

Prevalence and Factors Determining Adolescents Risk Taking Behaviours in Sarawak, Malaysia

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ABSTRACT

INTRODUCTION: During adolescence, significant physical, emotional, and social changes influence growth. This phase exposes adolescents to risky situations. Understanding adolescent risk-taking is crucial. This study aims to determine the extent of risk-taking behaviour among Malaysian adolescents and identify associated factors.

MATERIALS AND METHODS: In a community-based study, we surveyed 1,344 Malaysian adolescents aged 10-19 across 22 districts in Sarawak using multi-stage cluster sampling and face-to-face interviews. Data analysis was performed with IBM SPSS v28.0.

RESULTS: Analysis found that 43.7% of adolescents engaged in risky behaviours, with a higher incidence in males (50.1%) compared to females (37.4%). Multinomial logistic regression analysis identified for low-medium risk behaviours were being aged 15-19 (AOR=1.52; CI:1.14-2.02), infrequent religious practice (AOR=1.70; CI:1.01-2.84), poor parent-child relations (AOR=2.02; CI:1.07-3.83) and having a history of mental abuse (AOR=3.02; CI:1.37-6.62). However, a larger family size appeared to be a protective factor (AOR=0.39; CI: 0.18-0.89). High-risk behaviours were more prevalent in older (AOR=2.65; CI:1.91, 3.68) male adolescents (AOR=2.75; CI: 2.02, 3.75) and low religious value (AOR=3.55; CI: 1.32-9.52), larger families (AOR=2.03; CI: 1.38-3.00), lower school grades (AOR=1.74; CI: 1.27-2.38), physical ailments (AOR=2.63; CI:1.60-4.32), and a history of mental abuse (AOR=3.85; CI:1.78-8.31).

CONCLUSION: Adolescents aged 15-19 with weak family ties, low religious engagement, and a history of mental abuse tend to exhibit low to medium risk behaviours. Older male adolescents with health issues are more likely to engage in high-risk behaviours, whereas those from larger families show fewer such tendencies. These insights are crucial for shaping targeted interventions and policies.

Keywords

Adolescents, Risk Behaviours, Sarawak, Adolescence, Teenagers

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INTRODUCTION

Adolescent health experts have identified that the most significant threat to the well-being of adolescents is their engagement in risky behaviours.¹ The increase in prevalence of such behaviours among this age group is a major concern for public health officials.^{1,2} These behaviours are characterised as harmful and maladaptive, but has a high appeal or excitement for adolescents. They can negatively impact the psychosocial aspects of development, becoming the leading cause of mortality and morbidity.³ Adolescents tend to engage in risky behaviours as a means of self-discovery, exploring the world around them, gaining acceptance from peers, coping with stress, reducing psychosocial pressure and negativity, and asserting their independence from their families.⁴ The worldwide occurrence of risk-oriented behaviours among adolescents is concerning. Studies suggest that many adolescents engage in risky behaviours, including smoking, drinking, substance abuse, physical confrontations, criminal activities, close physical interactions, and pre-marital intimacy.⁵ Such tendencies are especially prominent in older adolescents and males.⁶ It is not uncommon for adolescents to exhibit multiple risky behaviours simultaneously, with most showing at least two risk factors and a substantial group displaying three or more.⁷ Typical risk factors encompass sedentary lifestyles, minimal consumption of fruits and vegetables, tobacco use, alcohol

consumption, and poor dietary habits.⁸ Both urban and rural settings witness these behaviours.⁹ Earlier studies have pinpointed gender variations in risk behaviours.^{10,11} Young females elevate their HIV risk due to early and unprotected intimate relations, yet fewer females indulge in these behaviours compared to males.^{6,12,13} Conversely, young males often engage in dangerous driving, especially under the influence of cannabis or other substances.³ Studies among Malaysian adolescents indicate alarming trends in high-risk behaviours. Johari et al.¹⁴ reported that 66.8% to 83.7% of these adolescents engage in risky activities, with 7.8% showing suicidal ideation—a finding corroborated by Kadir et al.¹⁵, which reported a similar 8.7% rate.

Common high-risk behaviours such as physical inactivity, smoking, and alcohol consumption were highlighted by Cheah et al.¹² Further, another study reported 14.6% smoking rate linked to underachievement in school and parental smoking habits.¹⁶ The issues extend to mental health too; Chan et al.¹⁷ found that 6.2% of adolescents, especially females of Indian descent, attempted suicidal thoughts. Likewise, Nik Daliana et al.¹⁸ noted that 4.7% are involved in other high-risk behaviours, including tobacco use and accessing inappropriate online content. These behaviours and their profound impact on adolescents could be better understood using the biopsychosocial model proposed by Sales and Irwin.¹⁹ However, past studies have examined these behaviours in isolation. We aimed to understand how adolescents engage in multiple risk behaviours simultaneously. In this context, we conducted a study to determine the prevalence and pattern of these behaviours among adolescents and identify the associated factors. The findings would contribute to a better understanding of the complex nature of adolescent risk behaviours.

MATERIALS AND METHODS

Setting and Sample Size Determination

A community-based cross-sectional study was conducted to ascertain the prevalence and patterns of risk-taking behaviours among adolescents in Sarawak, a multi-ethnic state. This comprehensive study was crucial for a holistic understanding of the behaviours across diverse ethnicities

and varied living areas within the state. We utilised a precision-based approach to decide the necessary sample size, considering variables such as estimated mental health disorder prevalence (16.9%), confidence level (95%), absolute precision (3%), design effect (here, 2), and non-response rate. By this method, we determined that we needed responses from 1439 adolescents for the research, which included a 20% attrition rate. However, we managed to collect 1344 adolescents between the ages of 10 and 19 who resided in housing areas, villages, or longhouses with Internet access who were included in this study. However, those with reported mental or cognitive impairment, inability to speak English, Bahasa Malaysia, or Mandarin, or those without a matching partner of the opposite gender from the same housing area, village, or longhouse were excluded.

Sampling Procedure

We employed a multi-stage cluster sampling method, randomly selecting two districts from each of the 12 administrative divisions, resulting in 22 districts. We obtained a list of housing areas, villages, or longhouses from the relevant district offices or local councils. We randomly select these areas based on the number of adolescents required. In each housing area, village, or longhouse, 10 pairs of adolescents were selected, representing the balance of gender in the community.

Measurements

Risky behaviours are activities that can negatively impact adolescents' physical, mental, or social well-being. We utilised a scoring system to evaluate the level of engagement in certain behaviours among adolescents. We assigned a score of '0' for no engagement, 1 for involvement within the past month, 2 for involvement during the past 1-6 months, and 3 for involvement beyond the last six months. The data from these three time periods allowed us to assess the extent of adolescent risky behaviour and determine the potential impact on their health. A 21-item questionnaire (i.e. 21 types of risky behaviour) was administered to assess risky behaviours. The total score range was between 0 to 63. We classified risky behaviours into three levels: no risky behaviour (0), low-medium risky behaviour (1-3), and high risky

behaviour (≥ 4). The classification was based on an equal percentile of scanned data using IBM SPSS. This classification method is objective, consistent, and useful for identifying individuals who has a high tendency to engage in risky behaviours.

Data Collection

We adopted the 21-item questions based on the Youth Risk Behaviours Surveillance System (YRBSS) developed by the Centers for Disease Control and Prevention.²⁰ Data were collected by face-to-face interviews using a validated, pre-tested questionnaire. We sought voluntary participation from adolescents during the data collection process. We obtained written informed consent from both the parent/guardian and the adolescents themselves. The information obtained was treated as confidential and kept anonymous to protect the privacy of our participants. Before initiating the main survey, a questionnaire pre-test was conducted to determine its feasibility and reliability, especially since some portions were adapted and modified from existing questionnaires.

The pre-test was conducted from February to March 2017 with adolescents in a non-sampled area. The pre-test assessed the clarity, applicability, and relevance of the questionnaire. The questionnaire was tested among 72 participants, constituting 5% of the main study's sample size. After the pre-test, a content analysis was done, leading to necessary alterations based on feedback. Statistical analysis confirmed the reliability of Likert-scale questions with Cronbach's alpha values between 0.704 and 0.953. We professionally conducted this study and maintained the highest level of ethical standards.

Data Entry and Analysis

We used Statistical Package for Social Science version 28.0 for data analysis. Firstly, the collected data were checked and cleaned. We analysed data from a total of 1344 respondents with a response rate of 93.4%. In the descriptive analysis, we calculated frequency, percentage, mean, median, and standard deviation for numeric data. Categorical data were presented in the form of frequency and percentage. We conducted multinomial logistic regression to investigate the factors influencing adolescent

risk behaviours. We used the results of the analysis to determine the factors contributing to such behaviours. We examined several predictor variables that could impact an adolescent's risk behaviour. They were age, gender, religious practices, importance of religion, relationship quality with parents, family size, school grade, number of friends, presence of comorbidity, and history of mental abuse. The risky behaviours were then categorised into three groups: no risky behaviour (0), low-medium risky behaviour (1-3), and high risky behaviour (≥ 4). The reference category was no risky behaviour, and adjusted odds ratios were calculated for each predictor. These ratios provided information on the association between exposure and outcome, representing the odds that an effect will happen given a particular exposure compared to the odds of it occurring without that exposure.

Ethical Issues

The study was granted ethical approval by the Universiti Malaysia Sarawak Ethics Committee [Ref # UNIMAS/NC-21.02/03-02 Jld.2 (64)]. The research was also registered with the National Institutes of Health, Ministry of Health, Malaysia (Ref # NMRR-17-346-34067) to ensure compliance with national regulations. Obtaining ethics approval from the two authorities ensured that the study was conducted ethically, with due consideration given to the safety and well-being of all participants.

RESULTS

Characteristics of Adolescents

The average age of the adolescents in the study was 15.02 years old, with a standard deviation of 2.60 years. The relative majority were Chinese (29.2%) and Malay (26.0%), while the remaining 44.8% were made up of other ethnicities. The largest proportion of respondents identified themselves as Christian (57.6%), followed by Islam (33.2%), with 9.2% having other religious affiliations or no religion. Most adolescents were single (98.5%), and most were students (95.0%). Regarding education, 21.6% had completed primary education, 66.2% had completed secondary education, and 12.2% had other educational backgrounds. The average daily pocket money was MYR 7.31, with a standard deviation of MYR 8.21 and a median of MYR 5.00 (Table 1).

Table 1: Characteristics of the adolescents (n=1344)

Characteristics	n	%
Mean age (SD) years	15.02 (2.60)	
Ethnicity		
Chinese	393	29.2
Malay	349	26.0
^a Others	602	44.8
Religion		
Christian	774	57.6
Islam	446	33.2
^b Others	124	9.2
Marital status		
Single	1324	98.5
^c Others	20	1.5
Occupation		
Student	1277	95.0
^e Others	67	4.9
Highest level of education		
Primary	290	21.6
Secondary	890	66.2
^e Others	164	12.2
Average pocket money each day (MYR)		
Mean (SD) (MYR)	7.31 (8.21)	
Median (MYR)	5.00; Q ₁ , Q ₃ = 2.0, 10	

^aIban, Bidayuh, Orang Ulu, Melanau; ^bBuddhist, Taoist, BahaI, No religion; ^cMarried, Engaged, Divorced; ^dUnemployed, Employed, Housewife; ^eKindergarten, Pre-university, Vocational, Diploma, No formal education;

Table 2: Pattern of adolescents' risky behaviours (n=1344)

Risky behaviours	Level of risk behaviours			
	Never	Within the last month	During the last 1-6 months	Beyond the last 6 months
Loitering	74.5	16.9	4.8	3.9
Fighting	85.8	5.8	4.8	3.6
Drinking alcohol	87.6	4.2	3.9	4.3
Smoking/Vaping	89.4	6.3	1.6	2.8
Bullying others	92.0	3.8	1.6	2.6
Underage driving	92.3	5.0	1.3	1.3
Been bullied	93.2	3.3	1.3	2.2
Watching/reading pornographic materials	93.6	2.8	1.6	2.1
Skipping classes or work	94.0	1.9	1.9	2.3
Self-harm	96.0	1.3	1.0	1.7
Driving recklessly	96.4	2.1	1.0	0.5
Gambling	96.5	1.0	1.2	1.3
Sexual activities	97.1	2.2	0.4	0.3
Stealing	97.5	0.4	0.6	1.5
Gangsterism	97.9	1.1	0.1	0.8
Illegal racing	98.0	1.1	0.6	0.3
Carrying weapons	98.2	0.4	0.2	1.1
Glue-sniffing	98.7	0.4	0.3	0.6
Claiming protection money	98.8	0.4	0.2	0.6
Same gender relationship	99.2	0.4	0.1	0.3
Taking illegal drugs	99.4	0.1	0.1	0.4

Adolescents Risky Behaviours

The distribution of risky behaviours among adolescents is presented in **Table 2**, with the most common being loitering, followed by fighting, drinking alcohol, and

smoking or vaping. Taking illegal drugs was found to be the least common behaviour.

Overall, 43.7% of adolescents engaged in risky behaviours in the last six months, with males being more likely to engage in such behaviours than females. Specifically, half of male (50.1%) adolescents were involved in risky behaviours in the last six months, compared to just under two-fifths of females (62.6%) reported no risky behaviours than males (49.9%). Additionally, male adolescents were twice as likely as females to engage in high level of risky behaviours (27.8% versus 14%). (**Figure 1**).

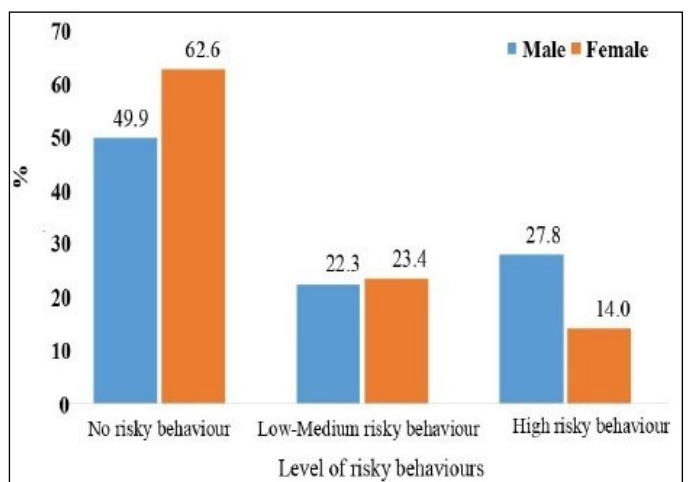


Figure 1: Adolescents levels of risky behaviour by gender (n=1344)

Factors Affecting Adolescent's Risk Behaviours: Multinomial Logistic Regression Analysis

Our analysis revealed that for low-medium level of risky behaviour, adolescents aged 15-19 are 1.52 times more likely to engage in these behaviours than those aged 10-14. Those who rarely (AOR=1.70) or occasionally (AOR=1.56) practice religion and those who do not have a good relationship with their parents (AOR=2.02) also show higher odds of low-medium level of risky behaviour. However, the quality of the father-mother relationship and the importance of religion do not significantly affect low-medium level of risky behaviours. Having comorbidities (AOR=1.81) or a history of mental abuse (AOR=3.02) also seems to increase the odds of low-medium level risky behaviour. However, among family size (5-9 members) (AOR=0.39), 61% less likely risky behaviour than small family size (1-4 members). The

odds for high level of risky behaviour are significantly higher for older adolescents (AOR=2.65), males (AOR=2.75), and those who rate religion as unimportant (AOR=3.55). Those with larger families (more than ten members) (AOR=2.03) or lower academic grades (AOR=1.74), also, physical ailments (AOR=2.63) or mental abuse (AOR=3.85) strongly affect high level of risky behaviour. However, religious practice frequency does not significantly affect the odds of high level risky behaviour (Table 3). The model fit measures indicated that the goodness-of-fit of the model was statistically significant ($p < .001$) with Chi-square (df)=252.87(34), suggesting that the model significantly deviates from a null model. Several Pseudo R-squared values estimate the proportion of variance explained by the model. R² McFadden value was 0.10, indicating that the model explains approximately 10% of the variance in the outcome variable. The R² Cox & Snell was 0.06, suggesting that the model explains around 6% of the variance, and R² Nagelkerke was 0.13, indicating that the model explains approximately 13% of the variance. Overall these measures help to evaluate the model's goodness-of-fit and explanatory power.

DISCUSSION

Adolescents are known to engage in various risky behaviours, but the prevalence of each behaviour varies from study to study. There is no specific documented prevalence of risky behaviours as a combination of behaviours. Each study differs due to the range of risky behaviours of adolescents involved.²¹⁻²³ Our study found that adolescents were engaged in at least two risky behaviours on average. Ahmed et al.¹ report that adolescents who engage in risky behaviours are more likely to be involved in multiple risk behaviours.

Our analysis found that male adolescents were 2.75 times likely to engage in risky behaviours compared to female. Previous studies have shown that more male adolescents are involved in risky behaviours compared to female adolescents.^{24,25} This difference might be due to biological and social influences, where male adolescents perceive behaviours as less risky and take more risks than females.^{18,26} Another explanation might be that male adolescents

Table 3: Factors affecting adolescent risky behaviours: Multinomial logistic regression analysis

Predictors	Low-Medium(1-3)			High(≥4)		
	AOR	LL	UL	AOR	LL	UL
Intercept	-2.06***	0.08	0.22	-3.63***	0.01	0.05
Age in years						
15-19 – 10-14	1.52**	1.14	2.02	2.65***	1.91	3.68
Gender						
Male – Female	1.24	0.94	1.63	2.75***	2.02	3.75
Religious practice						
No & Never – Always	0.78	0.30	2.05	0.93	0.35	2.47
Rarely – Always	1.70*	1.01	2.84	2.14**	1.21	3.78
Occasionally – Always	1.56*	1.08	2.25	1.99**	1.31	3.01
Frequently – Always	1.23	0.84	1.79	1.73*	1.14	2.63
Importance of religion						
Not important – Important	1.54	0.54	4.40	3.55*	1.32	9.52
Father-mother relation						
Not good – Good	1.21	0.76	1.92	1.91**	1.20	3.02
Relation with parents						
Not good – Good	2.02*	1.07	3.83	1.86	0.97	3.56
Family size						
5-9 – 1-4	1.28	0.92	1.78	2.03***	1.38	3.00
≥10 – 1-4	0.39*	0.18	0.89	0.60	0.26	1.42
Academic grade						
Others – A and B	1.53**	1.14	2.04	1.74***	1.27	2.38
No. of friends						
11-50 – ≤10	1.02	0.69	1.49	0.84	0.55	1.26
>50 – ≤10	1.04	0.67	1.61	0.87	0.54	1.38
Many – ≤10	1.78**	1.20	2.63	1.33	0.88	2.01
Any physical ailments						
Yes – No	1.81*	1.10	2.96	2.63***	1.60	4.32
Mental abuse						
Yes – No	3.02**	1.37	6.62	3.85***	1.78	8.31

Reference category: No risky behaviour for the dependent variable

ℒ Reference category: for independent variables

* $p < .05$, ** $p < .01$, *** $p < .001$;

AOR = Adjusted Odds ratio, LL=Lower limit of 95% CI; UL=Upper limit of 95% CI

are more prone to aggressive and violent activities such as anti-social, criminal, and vehicle-related behaviours. This finding is consistent with a previous study.²⁵ Age and religion are significant predictors of adolescent risk-taking behaviour. Older adolescents were 2.65 times more likely to engage in risky behaviour. Male adolescents tend to perceive a higher level of risk linked with specific behaviours during their developmental stage, which tends to increase with age.²⁷ In contrast, older adolescents tend to be more inclined to engage in risky activities.⁵ Our analysis revealed that individuals who infrequently practised or did not consider religion important were more likely to engage in risky behaviour. Past studies reported that active religious practice and the perceived importance of religion are also associated with decreased risk behaviours.^{28, 29} However, risk-taking behaviour is a complex phenomenon influenced by various factors,

such as psychological, sociocultural, economic, and environmental factors.³⁰⁻³⁴ Our findings indicate that individuals lacking a robust bond with their parents (AOR=2.02) are more likely to engage in low-medium levels of risky behaviour. On the other hand, a strained relationship between parents can also influence these risky behaviours. This finding is consistent with past studies' findings.³⁵⁻³⁷ It is argued that if the parental relationship is poor, adolescents are more likely to engage in risky behaviours to escape the uncomfortable home environment.^{1, 2, 38} Our research shows that adolescents from families with 5–9 members have a 61% reduced likelihood of partaking in risky behaviour compared to those from smaller families with fewer than five members. Conversely, families with over ten members are twice as likely to engage in high levels of risky behaviour.

The relationship between family size and adolescents' propensity for risk-taking is multifaceted and influenced by various factors. Although some research suggests that having more siblings may increase the likelihood of risky behaviour due to peer influence, others emphasise the potential for greater parental supervision³⁹ and positive family dynamics to mitigate such behaviour.⁴⁰ It is crucial to consider the interplay of these factors and not attribute risk-taking solely to family size. Our analysis revealed that adolescents with lower academic grades are more likely to engage in high level of risky behaviour (AOR=1.74) and are 1.53 times more inclined to exhibit low-medium level of risky behaviour. This is consistent with previous studies.²⁵

This might be due to the fact that adolescents who perform well academically, have good school attendance and are not in romantic relationships are less likely to engage in risky behaviour. Peer relationships might also protect adolescents from risky behaviour. However, it depends on friendship quality.⁴¹ Friendship quality encompasses several dimensions, including companionship, intimacy, support, and conflict.⁴² Our analysis revealed that adolescents having multiple friends had engaged in risky behaviour. Understanding the complex relationship between these factors is pertinent for developing effective interventions to prevent adolescent risk behaviour.⁴³ Our study found that male adolescents

with comorbidity might exhibit higher level of risky behaviour than their healthy peers. This finding could be attributed to the complex medico social and environmental factors that impact adolescents' developmental stages.⁴⁴ Illness specific risk-taking and nonadherence to treatment might be interconnected⁴⁵, but this hypothesis needs to be explored through further research. Adolescent friendships tend to be more intimate and emotional, which could influence their involvement in risky behaviours. Female adolescents are more likely to experience mental abuse, and those with a history of abuse are more likely to engage in delinquent behaviour.⁴⁶ Our study indicates that mental abuse (AOR=3.85) significantly impacts high level of risky behaviour. These findings highlight the importance of addressing adolescents' challenges, especially those with health conditions or a history of abuse, in promoting positive behaviour and well-being.

STRENGTH AND LIMITATION

Even though this study was conducted on adolescents in Sarawak, the findings could be applied to the entire region since the participants were from diverse socio-economic backgrounds in both urban and rural areas, and the sample size was large. We employed multinomial logistic regression to understand how different predictors impact the likelihood of falling into a specific risk category of low-medium and high levels of risky behaviours compared with no risky behaviour group in accommodating both continuous and categorical 15 predictors. The study findings provide a foundation for identifying the factors contributing to multiple risk behaviours among adolescents.

This could be an aid in creating effective policies to reduce such behaviours. However, it is important to note that the study could serve as a guide and cannot confirm the exact factors that lead to risk behaviours. Furthermore, response and recall bias are possible since the study relied on self-reports from adolescents. We ensured anonymity, used clear and neutral questions, and shorter recall periods to minimise response and recall biases. Proper pilot testing of the study instruments also enhances the accuracy and reliability of responses. Despite these limitations, the

research offers valuable information to promote healthy behaviours among adolescents in Sarawak.

CONCLUSION

This study found that a significant number of adolescents engage in risky behaviours, with loitering being the most common. Risky behaviours were more common among males and older adolescents. Religious practice frequency did not significantly impact risky behaviours, but the importance of religion was associated with a higher likelihood of engaging in high level of risky behaviours. Family size, comorbidities, and history of mental abuse also influenced the odds of having low-medium level of risky behaviours. In conclusion, this study highlights the complexity of risky behaviours among adolescents. Several factors could influence whether or not an adolescent engages in risky behaviours, and these factors can vary depending on the type of risky behaviour.

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COMPETING INTERESTS

The study's authors have no financial or personal ties to organisations or individuals that could have influenced the study results. Additionally, the study was not funded by any organisation or individual that could have had a vested interest in the study's outcome.

REFERENCES

1. Ahmed S, Abu-Ras W, Arfken C. Prevalence of Risk Behaviors among U.S. Muslim College Students. *Journal of Muslim Mental Health*. 2014;8(1):5-19.<https://doi.org/10.3998/jmmh.10381607.0008.101>
2. Alhyas L, Al Ozaibi N, Elarabi H, et al. Adolescents' perception of substance use and factors influencing its use: a qualitative study in Abu Dhabi. *JRSM Open*. 2015;6(2):2054270414567167.<https://doi.org/10.1177/2054270414567167>
3. Centers for Disease Control and Prevention. Teen Drivers and Passengers: Get the Facts. Centers for Disease Control and Prevention, National Center for Injury Prevention and Control. Available at: https://www.cdc.gov/transportationsafety/teen_drivers/teendrivers_factsheet.html.
4. Balocchi E, Chiamenti G, Lamborghini A. Adolescents: which risks for their life and health? *J Prev Med Hyg*. 2013;54(4):191-194
5. Ajiuksmo CRP. Why Some Adolescents Engage in Risk-Taking Behavior *International Journal of Educational Psychology*. 2021;10(2):143-171.<https://doi.org/10.17583/ijep.2021.4258>
6. Sancu L, Webb M, Hocking J. Risk-taking behaviour in adolescents. *Australian Journal for General Practitioners*. 11/23 2018;47:829-834
7. Uddin R, Lee E-Y, Khan SR, Tremblay MS, Khan A. Clustering of lifestyle risk factors for non-communicable diseases in 304,779 adolescents from 89 countries: A global perspective. *Preventive Medicine*. 2020/02/01/ 2020;131:105955.<https://doi.org/https://doi.org/10.1016/j.ypmed.2019.105955>
8. Azmawati MN, Hazariah AHS, Shamsul AS, Norfazilah A, Azimatun NA, Rozita H. Risk taking behaviour among urban and rural adolescents in two selected districts in Malaysia. *South African Family Practice*. 2015/05/04 2015;57(3):160- 165.<https://doi.org/10.1080/20786190.2014.977048>
9. Swami PD, Sukla P, Kumar S. Prevalence of health risk behaviours among the school going adolescents of Gwalior township. *International Journal of Community Medicine and Public Health*. 11/27 2019;6(12):5129-5134.<https://doi.org/10.18203/2394-6040.ijcmph20195457>
10. Haegerich TM, Shults RA, Oman RF, Vesely SK. The Predictive Influence of Youth Assets on Drinking and Driving Behaviors in Adolescence and

- Young Adulthood. *J Prim Prev.* 2016;37(3):231-245.<https://doi.org/10.1007/s10935-016-0418-7>
11. Mahalik JR, Levine Coley R, McPherran Lombardi C, Doyle Lynch A, Markowitz AJ, Jaffee SR. Changes in health risk behaviors for males and females from early adolescence through early adulthood. *Health Psychol.* 2013;32(6):685- 694.<https://doi.org/10.1037/a0031658>
 12. Cheah YK, Lim HK, Kee CC. Personal and Family Factors Associated With High-risk Behaviours Among Adolescents in Malaysia. *J Pediatr Nurs.* Sep-Oct 2019;48:92- 97.<https://doi.org/10.1016/j.pedn.2019.07.012>
 13. Dellar RC, Dlamini S, Karim QA. Adolescent girls and young women: key populations for HIV epidemic control. *Journal of the International AIDS Society.* 2015;18(2(Suppl 1)):19408.<https://doi.org/10.7448/ias.18.2.19408>
 14. Johari MZ, Wee LH, Nudin SSaH, et al. High Risk Health Behavior among Malaysian Adolescents: A Comparison between Gender *Global Journal of Health Science.* 2020;12(11):152-165.<https://doi.org/10.5539/gjhs.v12n11p152>
 15. Kadir NByA, Johan D, Aun NSM, Ibrahim N, Nor HAM. The prevalence of depression and suicide attempts among adolescents in Malaysia. *Jurnal Psikologi Malaysia* 2018;32(4):150-158
 16. Lim KH, Lim HL, Teh CH, et al. Smoking among school-going adolescents in selected secondary schools in Peninsular Malaysia- findings from the Malaysian Adolescent Health Risk Behaviour (MyaHRB) study. *Tobacco Induced Diseases.* 2017/01/31 2017;15(1):9.<https://doi.org/10.1186/s12971-016-0108-5>
 17. Chan YY, Lim KH, Teh CH, et al. Prevalence and risk factors associated with suicidal ideation among adolescents in Malaysia. *International journal of adolescent medicine and health.* Vol 30; 2016:/j/ijamh.2018.2030.issue-2013/ijamh-2016-0053/ijamh 2201.<https://doi.org/10.1515/ijamh-2016-0053>
 18. Farid NDN, Yahya A, Al-Sadat N, et al. High-Risk Behavior Among Young Adolescents in The Central and Northern Region of Peninsular Malaysia: Baseline Data from The MyHeART Study. *Journal of Child and Family Studies.* 2016;25(11):3204-3213.<https://doi.org/10.1007/s10826-016-0494-6>
 19. Sales JM, Irwin CE. A Biopsychosocial Perspective of Adolescent Health and Disease. In: O'Donohue WT, Benuto LT, Woodward Tolle L, eds. *Handbook of Adolescent Health Psychology.* New York, NY: Springer New York; 2013:13-29.
 20. Center for Disease Control and Prevention. Youth Risk Behavior Surveillance System (YRBSS). Division of Adolescent and School Health, National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention. Available at: <https://www.cdc.gov/healthyyouth/data/yrbs/index.htm>, 2022.
 21. Center for Disease Control and Prevention. CDC releases 2019 Youth Risk Behavior Survey Results. Division of Adolescent and School Health, National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention. Available at: <https://www.cdc.gov/healthyyouth/data/yrbs/feature/index.htm>, 2022.
 22. Nagalingam S, Arumugam B, Krishnasamy S, Khanna R. Appraisal of risky behaviour of youth populace and ndash; a vulnerable venture. *International Journal of Community Medicine and Public Health.* 2016:1195-1199.<https://doi.org/10.18203/2394-6040.ijcmph20161383>
 23. Institute of Public Health Malaysia. National Health and Morbidity Survey (NHMS) 2019: Non-communicable diseases, healthcare demand, and health literacy—Key Findings. Kuala Lumpur: National Institutes of Health (NIH); 2022. Available at: www.iku.gov.my/nhms.
 24. Bányai F, Zsila Á, Király O, et al. Problematic Social Media Use: Results from a Large Scale Nationally Representative Adolescent Sample. *PLOS ONE.* 2017;12(International Journal of Sustainable Energy1):e0169839.<https://doi.org/10.1371/journal.pone.0169839>
 25. Thornberry TP, Krohn MD, Augustyn MB, Buchanan M, Greenman SJ. The impact of adolescent risk behavior on partner relationships. *Adv Life Course Res.* 2016;28:6- 21.<https://doi.org/10.1016/j.alcr.2015.04.002>
 26. Reniers RL, Murphy L, Lin A, Bartolomé SP, Wood SJ. Risk Perception and Risk-Taking Behaviour

- during Adolescence: The Influence of Personality and Gender. *PLOS ONE*. 2016;11(4):e0153842.<https://doi.org/10.1371/journal.pone.0153842>
27. Said MA, Almatar AA, Alibrahim MS. Higher Sedentary Behaviors and Lower Levels of Specific Knowledge Are Risk Factors for Physical Activity-Related Injuries in Saudi Adolescents. *Int J Environ Res Public Health*. Mar 5 2023;20(5).<https://doi.org/10.3390/ijerph20054610>
 28. Soleimani MA, Pahlevan Sharif S, Bahrami N, Yaghoobzadeh A, Allen KA, Mohammadi S. The relationship between anxiety, depression and risk behaviors in adolescents. *Int J Adolesc Med Health*. 2017;31(2).<https://doi.org/10.1515/ijamh-2016-0148>
 29. Mendolia S, Paloyo AR, Walker I. The Effect of Religiosity on Adolescent Risky Behaviors. Bonn: Institute of Labor Economics; 2018:38-19
 30. Shahrabi Farahani F, Khosrowabadi R, Jaafari G. Risk-taking Behavior Under the Effect of Emotional Stimuli Among Children and Adults. *Basic and Clinical Neuroscience Journal*. 2022;13(4):585-594.<https://doi.org/10.32598/bcn.2021.2508.1>
 31. De-Juan-Ripoll C, Chicchi Giglioli IA, Llanes-Jurado J, Marín-Morales J, Alcañiz M. Why Do We Take Risks? Perception of the Situation and Risk Proneness Predict Domain Specific Risk Taking. *Frontiers in Psychology*. 2021;12.<https://doi.org/10.3389/fpsyg.2021.562381>
 32. Saleme DM, Moustafa AA. Chapter 3 - The multifaceted nature of risk-taking in drug addiction. In: Moustafa AA, ed. *Cognitive, Clinical, and Neural Aspects of Drug Addiction*: Academic Press; 2020:41-60.
 33. Shang ESW, Lo ESK, Huang Z, Hung KKC, Chan EYY. Factors Associated with Urban Risk Taking Behaviour during 2018 Typhoon Mangkhut: A Cross Sectional Study. *International Journal of Environmental Research and Public Health*. 2020;17(11):4150.<https://doi.org/10.3390/ijerph17114150>
 34. Zinn JO. Key Characteristics of Risk-Taking. In: Zinn JO, ed. *Understanding Risk-Taking*. Cham: Springer International Publishing; 2020:89-143.
 35. Holmes C, Briant A, King-Casas B, Kim-Spoon J. How Is Religiousness Associated With Adolescent Risk-Taking? The Roles of Emotion Regulation and Executive Function. *J Res Adolesc*. 2019;29(2):334-344.<https://doi.org/10.1111/jora.12438>
 36. Perrotte JK, Shattuck EC, Daniels CL, Xu X, Sunil T. A latent profile analysis of the link between sociocultural factors and health-related risk-taking among U.S. adults. *BMC Public Health*. 2021;21(1):546.<https://doi.org/10.1186/s12889-021-10608-z>
 37. Pavlíček A, Bobenič Hintošová A, Sudzina F. Impact of Personality Traits and Demographic Factors on Risk Attitude. *SAGE Open*. 2021;11(4):21582440211066917.<https://doi.org/10.1177/21582440211066917>
 38. Piang TB, Osman ZJ, Mahadir NB. Structure or relationship? Rethinking family influences on juvenile delinquency in Malaysia. *Asia-Pacific Social Science Review*. 2017;17(2):171-184
 39. See SG. Parental Supervision and Adolescent Risky Behaviors. *Review of Economics of the Household*. 2014;14.<https://doi.org/10.1007/s11150-014-9254-9>
 40. Guassi Moreira JF, Telzer EH. Family conflict shapes how adolescents take risks when their family is affected. *Developmental Science*. 2018;21(4):e12611.<https://doi.org/10.1111/desc.12611>
 41. Stapley E. Peer influence and risk-taking behaviour during adolescence. 2018
 42. Moses JO, Villodas MT. The Potential Protective Role of Peer Relationships on School Engagement in At-Risk Adolescents. *J Youth Adolesc*. 2017;46(11):2255-2272.<https://doi.org/10.1007/s10964-017-0644-1>
 43. Telzer EH, Fuligni AJ, Lieberman MD, Miernicki ME, Galván A. The quality of adolescents' peer relationships modulates neural sensitivity to risk taking. *Soc Cogn Affect Neurosci*. 2015;10(3):389-398.<https://doi.org/10.1093/scan/nsu064>
 44. Rosalba M, Sara P, Matteo D, Juri N, Alberto B. Vulnerability and Social Exclusion: Risk in Adolescence and Old Age. In: Rosalba M, Sara P, eds. *The New Forms of Social Exclusion*. Rijeka: IntechOpen; 2019.
 45. Wasserman R, Anderson BJ, Schwartz DD. Illness-Specific Risk-Taking in Adolescence: A Missing Piece of the Nonadherence Puzzle for Youth With

Type 1 Diabetes? *Diabetes Spectr.* 2017;30(1):3-10.<https://doi.org/10.2337/ds15-0060>

46. Asscher JJ, Van der Put CE, Stams GJ. Gender Differences in the Impact of Abuse and Neglect Victimization on Adolescent Offending Behavior. *J Fam Violence.* 2015;30(2):215-225.<https://doi.org/10.1007/s10896-014-9668-4>