
PUBLIC HEALTH RESEARCH

Anxiety and Its Associated Factors among School-going Adolescents in Malaysia

Muhd Hafizuddin Taufik Ramli*, Muhammad Solihin Rezali, Nik Adilah Shahein, Norhafizah Sahril, Chan Ying Ying and Nor' Ain Ab Wahab

Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia, Selangor, Malaysia.

*For reprint and all correspondence: Muhd Hafizuddin Taufik Ramli, Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia, Block B5 & B6, Persiaran Setia Murni U13/52, Setia Alam, 40170 Shah Alam, Selangor, Malaysia.

Email: mh.taufik@moh.gov.my

ABSTRACT

Introduction	Many mental health disorders have onset during adolescence. To date, the data on the correlates of anxiety is still lacking. Therefore, this study is crucial to determine the factors associated with anxiety among school-going adolescents in Malaysia.
Methods	This study was based on 26,892 school-going adolescents from 212 selected schools in Malaysia. Anxiety was measured using Depression Anxiety and Stress Scale (DASS-21). Associations between anxiety, sociodemographic characteristics and variables of interest were examined using multivariable logistic regression.
Results	Overall, 10,540 (39.7%) school-going adolescents had anxiety. Anxiety was positively associated with female (odds ratio, OR [95% confidence interval, CI] = 1.30 [1.19,1.42]) compared to male counterpart, feeling loneliness (1.78 [1.54,2.05]) compared to not lonely, unable to sleep due to worry of something (1.79 [1.56,2.05]) compared to able to sleep, being bullied (1.66 [1.48,1.87]) compared to not being bullied, physical abuse (1.33 [1.18,1.49]) compared to no physical abuse, verbal abuse (1.47 [1.35,1.59]) compared to no verbal abuse, current drinker (1.23 [1.06,1.43]) compared to not current drinker, current drug use (1.84 [1.43,2.35]) compared to not current drug use, ever had sex (1.17 [1.01,1.36]) compared to never had sex, physically inactive (1.16 [1.06,1.26]) compared to physically active and internet addiction (2.59 [2.37,2.83]) compared to no internet addiction. Chinese ethnic (0.68 [0.50,0.93]) compared to other ethnic, and Form 2 (0.78 [0.69,0.89]) and Form 3 (0.73 [0.65,0.82]) students compared to Form 1 students, were protective of anxiety.
Conclusions	Prevention and intervention programs for these “at-risk” adolescents should be planned holistically towards reducing the risk factors.
Keywords	Anxiety - Mental health - Adolescents - NHMS - Malaysia.

Article history:

Received: 5 May 2021

Accepted: 11 August 2022

Published: 1 September 2022

INTRODUCTION

Adolescence is a transition period between childhood and adulthood where there are significant changes like physical appearance, mental and social well-being. As the most valuable asset in the country, they are always perceived as the healthiest population and are often overlooked. However, the rapid advancement of technology in this era has changed the way they live, in which more adolescents are trapped in the cyber life and have difficulties adapting with real life, which is later associated with mental health problems among adolescents.

A study conducted in the United States of America revealed that about 20% of adolescents have a diagnosable mental health disorder. In addition, many mental health disorders have onset during adolescence.¹ In Malaysia, from the findings of National Health and Morbidity Survey (NHMS) 2012: Mental Health of Adolescents, it was found that the prevalence of depression, anxiety and stress was 17.7%, 39.6% and 10.1%, respectively.² The high prevalence of anxiety, which was about two-fifths of the adolescence is alarming because it can lead to serious mental health problems such as depression, suicidal ideation and even suicide. It can interfere with the ability to focus on learning, causing school problems such as truancy or social problems such as substance abuse.

The previous study has highlighted the correlates of depression among adolescents in Malaysia³, however data on the correlates of anxiety is still lacking, even though the prevalence of anxiety among this population was higher compared to depression.

Therefore, this study is crucial to determine the factors associated with anxiety among school-going adolescents in Malaysia, which can facilitate in the early detection of adolescents who are at-risk, so that prevention and intervention programmes can be planned strategically for them.

METHODS

Study design and sampling

As part of the 2017 National Health and Morbidity Survey (NHMS): Adolescent Mental Health, this study implemented a two-stage stratified cluster sampling design looking at students in Forms 1 to 5 (13 – 17 years). Malaysia was stratified into 13 states and three Federal Territories. In the first stage sampling, a total of 212 secondary schools were selected randomly. In the second stage, all classes in each selected school were included in the sampling frame, using systemic random sampling. All students in the selected classes were eligible to participate in the survey. The detailed methodology was explained in another article.⁴

Data collection

Data collection was conducted from 26th March till 3rd May 2017 by a total of 36 teams, 4 teams for Sabah and Sarawak and 2 teams per state for the rest. Parental consent forms were distributed to all students from selected classes, and nonconsenting students were considered as nonresponses. Validated self-administered bilingual anonymous questionnaires were used to ensure the students' privacy. Ethical approval for the study was obtained from the Medical Research and Ethics Committee (MREC), Ministry of Health Malaysia (NMRR-16-698-30042) and the Ministry of Education's Ethics Committee. The 2017 NHMS data were representative of all students attending Forms 1 to 5 (13-17 years) in Malaysia.

Measures

Assessment of Anxiety

Based on the scoring system of Depression Anxiety and Stress Scale (DASS-21), respondents were considered as having anxiety if they had a moderate level of anxiety or more (score of 20 and above).⁵

Sociodemographic Variables

Socio-demographic variables included sex, ethnicity, residential area, parental marital status and forms.

Forms were based on the school's class system at government secondary schools. Form 1 generally applies to adolescents aged 13, Form 2 for 14 years old, Form 3 for 15 years old, Form 4 for 16 years old, and Form 5 for 17 years old.

Other Independent Variables

For mental health problems, respondents were considered as lonely if they felt lonely "most of the time" or "always", during the past 12 months before survey. Respondents were considered unable to sleep due to worry if they responded either "most of time" or "always" for being worried about something as they could not sleep at night during past 12 months before survey.

Respondents were considered as having had a close friend if they had at least one close friend at school. Peer support was described as students in their school were kind and helpful for most of the time or always during the past 30 days. Parental connectedness was defined as parents/guardians had always or most of the time understood their problems and worries in the past 30 days, while parental bonding was defined as parents/guardians had always or most of the time, really knew what they were doing with their free time in the past 30 days.

Respondents were reported as having been bullied if they were bullied on 1 or more days in the last 30 days before the survey. Physical abuse at home was defined as being hit by someone at home leaving a mark or an injury in the past 30 days. Verbal abuse at home was reported if someone at

home said hurtful or insulting things to them in the past 30 days.

Respondents were considered as current smokers if they smoked cigarettes or other tobacco products for at least 1 day in the past 30 days prior to the survey, and were considered as current drinkers if they consumed at least 1 drink of alcohol in the past 30 days, whereas current drug users were defined as having used drug(s) 1 or more times in the past 30 days.

Ever had sex meant that the respondents had ever had sexual intercourse at least 1 episode per lifetime. Respondents were described as physically active if they had been active physically for at least 60 minutes per day, for a minimum of five days per week. Internet addiction was defined when the respondents scored 43 or above using self-administered 20-item Malay Version Internet Addiction Test (MVIAT) questionnaire.

Statistical analyses

Descriptive statistics were used to summarize the characteristics of the study population. Univariable and multivariable logistic regression analyses were performed to investigate the association between anxiety, socio-demographic and other independent variables. The results are presented as crude and adjusted odds ratios (ORs) with 95% confidence interval (CIs). In multivariable analysis, all variables

with a *p*-value of <0.05 indicates statistical significance.⁶ All analyses were performed using the Statistical Package of Social Sciences (SPSS) for Windows version 25.0 (IBM Corp., Armonk, NY, USA), taking into account the sample weighting and complex sampling design.

RESULTS

Out of 30,823 eligible school-going adolescents from 212 selected schools in the 2017 NHMS, 26,892 of them completed the survey, achieving a response rate of 87.2%.⁷

Table 1 shows descriptive statistics on sample characteristics and anxiety status among school-going adolescents in Malaysia by socio-demographic and other independent variables. By gender, females and males made up the almost similar size of respondents, with 50.5% and 49.5%, respectively. The majority were of Malay ethnicity (63.1%), whereas the rest were of Chinese (16.8%), Indians (6.9%), Bumiputeras from Sabah and Sarawak (11.4%), and other ethnicities in Malaysia (1.7%). Most of them were residents in the urban area (56.8%). Almost equal percentage of students' distribution by school Forms (class). 87.4% of respondents reported that their parents were married, while the remaining 12.6% reported that their parents were divorced/widowed/ separated.

Table 1 Sample characteristics and anxiety status among school-going adolescents by socio-demographic and associated factors, NHMS 2017

Variables	Total sample N (%)	Anxiety Status	
		Anxiety N (%)	Non-Anxiety N (%)
Overall	26892 (100.0)	10540 (39.7)	16352 (60.3)
Sex			
Male	12828 (49.5)	4612 (37.1)	8216 (62.9)
Female	14064 (50.5)	5928 (42.3)	8136 (57.7)
Strata			
Urban	15630 (56.8)	6166 (40.1)	9464 (59.9)
Rural	11262 (43.2)	4374 (39.2)	6888 (60.8)
Form			
Form 1	5563 (20.9)	2310 (41.9)	3253 (58.1)
Form 2	5392 (19.9)	1939 (36.8)	3453 (63.2)
Form 3	5726 (20.2)	2090 (36.9)	3636 (63.1)
Form 4	5399 (19.3)	2227 (41.4)	3172 (58.6)
Form 5	4812 (19.7)	1974 (41.6)	2838 (58.4)
Ethnicity			
Malays	18310 (63.1)	7139 (39.1)	11171 (60.9)
Chinese	4031 (16.8)	1410 (35.6)	2621 (64.4)
Indians	1399 (6.9)	629 (47.1)	770 (52.9)
Bumiputera Sabah and Sarawak	2623 (11.4)	1132 (44.3)	1491 (55.7)
Others	529 (1.7)	230 (43.8)	299 (56.2)
Parents marital status			
Married	23026 (87.4)	8884 (39.0)	14142 (61.0)
Divorced/widowed/separated	3291 (12.6)	1388 (43.5)	1903 (56.5)
Feeling loneliness			
Lonely	2434 (9.4)	1549 (63.8)	885 (36.2)

Not lonely	24388 (90.6)	8962 (37.2)	15426 (62.8)
Unable to sleep, worried something			
Unable to sleep	1836 (7.1)	1209 (65.9)	627 (34.1)
Able to sleep	24974 (92.9)	9296 (37.7)	15678 (62.3)
Close friend			
No close friend	916 (3.6)	471 (49.8)	445 (50.2)
Had close friend	25830 (96.4)	10006 (39.4)	15824 (60.6)
Peer support			
Yes	12249 (44.2)	4655 (38.7)	7594 (61.3)
No	14584 (55.8)	5864 (40.5)	8720 (59.5)
Parental connectedness			
Yes	8929 (32.1)	3242 (36.8)	5687 (63.2)
No	17889 (67.9)	7270 (41.1)	10619 (58.9)
Parental bonding			
Yes	11597 (42.8)	4221 (36.8)	7376 (63.2)
No	15186 (57.2)	6271 (41.9)	8915 (58.1)
Being bullied			
Yes	4307 (16.1)	2472 (58.5)	1835 (41.5)
No	22522 (83.9)	8044 (36.1)	14478 (63.9)
Physical abuse			
Yes	2938 (11.7)	1721 (58.9)	1217 (41.1)
No	23886 (88.3)	8789 (37.2)	15097 (62.8)
Verbal abuse			
Yes	11407 (43.2)	5656 (49.7)	5751 (50.3)
No	15376 (56.8)	4843 (32.1)	10533 (67.9)
Current smoker			
Yes	3474 (13.6)	1606 (47.3)	1868 (52.7)
No	23385 (86.4)	8926 (38.5)	14459 (61.5)
Current drinker			
Yes	2405 (10.2)	1272 (52.5)	1133 (47.5)
No	24452 (89.8)	9259 (38.3)	15193 (61.7)
Current drug use			
Yes	765 (3.4)	564 (71.9)	201 (28.1)
No	26092 (96.6)	9967 (38.6)	16125 (61.4)
Ever had sex			
Yes	1858 (7.3)	975 (52.1)	883 (47.9)
No	24938 (92.7)	9509 (38.7)	15429 (61.3)
Physical inactive			
Yes	21090 (80.1)	8440 (40.5)	12650 (59.5)
No	5702 (19.9)	2065 (36.4)	3637 (63.6)
Internet addiction			
Yes	193 (5.2)	4483 (57.4)	3384 (42.6)
No	3508 (94.8)	6037 (32.5)	12929 (67.5)

Overall, the prevalence of anxiety was 39.7%, about two-fifths of school-going adolescents' population, which was higher in females (42.3%) compared to males (37.1%), with no significant difference between residents in urban and rural areas. According to school classes, the prevalence of anxiety was higher among Form 1 (41.9%), Form 4 (41.4%) and Form 5 (41.6%) students. The prevalence of anxiety was higher among students whose parents were divorced/widowed/separated (43.5%). Multivariate analysis using logistic regression revealed that anxiety was positively associated with female gender (odds ratio, OR [95% confidence interval, CI] = 1.30 [1.19,1.42]) compared to male

counterpart, feeling loneliness (1.78 [1.54,2.05]) compared to not lonely, unable to sleep due to worry of something (1.79 [1.56,2.05]) compared to able to sleep, being bullied (1.66 [1.48,1.87]) compared to not being bullied, physical abuse (1.33 [1.18,1.49]) compared to no physical abuse, verbal abuse (1.47 [1.35,1.59]) compared to no verbal abuse, current drinker (1.23 [1.06,1.43]) compared to not current drinker, current drug use (1.84 [1.43,2.35]) compared to not current drug use, ever had sex (1.17 [1.01,1.36]) compared to never had sex, physically inactive (1.16 [1.06,1.26]) compared to physically active and internet addiction (2.59 [2.37,2.83]) compared to not internet addiction. Chinese ethnicity (0.68 [0.50,0.93]) compared to other

Anxiety among Malaysian Adolescents

ethnicity, and Form 2 (0.78 [0.69,0.89]) and Form 3 (0.73 [0.65,0.82]) students compared to Form 1 students, were protective of anxiety. Having a close

friend, peer support, parental bonding and parental connectedness were not related to anxiety (Table 2).

Table 2 Unadjusted and adjusted logistic regression for anxiety among school-going adolescents by socio-demographic and associated factors, NHMS 2017

Variables	Unadjusted OR (95% CI)	<i>p</i> -value	Adjusted OR ^a (95% CI)	<i>p</i> -value
Sex				
Male	1.00		1.00	
Female	1.25 (1.14-1.36)	<0.001	1.30 (1.19-1.42)	<0.001
Strata				
Urban	1.04 (0.93-1.17)	0.512	1.04 (0.93-1.15)	0.524
Rural	1.00		1.00	
Form				
Form 1	1.00		1.00	
Form 2	0.81 (0.70-0.92)	0.002	0.78 (0.69-0.89)	<0.001
Form 3	0.81 (0.71-0.93)	0.002	0.73 (0.65-0.82)	<0.001
Form 4	0.98 (0.86-1.12)	0.764	0.90 (0.79-1.02)	0.096
Form 5	0.99 (0.87-1.13)	0.869	0.89 (0.78-1.01)	0.079
Ethnicity				
Malays	0.82 (0.62-1.09)	0.177	0.89 (0.66-1.21)	0.461
Chinese	0.71 (0.53-0.95)	0.023	0.68 (0.50-0.93)	0.015
Indians	1.14 (0.84-1.56)	0.398	0.96 (0.66-1.38)	0.805
Bumiputera Sabah and Sarawak	1.02 (0.75-1.40)	0.894	0.98 (0.70-1.38)	0.911
Others	1.00		1.00	
Parents marital status				
Married	1.00		1.00	
Divorced/widowed/separated	1.21 (1.10-1.32)	<0.001	1.06 (0.95-1.17)	0.302
Feeling loneliness				
Lonely	2.97 (2.62-3.37)	<0.001	1.78 (1.54-2.05)	<0.001
Not lonely	1.00		1.00	
Unable to sleep, worried something				
Unable to sleep	3.20 (2.83-3.62)	<0.001	1.79 (1.56-2.05)	<0.001
Able to sleep	1.00		1.00	
Close friend				
No close friend	1.53 (1.31-1.79)	<0.001	1.02 (0.85-1.22)	0.847
Had close friend	1.00		1.00	
Peer support				
Yes	1.00		1.00	
No	1.08 (1.01-1.16)	0.034	1.00 (0.93-1.08)	0.918
Parental connectedness				
Yes	1.00		1.00	
No	1.20 (1.11-1.29)	<0.001	1.05 (0.95-1.15)	0.330
Parental bonding				
Yes	1.00		1.00	
No	1.24 (1.16-1.33)	<0.001	1.08 (0.99-1.18)	0.075
Being bullied				
Yes	2.50 (2.23-2.80)	<0.001	1.66 (1.48-1.87)	<0.001
No	1.00		1.00	
Physical abuse				
Yes	2.42 (2.14-2.74)	<0.001	1.33 (1.18-1.49)	<0.001
No	1.00		1.00	
Verbal abuse				
Yes	2.09 (1.95-2.25)	<0.001	1.47 (1.35-1.59)	<0.001
No	1.00		1.00	
Current smoker				
Yes	1.43 (1.27-1.60)	<0.001	1.04 (0.92-1.17)	0.553
No	1.00		1.00	

Current drinker				
Yes	1.79 (1.55-2.05)	<0.001	1.23 (1.06-1.43)	0.006
No	1.00		1.00	
Drug use				
Yes	4.06 (3.23-5.10)	<0.001	1.84 (1.43-2.35)	<0.001
No	1.00		1.00	
Ever had sex				
Yes	1.73 (1.51-1.98)	<0.001	1.17 (1.01-1.36)	0.037
No	1.00		1.00	
Physical inactive				
Yes	1.19 (1.09-1.29)	<0.001	1.16 (1.06-1.26)	0.001
No	1.00		1.00	
Internet addiction				
Yes	2.81 (2.59-3.05)	<0.001	2.59 (2.37-2.83)	<0.001
No	1.00		1.00	

OR, Odds ratio; CI, confidence interval.

*Odds ratios adjusted for all other variables with unadjusted *p*-value of less than 0.25.

DISCUSSION

The prevalence of anxiety in 2017 (39.7%) mimicked the earlier nationwide school-based study in 2012 (39.6%).² Our prevalence on anxiety among adolescents was higher compared to that of US (31.9%)⁸ and Vietnam (22.8%)⁹ adolescents, but lower compared to that of Indian adolescents (65.3%).¹⁰ These differences may be due to different diagnostic tools adopted¹¹ and different age group examined, such as the current study used secondary school-going adolescents in Malaysia of 13-17 years' age group, while the previous studies used 13-16 years' or 13-18 years' age group according to their education system. There was no significant difference in rural and urban areas in terms of the prevalence of anxiety. When compared with a recent study that assessed the psychosocial impact of COVID-19 pandemic on Malaysian families, there was a lower prevalence of anxiety among adolescents recorded (28.5% vs 39.7%).¹² The lower prevalence of anxiety could be due to different sampling time frame during the pandemic that affected psychosocial impact over time.

There were several factors associated with anxiety among school-going adolescents identified. Female students were 1.3 times more likely to have anxiety compared to male students, similar to findings from other studies, explaining it as a result of biological factors, hormonal factors and experience during childhood.^{13,14}

Students of Form 2 and 3 had a significantly lower risk of anxiety, compared to students of Form 1, 4 and 5. Increased anxiety in Form 1 students can be as a consequence of the transition from primary to secondary school. This is comparable with the findings from other study indicating that early adolescence is a time of life with stressful challenges¹⁵ which leads to anxiety. Increased anxiety in Form 4 and 5 students could be as consequence of pressure of studies, similar findings from a previous study among Indian high school students, where there were instances of

mental health problems in 10th and 12th grade final examination due to parental pressure on their children to excel because of their concern for the welfare of their children and their awareness of the competition for admission in reputed institutions.¹⁶

Chinese students had a significantly lower risk of anxiety, compared to the other races. A previous study in the United States also showed that ethnicity may affect mental health within society¹⁷ such as low rates of depressive illness among Chinese American youth were related to the tendency to somatize emotional disturbances. Conversely, parental marital status (married or divorced/widowed/separated) was not significantly associated with anxiety.

In the current study, feeling loneliness was one of the factors that significantly associated with anxiety, consistent with the findings from another study among high school adolescents in the United States mentioning that loneliness was a painful and widespread problem among adolescents and was positively related to anxiety.¹⁸

Another important finding from the current study was that adolescents who were unable to sleep, worried of something were likely to have anxiety. This is comparable with the finding from another study among adolescents from general population in New Zealand reporting that adolescents with sleep problems showed more anxious.¹⁹

In the current study, being bullied, physical and verbal abuse showed significant associations with anxiety. These findings were in line with the findings from a previous study in the United Kingdom, which indicated that anxiety was 3.2 times more likely to occur in adolescents with a history of being bullied²⁰, while another study among secondary school adolescents in Hong Kong observed that students who had experienced physical abuse were at a significant disadvantage for a wide range of morbidity indicators, including anxiety and stress.²¹ Our findings were also comparable with another study among high school

students in Pakistan showed that parental psychological abuse including verbal abuse is related with anxiety.²²

In this study, we also found that those who were current drinkers had a significant association with anxiety. The relationship between anxiety and alcohol was well-documented in another study on anxiety / substance use disorder in which individuals with anxiety might start misusing alcohol as a safety behavior to reduce short-term anxiety, thereby maintaining anxiety by preventing the gathering of information to disconfirm beliefs that a negative thing would occur in social situations if alcohol was not consumed.²³ Current drug use was also seen to be significantly associated with anxiety. This finding was not surprising as many individuals may use psychoactive substances, particularly drugs and alcohol, to decrease negative emotions, such as anxiety.²⁴ Conversely, current smoker was not significantly associated with anxiety.

Another important finding from the current study was that adolescents who had ever had sex were associated with anxiety, consistent with the findings from a previous study among adolescents in the United States correlating psychological characteristics and episodes of sexual intercourse among adolescents.²⁵

In this study, physical inactivity among adolescents was another associated factor for anxiety. Higher physical activity was positively correlated with higher social activity²⁶ and adolescents who engaged in social interactions with enthusiasm, may not meet the anxiety symptoms.²⁷

Last but not least, in our study, internet addiction had 2.6 times higher association with anxiety, consistent with the report from another study in Turkey, indicating that the more addictive to the internet a student is, the more anxious he/she is due to a reason that those who suffer from anxiety often have trouble communicating and interacting with others in a healthy, positive, and meaningful way, which was important determinants of internet addiction.²⁸

Our study observed no relationship between having a close friend, peer support, parental connectedness and parental bonding, with anxiety.

The strengths of the present study were mainly due to its focus on school-based adolescents (for whom information is needed), its nationwide representativeness, the relatively large number of participants, and the high response rate.

The limitation of this study was its cross-sectional design, which did not allow the identification of causal relationships between anxiety and its associated factors.

Future studies need to focus on whether early prevention and early intervention programs could reduce disease burden, and lead to healthier adolescents, in terms of mental health.

CONCLUSION

Our results suggest that feeling loneliness, unable to sleep, being bullied, physical and verbal abuse, current drinker/drug use status, ever had sex, physically inactive and internet addiction had a positive association with anxiety among school-going adolescents, while Chinese ethnicity and Form 2 and 3 students were negatively associated with anxiety.

Thus, intervention programs for these “at-risk” adolescents should be aimed towards reducing the risk factors in a holistic approach.

School and home environments have a great role in helping adolescents to control their anxiety. Schools and home should be free from violence including bullying, physical and verbal abuse. Parents should ensure that home provides sufficient emotional support. School atmosphere should be supportive for the emotional and mental health development of adolescents. Psychological support intervention should be implemented by the government and policymakers, and made widely accessible to the community. For the current situation, the planning should involve mental health interventions to mitigate the psychosocial ill effects of the pandemic.

Funding

The Ministry of Health Malaysia funded the study (NMRR-16-698-30042).

Availability of the data and materials

For data protection purposes, the data used for this study are not publicly available but are available from the Institute for Public Health, Ministry of Health Malaysia upon reasonable request and with permission from the Director General of Health Malaysia.

Ethics approval and consent to participate

Participants were provided with written consent to participate in the study prior to interviews. The study was approved by the Medical Research and Ethics Committee (MREC), Ministry of Health Malaysia (NMRR-16-698-30042) and the Ministry of Education’s Ethics Committee.

Consent for publication

The authors obtained permission to publish this paper from the Director General of Health Malaysia.

Competing interests

The authors declare that they have no competing interests.

ACKNOWLEDGEMENT

The authors would like to thank the Director General of Health Malaysia for his permission to publish this paper. We would also like to thank all research team members and data collectors for their contributions

and commitment in this study. We appreciate the funding and support from the Ministry of Health Malaysia. We are also grateful for the kind cooperation of all participants.

REFERENCES

1. Kessler RC, Berglund P, Demler O, Jin R, Merikangas KR, Walters EE. Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the National Comorbidity Survey Replication. *Archives of general psychiatry*. 2005 Jun 1;62(6):593-602.
2. Institute for Public Health. National Health and Morbidity Survey (NHMS) 2012: Mental Health of Adolescents (DASS 21). Kuala Lumpur: Ministry of Health Malaysia. (2014): 4-6.
3. Kaur J, Cheong SM, Mahadir Naidu B, Kaur G, Manickam MA, Mat Noor M, Ibrahim N, Rosman A. Prevalence and correlates of depression among adolescents in Malaysia. *Asia Pacific Journal of Public Health*. 2014 Sep;26(5_suppl):53S-62S.
4. Awaluddin SM, Ibrahim Wong N, Rodzlan Hasani WS, Omar MA, Mohd Yusoff MF, Nik Abd Rashid NR, Aris T. Methodology and representativeness of the Adolescent Health Survey 2017 in Malaysia. *Asia Pacific Journal of Public Health*. 2019 Nov;31(8_suppl):8S-17S.
5. Musa R, Fadzil MA, Zain ZA. Translation, validation and psychometric properties of Bahasa Malaysia version of the Depression Anxiety and Stress Scales (DASS). *ASEAN Journal of Psychiatry*. 2007 Jan 1;8(2):82-9.
6. Bursac Z, Gauss CH, Williams DK, Hosmer DW. Purposeful selection of variables in logistic regression. *Source Code Biol Med*. 2008;3: 17.
7. Institute for Public Health, 2017. National Health and Morbidity Survey (NHMS) 2017: Adolescent Health.
8. Merikangas KR, He JP, Burstein M, Swanson SA, Avenevoli S, Cui L, Benjet C, Georgiades K, Swendsen J. Lifetime prevalence of mental disorders in US adolescents: results from the National Comorbidity Survey Replication–Adolescent Supplement (NCS-A). *Journal of the American Academy of Child & Adolescent Psychiatry*. 2010 Oct 1;49(10):980-9.
9. Nguyen Dat Tan, Christine Dedding, Tam Thi Pham, Pamela Wright and Joske Bunders. "Depression, anxiety, and suicidal ideation among Vietnamese secondary school students and proposed solutions: a cross-sectional study." *BMC Public Health*. 2013; 13(1): 1195.
10. Sandal Raman Kumar, Naveen Krishan Goel, Manoj Kumar Sharma, Ravleen Kaur Bakshi, Navpreet Singh, and Dinesh Kumar. "Prevalence of depression, anxiety and stress among school going adolescent in Chandigarh." *Journal of family medicine and primary care*. 2017; 6(2): 405.
11. Mishra Shailendra Kumar, Mona Srivastava, Narendra K. Tiwary, and Abhinit Kumar. Prevalence of depression and anxiety among children in rural and suburban areas of Eastern Uttar Pradesh: A cross-sectional study. *Journal of family medicine and primary care*. 2018; 7 (1): 21.
12. Zainudeen, Zarina Thasneem, Intan Juliana Abd Hamid, Muhd Nur Akmal Azizuddin, Firdaus Farhani Abu Bakar, Salina Sany, Izzal Asnira Zolkepli, and Ernest Mangantig. Psychosocial impact of COVID-19 pandemic on Malaysian families: a cross-sectional study. *BMJ open*. 2021; 11(8): e050523.
13. Pillai, Aravind, Vikram Patel, Percy Cardozo, Robert Goodman, Helen A. Weiss, and Gracy Andrew. Non-traditional lifestyles and prevalence of mental disorders in adolescents in Goa, India. *The British Journal of Psychiatry*. 2008; 192(1): 45-51.
14. Yadav DU, Kumar A. A wake up call: Rising incidences of anxiety disorder in paediatric population. *Int J Pharm Bio Sci*. 2013;4: 1056–62.
15. Deb Sibnath, Pooja Chatterjee and Kerryann M. Walsh. Anxiety among high school students in India: comparisons across gender, school type, social strata, and perceptions of quality time with parents. *Australian Journal of Educational and Developmental Psychology*. 2010; 10(1): 18-31.
16. Deb Sibnath, Esben Strodl and Jiandong Sun. Academic stress, parental pressure, anxiety and mental health among Indian high school students. *International Journal of Psychology and Behavioral Sciences*. 2015; 5(1): 26-34.
17. Anderson Emily R and Linda C. Mayes. Race/ethnicity and internalizing disorders in youth: A review. *Clinical Psychology Review*. 2010; 30(3): 338-348.
18. Moore DeWayne, and Norman R. Schultz. Loneliness at adolescence: Correlates, attributions, and coping. *Journal of Youth and Adolescence*. 1983; 12(2): 95-100.
19. Morrison DN, R McGee, and WR Stanton. Sleep problems in adolescence. *Journal of*

Anxiety among Malaysian Adolescents

- the American Academy of Child and Adolescent Psychiatry. 1992; 31(1): 94.
20. Salmon Gilly, Anthony James, and David M. Smith. Bullying in schools: self-reported anxiety, depression, and self-esteem in secondary school children. *BMJ*. 1998; 317(7163): 924-925.
21. Lau Joseph TF, Joseph LY Liu, Jacky CK Cheung, Aaron Yu, and Chun-Kwan Wong. Prevalence and correlates of physical abuse in Hong Kong Chinese adolescents: a population-based approach. *Child Abuse & Neglect*. 1999; 23(6): 549-557.
22. Rizvi Syeda Fariha Iram and Najma Najam. Parental psychological abuse toward children and mental health problems in adolescence." *Pakistan journal of medical sciences*. 2014; 30(2): 256.
23. Wolitzky-Taylor Kate, Lyuba Bobova, Richard E. Zinbarg, Susan Mineka, and Michelle G. Craske. Longitudinal investigation of the impact of anxiety and mood disorders in adolescence on subsequent substance use disorder onset and vice versa. *Addictive Behaviors*. 2012; 37(8): 982-985.
24. Valentiner David P, Nina S. Mounts, and Brett J. Deacon. Panic attacks, depression and anxiety symptoms, and substance use behaviors during late adolescence. *Journal of Anxiety Disorders*. 2004; 18(5): 573-585.
25. Dawson, Laura H, Mei-Chiung Shih, Carl de Moor, and Lydia Shrier. Reasons why adolescents and young adults have sex: Associations with psychological characteristics and sexual behavior. *Journal of Sex Research*. 2008; 45(3): 225-232.
26. Mendonça, Gerefeson, Luanna Alexandra Cheng, Edilânea Nunes Mélo, and José Cazuza de Farias Júnior. Physical activity and social support in adolescents: a systematic review. *Health Education Research*. 2014; 29(5): 822-839.
27. Paluska SA and TL Schwenk. Physical activity and mental health: current concepts. *Sports Med*. 2000; 29(3): 167-80.
28. Akin Ahmet and Murat Iskender. Internet addiction and depression, anxiety and stress." *International Online Journal of Educational Sciences*. 2011; 3(1): 138-148.