic relationship problems	22 (10.0)	3 (9.4)	19 (10.1)	0.602
Drugs/substance use, no. (%)				
Exposed to the influence of substance abuse, cigarettes or alcohol	39 (17.6)	6 (18.8)	33 (17.5)	0.860
Sexuality, no. (%)				
Sexually active	9 (4.1)	3 (9.4)	6 (3.2)	0.126
Gender identity issues	37 (16.7)	5 (15.6)	32 (16.9)	0.855
Suicidality, no. (%)				
Disclosed about non-suicidal self-injury	164 (74.2)	12 (37.5)	152 (80.4)	<0.001
Disclosed about previous suicide attempts	91 (41.2)	6 (18.8)	85 (45.0)	0.005
Safety, no. (%)				
Past history of non-accidental injuries, neglect or sexual abuse	41 (18.6)	5 (15.6)	36 (19.1)	0.645

P values in bold are statistically significant.

difference in methods chosen between the sexes could be explained by our finding that there was a higher proportion of males with suicidal intent (46.9% vs 33.3%). Despite a lower attempt rate, the mortality rate of suicide is higher in males, suggesting a tendency to employ more lethal methods.⁹ Identification of sex-specific risk factors such as autistic spectrum disorder and excessive recreational screen time in males, and eating disorders and past history of self-harm or suicide attempts in females can inform risk management in screening strategies.^{9,13}

In a study published by Wong et al., adolescents were at risk of mental health symptoms, which were often associated to their immature psychological resilience.¹⁴ This explains the vulnerabilities in our study population. The increased vulnerability during this specific period of transition calls for targeted interventions to build psychological resilience in this age group.

In 2021, the months of July to October had the highest number of attendances, which coincided with the second school semester and year-end academic examinations. Meanwhile, the lowest was from April to June, which overlaps with the mid-semester break. This seasonality in relation to the academic examinations is consistent with findings by Matsubayashi et al.¹⁵ The sharp uptick from the June school holidays to the peak in July suggests the return of school could be a particularly stressful period for vulnerable adolescents. Future interventions could thus consider introducing school-based screening and mental health resilience programmes from July onwards, or at the start of all semesters and the period leading up to examinations.

In relation to COVID-19 in 2021, restrictions due to the Omicron and Delta variants of concern, which started in May, continued to impact the school calendar until October, when restrictions were eased.¹⁶⁻¹⁸ These restrictions included limitations in social gatherings, in-person school lessons and co-curricular activities. The higher ED attendance in the second semester could also possibly be attributed to the social isolation adolescents were subjected to during this period.¹⁹ Our study findings, together with other studies that investigate psychosocial support service utilisation associated with the COVID-19 pandemic, may inform strategies for adolescent mental health support should a similar crisis occur in the future.⁹

More than half of our study cohort has ambivalent intent. They were confused themselves on whether they truly wanted to end their own lives. This further highlights the immaturity in emotional regulation and impulsivity in adolescents.²⁰ Population health and community-based strategies that consist of social interventions, together with

process-based and transdiagnostic psychological interventions to strengthen emotional regulation capabilities, are therefore likely to be cost-effective and impactful.²¹⁻²³

The high proportions of patients who disclosed previous suicide attempts (41.2%) and non-suicidal self-injury (NSSI) (74.2%) concur with similar studies demonstrating that prior suicidal attempts and NSSI are known risk factors for subsequent suicide attempts. The postulation is that each attempt desensitises the individual to pain and fear, thus leading to more perilous and serious subsequent attempts.^{9,24} This underscores the importance obtaining honest disclosures about past attempts through psychosocial screening. In contrast, Klonsky et al. suggest that self-injury is anti-suicide because the intent is self-punishment to alleviate negative affect.²⁵

Home conflicts featured highly as another psychosocial risk factor, with many experiencing parent-child problems (35.0%) and parental conflict (33.9%). Research has shown that such adverse social determinants of health are significantly associated with self-harm.²⁶ Working with community partners, such as family service centres to address relationship difficulties within the family, is therefore crucial.²⁷

Similarly, other researchers have found that sleep problems, academic stress and increased recreational screen time have been linked with higher risk of depression and suicide.^{9,28,29} Those with a history of sexual or physical abuse are known to have higher rates of suicidal ideation and attempts.^{9,28,30} Peer conflict and school absenteeism are also associated with higher rates of suicidal ideation.^{9,28,30,31} As demonstrated in our study cohort, patients often present with multiple inter-related psychosocial problems. From the preventive perspective, opportunistic psychosocial screening covering these issues should be integral to holistic care of adolescents at healthcare touchpoints.

In terms of psychopathology, stress-related and emotional coping difficulties (50.7%), together with mood and anxiety difficulties (53.4%), make up the 2 most prevalent issues in this cohort. In this study, surprisingly, only 21.7% had the former without any other psychopathology. The role of emotional dysregulation in causing distress leading to self-harm and suicidal behaviour cannot be underestimated.²⁰ Investments in community-based transdiagnostic interventions to build psychological resilience will likely yield high returns in enhancing adolescent well-being and reducing suicidal behaviour.^{21-23,32} Process-based psychological interventions hold promise by targeting bio-psychosocial processes contributing to mental health symptoms.²² It is apt because evidence-based psychological change

processes may be applied and individualised for the young person at the at-risk and pre-diagnosis stages. Trained school counsellors and community mental health practitioners may be best placed to deliver psychological interventions to augment counselling.³³

Almost half of the patients had ongoing psychiatric or psychological support (48.4%), while over a quarter were receiving psychosocial support from the school or community (28.5%). This could indicate that the current system of support might be inadequate. Studies have suggested that patients treated within a collaborative care model have better health outcomes.³⁴ Thus, from a systems perspective, there is an urgency to address this gap to improve efficiency and coordination of care.

In the 1 year prior to presentation, 17.2% of patients had attended a non-mental healthcare institution in the SingHealth cluster for suicidal or self-harm behaviour, 19.5% for medically unexplained symptoms that might possibly be somatisation episodes, and 15.4% for common mild illnesses. Hence, these healthcare visits provide opportunities for psychosocial and suicide risk screening.^{9,35,36} Indeed, psychosomatic symptoms and frequent healthcare seeking behaviour for minor ailments may be red flags for mental health distress.³⁷ Therefore, EDs and primary care clinics have an important role to play in conducting efficient psychosocial and suicide risk screening of adolescents, particularly those who seek medical care for non-mental health issues.³⁸

We found that adolescents at risk of self-harm and suicidal behaviours typically do not have serious mental health disorders, but instead have psychosocial problems and emotional regulation difficulties. However, their mental health distress can rapidly escalate and manifest in risk-to-self behaviours. This yields fresh insights that may impact strategies for school-based screening and sex-specific mental health support. The findings also give guidance to the current Tiered Care Model in Singapore’s National Mental Health and Well-being Strategy (Fig. 2) whereby resources for transdiagnostic psychosocial support of young people are strategically invested in schools and the community.³⁹ Through this collaborative care model, doctors who encounter adolescents with psychosocial distress in non-mental healthcare settings like primary care clinics, EDs and paediatric specialist clinics may partner with school counsellors and youth social service agencies to provide psychosocial support through counselling, social work and transdiagnostic psychological interventions (Fig. 3). This model is aligned with the preventive and pre-emptive stance advocated by McGorry et al. in the Lancet Psychiatry Commission on youth mental health.³³ We hope that our findings will prove valuable to inform strategies for early recognition and targeted intervention for adolescents with mental health distress in Singapore and in other high-income countries with similar socio-cultural context in Asia and globally.

Fig. 2. Singapore’s Tiered Care Model for mental healthcare with examples applicable to adolescents.

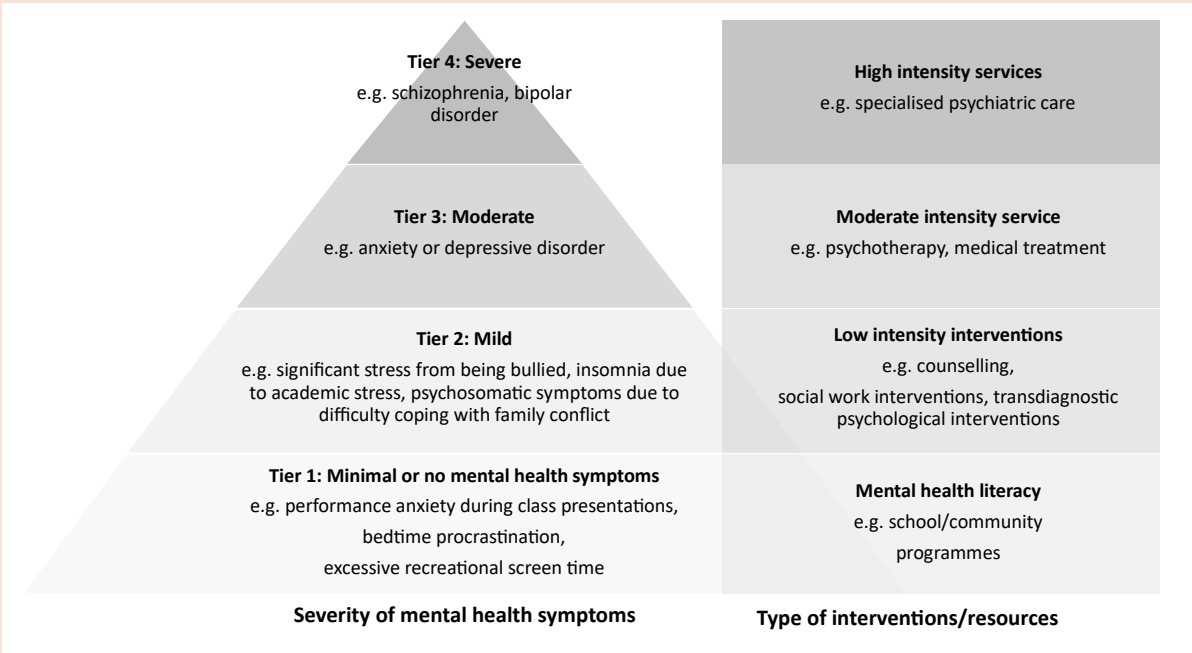
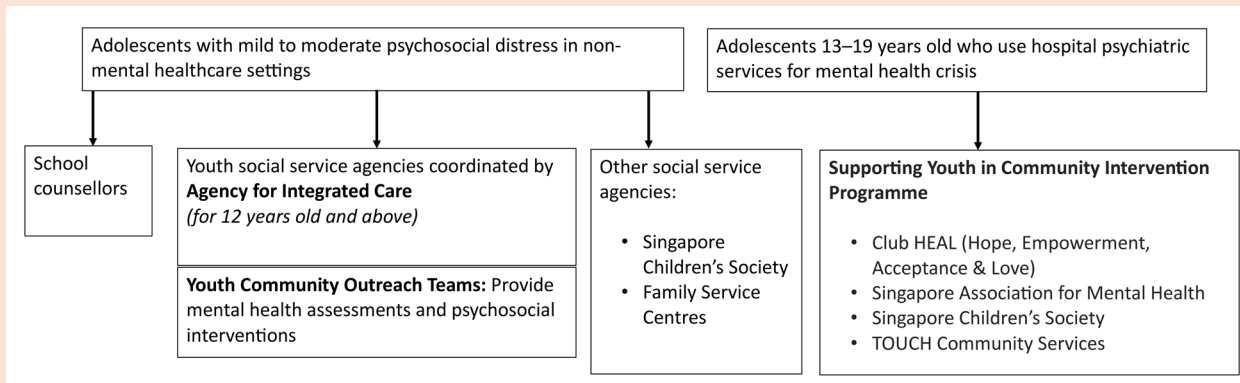


Fig. 3. Continuum of care of adolescents with psychosocial distress; right-siting from hospitals or clinics to the community for psychosocial support and interventions.



Note: Services by school counsellors in Ministry of Education schools, Youth Community Outreach Teams, Youth Integrated Teams and Family Service Centres are fully funded by the government.

Limitations

Given the cross-sectional and retrospective nature of the study, our data are subject to recall bias. The temporal direction of associations is unclear, and there is a certain degree of subjective judgement needed to interpret free-text entries in the medical records. Also, there is likely under-reporting of psychosocial problems because adolescents are known to be hesitant in disclosing stigmatised issues or disapproved behaviours to healthcare providers.⁴⁰ Moreover, there was no examination of the motivations that drive the actions, which may differ between adolescents with non-suicidal, ambivalent or suicidal intent.

The medical records access for this study was limited to SingHealth institutions. Past medical history and visits to other healthcare institutions were not available. Hence, this study's data likely underestimate the extent of patients' prior healthcare utilisation.

This study does not include patients who had been critically injured or died from completed suicide attempts. Such patients would have been directed to other public hospitals in closer proximity based on the country's public ambulance zoning system or might have been certified dead at the scene. Therefore, the patient profile and risk factors in this study do not represent adolescents with completed suicide. Our research findings may not translate to adolescent populations with socioeconomic and cultural backgrounds, or healthcare and social support infrastructure that are different from that of Singapore's.

CONCLUSION

This study has identified the demographic and psychosocial risk profiles of adolescents who

presented to the ED for suicide and self-harm attempts amid the COVID-19 pandemic in 2021. We hope this will further inform a coherent, holistic and bio-psychosocial approach to supporting vulnerable adolescents. Additionally, the findings give reassurance that Singapore's strategy to harness the resources in schools and social services to tackle the youth mental health crisis is in the right direction.³⁹

Ethics statement

This study was approved by the SingHealth Centralised Institutional Review Board (reference 2022-2291).

Declaration

The authors declare they have no affiliations or financial involvement with any commercial organisation with a direct financial interest in the subject or materials discussed in the manuscript.

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