

Co-occurrence of health risk behaviors and associated factors among adolescent students: Findings from a cross-sectional study in Bangladesh

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Research Article

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Abstract

Aim: This study aimed to determine the prevalence and associated factors of co-occurring health risk behaviors among Bangladeshi adolescents.

Subject and Methods: A cross-sectional study involving 637 adolescent students in three high schools and three colleges in Dhaka city, Bangladesh, was conducted from November 2019-February 2020. Participants were selected using a multistage sampling technique. A self-administered questionnaire was used to collect data and statistical package for social sciences, version 22.0 was used to perform data analysis.

Results: The participants comprised of 57.1% male, and their mean age was 15.65 ± 1.58 years. Among the participants, 2.4 % (n=15) reported one health risk behavior, while 0.3 % (n = 2) reported no risk behaviors. The prevalence of co-occurring health risk behaviors among the participants was 26.4%. Logistic regression analysis showed that co-occurrence of health risk behaviors was associated with participants aged with 17-18 years (OR = 3.11; 95% CI = 1.95-4.95, $p < .001$), college students (OR = 2.74, 95% CI = 1.90-3.94, $p < .001$), participants having secondary level of fathers' education (OR=2.63; 95% CI=1.68-4.09, $p < .001$), participants having secondary level of mothers' education (OR = 1.84; 95% CI = 1.12-3.02, $p = .015$), living apart form family (OR = 2.22; 95% CI = 1.37-3.59, $p = .001$), poor academic performance (OR=2.06; 95% CI = 1.26-3.36, $p = .004$), and reporting truancy (OR = 1.81; 95% CI = 1.20-2.72, $p = .005$).

Conclusion: The findings emphasize the need for effective interventions to prevent risk behavior practices among adolescents.

Introduction

During the last few decades, health risk behaviors have emerged as major determinants of premature and preventable mortality and morbidity among adolescents (Ford et al., 2011; Selivanova & Cramm, 2014). A health risk behavior is characterized as an activity conducted by an individual with a frequency or intensity that raises the risk of disease or injury, whether or not the individual is conscious of the harm (Steptoe, 2000). These behaviors include poor dietary intakes, physical inactivity and sedentary behavior, substance abuse (smoking, alcohol, and drugs), unsafe sexual activities, and reckless driving (Selivanova & Cramm, 2014). Several of them, such as reckless driving, unsafe sexual activity, and tobacco or alcohol use, can contribute to leading causes of death and morbidity (McPherson et al., 2013; Spengler et al., 2014). In addition, poor dietary intakes, smoking, alcohol use, physical inactivity, and sedentary lifestyles result in non-communicable disease outcomes such as cardiovascular disease, type 2 diabetes, and other illnesses (Ezzati & Riboli, 2013; Mewton et al., 2019).

Adolescents are generally considered healthy. According to the World Health Organization (WHO), about 1.1 million adolescents aged 10–19 died in 2016 and more than half of these deaths occurred in low- and middle-income African and Southeast Asian countries, mostly due to preventable risk behaviors (WHO,

2018a). Evidence suggest that risk behaviors appear to be clustered among adolescents (Sychareun et al., 2011). Risk behaviors such as poor dietary consumptions, low level of physical activity, sedentary behaviors, smoking, and alcohol consumption are commonly co-occurring among adolescents (Kipping et al., 2012; Hale & Viner, 2016; Leão et al., 2017).

Adolescents between the ages of 10 and 19 constitute 22% of the overall population in Bangladesh (Worldometer, 2020). Although adolescents are usually considered to be healthy, during this period morbidity and mortality may occur, often due to health risk behaviors. Bangladesh has a dearth of data on adolescent risk behaviors. Moreover, previous research almost exclusively focused on single risk behaviors, like physical inactivity (Khan et al., 2017), sedentary behaviors (Khan & Burton, 2016), tobacco use (Islam et al., 2016). However, adolescents demonstrate concurrent numerous risk behaviors that are inadequately understood, particularly from a Bangladeshi viewpoint. Therefore, the present study aimed to investigate the prevalence and associated factors of co-occurring health risk behaviors among Bangladeshi adolescents.

Methods And Materials

Study design and sampling

A cross-sectional study was carried out with adolescent students between November 2019 and February 2020, using a self-administered questionnaire. It was conducted in Dhaka, the capital city of Bangladesh, and also has the largest concentration of educational institutions. Inclusion criteria were (a) being a student of 8th to 12th grade of the chosen educational units; (b) having adolescent age range; (c) having willingness to participate in the study; and (d) being present in the classroom on data collection day.

A multi-stage sampling technique was employed to draw the sample from selected high schools and colleges located in Dhaka city. Initially, three high schools and three colleges were conveniently selected. Each grade level in the selected schools and colleges is subdivided into several sections based on the school/college standards. Then, two sections were selected randomly for each grade level from those available in high schools and colleges. A total of 32 sections was selected. All students enrolled in the selected sections were welcome to participate. The number of students in each section varies by school and college. The survey questionnaire was distributed to 713 students, 681 of whom responded, resulting in a 95.5 percent response rate. Incomplete surveys (n = 44) were removed, remaining data on 637 participants for the final analysis.

Measures

Socio-demographic information

Participants were asked to report their age, sex, academic level, father's education level, father's occupation, mother's education level, mother's occupation, monthly family income, family size, living with

whom and religious status. The study divided participants into three age groups: 13–14, 15–16, and 17–18. Monthly household income was divided into four categories: <30,000 Bangladeshi Taka (BDT), 50,000-100,000 BDT, and 100,000 BDT or above. Family size was divided into three categories: 1–4, 5–8, and > 8.

Health-related behaviors

The present study investigated dietary behaviors (breakfast, vegetables, and fruits intakes), physical activity, screen-based sedentary behavior (screen time), sleep risk behavior, and substance use (i.e., smoking, marijuana, alcohol). Health-related behaviors (excluding substance use) were recorded for 7 days to reduce memory recall bias.

Dietary behaviors

Dietary behaviors were assessed in three domains: breakfast intake, vegetables intake, and fruits intake. Breakfast intake was assessed by asking the question, “During the past 7 days, did you take your breakfast daily?” with responses: 1= yes and 2= no. Skipping breakfast was defined missing breakfast at least one day before seven days of the survey. Vegetable intake was assessed by the question, “During the past 7 days, how many times per day did you usually eat vegetables?” and fruits intake by the question, “During the past 7 days, how many times per day did you usually eat fruits?”. Inadequate vegetables intake was defined as having <3 times/day and inadequate fruits intake was defined as having <2 times/day (El-ammari et al., 2019; Ziaei et al., 2019).

Physical activity and Screen-based sedentary behavior

The present study measured leisure time physical activity by asking, “During the past 7 days, on how many days were you physically active (moderate to vigorous-intensity physical activity) for a total of at least 60 minutes per day?” and allowed response options: 1 = 0 days to 8 = 7 days. Insufficient physical activity was defined as “less than the WHO recommended of 60 minutes of moderate to vigorous physical activity per day.” (WHO, 2018d). Screen-based sedentary behavior was defined as spending 2 or more hours of screen-related activities each day while not in school/college or doing homework (Al-haifi et al., 2016).

Sleep risk behavior

The participants were asked to report their sleep and waking times for the last seven days, divided into weekdays and weekends. Sleep duration was estimated by subtracting sleep onset from wakeup (Min et al., 2018). Combining weekday and weekend sleep durations with weights of 6/7 and 1/7 yielded the mean daily sleep duration. Sleep risk was defined as less than 7 hours per day or more than 11 hours per day on average (Mewton et al., 2019).

Substance use

Participants were asked “During the past 7 days, how many cigarettes did you smoke per day?” Currently smoking was defined as smoking ≥ 1 cigarettes per day. Participants were asked if they had ever used marijuana or alcohol. Both questions had the response options: 1 = yes, 2 = no.

Academic performance and truancy

Academic performance was evaluated by the last exam results and classified as follows: good (GPA 4.50-5), medium (GPA 3.50-4.50), and bad (GPA 3.5). Truancy was measured by ‘In the previous 30 days, how many days did you miss school/college without permission (from parents or teachers)?’ and defined as having 3 or more days of unexcused absences from school/college.

Co-occurring health risk behaviors

In the present study, co-occurring health risk behaviors were defined as five or more risk behaviors.

Data analysis

Data were analyzed using the Statistical Package for the Social Sciences (SPSS) software for windows, version 22.0 (IBM SPSS Statistics, New York, United States). Data analysis involved descriptive statistics as well as inferential statistics. Descriptive analysis like frequency, percentage, mean and standard deviation was carried out. The information was presented using frequency tables and figures. Chi-square test (χ^2) was used to compare the differences between groups. The logistic regression analysis was performed to determine the factors predicting co-occurring health risk behaviors and reported as an odds ratio (OR) with 95% confidence interval (CI), and the directions of relationship among all examined health risk behaviors were investigated applying Pearson correlation analyses. The association of variables was considered statistically significant if the p-value was less than or equal to 0.05.

Results

Descriptive statistics of study participants

The mean (\pm SD) age of the total participants was 15.65 ± 1.58 years with the range of 13–18 years. Of the total, 57.1% ($n = 364$) were males and 42.9% ($n = 273$) were females. Regarding academic level of participants, a majority i.e., 57.5% ($n = 366$) were high school students (8–10 grades), while 42.5% ($n = 272$) were college students (11–12 grades). The details of the descriptive statistics were shown in Table 1.

Table 1
Co-occurring health risk behaviors according to participants' characteristics

Characteristics	Total (%)	Co-occurrence of HRBs		χ^2	p-value
		No (%)	Yes (%)		
Gender					
Male	364 (57.1)	261 (71.7)	103 (28.3)	1.618	0.203
Female	273 (42.9)	208 (76.2)	65 (23.8)		
Academic level					
High school	366 (57.5)	300 (82.0)	66 (18.0)	30.822	< 0.001
College	271 (42.5)	169 (62.4)	102 (37.6)		
Father's education level					
Primary	66 (10.4)	46 (69.7)	20 (30.3)	19.380	< 0.001
Secondary	143 (22.4)	87 (60.8)	56 (39.2)		
Higher secondary	138 (21.7)	103 (74.6)	35 (25.4)		
Graduate or higher	290 (45.5)	233 (80.3)	57 (19.7)		
Father's occupation					
Farmer	39 (6.1)	25 (64.1)	14 (35.9)	5.564	0.135
Govt./private employee	276 (43.3)	215 (77.9)	61 (22.1)		
Business	300 (47.1)	214 (71.3)	86 (28.7)		
No work	22 (3.5)	15 (68.2)	7 (31.8)		
Mother's education level					
Primary	115 (18.1)	83 (72.2)	32 (27.8)	6.159	0.104
Secondary	211 (33.1)	147 (69.7)	64 (30.3)		
Higher secondary	154 (24.2)	112 (72.7)	42 (27.3)		
Graduate or higher	157 (24.6)	127 (80.9)	30 (19.1)		
Mother's occupation					
Housewife	543 (85.2)	395 (72.7)	148 (27.3)	1.475	0.225
Employed	94 (14.8)	74 (78.7)	20 (21.3)		
Monthly family income (BDT)					
<i>Note: Co-occurring health risk behaviors defined as five or more risk behaviors</i>					

Characteristics	Total (%)	Co-occurrence of HRBs		χ^2	p-value
		No (%)	Yes (%)		
< 30,000	252 (39.6)	186 (73.8)	66 (26.2)	3.285	0.350
30,000 - <50,000	117 (18.4)	88 (75.2)	29 (24.8)		
50,000 - <100,000	161 (25.3)	111 (68.9)	50 (31.1)		
\geq 100,000	107 (16.8)	84 (78.5)	23 (21.5)		
Living with whom					
With family	555 (87.1)	421 (75.9)	134 (24.1)	11.036	0.001
Apart from family	82 (12.9)	48 (58.5)	34 (41.5)		
Academic performance					
Poor	216 (3.9)	146 (67.6)	70 (32.4)	8.686	0.013
Medium	262 (41.1)	194 (74.0)	68 (26.0)		
Good	159 (25)	129 (81.1)	30 (18.9)		
Truancy					
No	540 (79.1)	384 (76.2)	120 (23.8)	8.173	0.004
Yes	133 (20.9)	85 (63.9)	48 (36.1)		
<i>Note: Co-occurring health risk behaviors defined as five or more risk behaviors</i>					

[Table 1 right here]

Prevalence of health risk behaviors

As regards specific health risk behaviors, Fig. 1 shows the evolution of percentages for each risk behavior. Nearly half of the participants (n = 47.3%) reported to skip their breakfast. Inadequate vegetables and fruits intake were reported by 67.5% (n = 430) and 85.7% (n = 546) participants, respectively. Around 65% (n = 415) of participants had insufficient physical activity level. Sleep risk behavior (i.e., sleep duration < 7 hours or > 11 hours/day) was reported by 26.4% (n = 168) participants and screen-time exposure > 2 hours/day was reported by 41.4% (n = 264). Around 10% (n = 63) reported currently smoking. Some of participants, 6.9% and 12.9%, respectively had ever used marijuana and alcohol.

[Figure 1 right here]

Prevalence of co-occurring health risk behaviors

The prevalence of co-occurring health risk behaviors investigated in this study is shown in Fig. 2. Among the participants, 0.3% (n = 2) did not have any health risk behaviors, while 2.4% (n = 15) had only one. About 12% (n = 74) of participants reported two risk behaviors, and 27.3% (n = 174) reported three risk behaviors occurring at a time. More than 26% had five or more co-occurring health risk behaviors.

[Figure 2 right here]

Correlation between health risk behaviors

Table 2 shows the degree of association among the health risks behaviors investigated in this study. The skipping breakfast was significantly and positively associated with inadequate vegetable intake ($r = .120$, $p < .01$) and life-time alcohol use ($r = .106$, $p < .01$), but negatively associated with > 2 hours/day screen time ($r = -.123$, $p < .01$). Inadequate vegetable intake was significantly and positively associated with inadequate fruits intake ($r = .129$, $p < .01$). Inadequate fruits intake habit was significantly and negatively associated with currently smoking ($r = -.105$, $p < .01$) and life-time alcohol use ($r = -.098$, $p < .05$). >2 hours/day screen time had a negative correlation with currently smoking ($r = -.159$, $p < 0.01$), life-time alcohol use ($r = -.162$, $p < .01$) and life-time marijuana use ($r = -.162$, $p < .01$). Sleep risk was positively associated with life-time marijuana use ($r = .090$, $p < .05$). Currently smoking was significantly and positively associated with life-time alcohol use ($r = .454$, $p < .01$) and life-time marijuana use ($r = .366$, $p < 0.01$). The life-time alcohol use was significantly and positively associated with life-time marijuana use ($r = .450$, $p < .01$).

Table 2
Correlations between health risk behaviors

Health risk behaviors	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) Skipping breakfast	1								
(2) Inadequate vegetables intake	.120**	1							
(3) Inadequate fruits intake	.000	.129**	1						
(4) Insufficient PA	.046	.069	-.044	1					
(5) > 2 hours/day screen time	-.123**	-.060	-.016	-.074	1				
(6) Sleep risk	.054	-.034	.051	-.063	-.024	1			
(7) Currently smoking	.076	.017	-.105**	.077	-.159**	.052	1		
(8) Life-time alcohol use	.106**	.036	-.098*	-.014	-.162**	-.007	.454**	1	.
(9) Life-time marijuana use	.027	.070	-.013	-.035	-.135**	.090*	.366**	.450**	1
<i>** Correlation is significant at the 0.01 level (2-tailed).</i>									
<i>*Correlation is significant at the 0.05 level (2-tailed).</i>									

[Table 2 right here]

Associations with the co-occurring health risk behaviors

The proportion of co-occurring of health risk behaviors was significantly higher among (♂) participants from college vs. high school (37.6% vs. 18.0%, $p < .001$), (♂) participants having fathers' education level primary vs. graduate or higher (30.3% vs. 19.7%, $p < .001$), (♂) participants living without vs. with family (41.5% vs. 24.1%, $p = .001$), (♂) participants those academic performance poor vs. good (32.4% vs. 18.9%, $p = .013$), and (v) participants reporting truancy vs. no truancy (36.1% vs. 23.8%, $p = .004$). (Table 1)

Predictors of co-occurring health risk behaviors

Table 3 shows the results of an ordinal logistic regression analysis used to determine the factors that predict co-occurring health risk behaviors among the participants. College students were found to be 2.74 times more likely than high school students to have co-occurring health risk behaviors (OR = 2.743, 95%

CI = 1.909–3.942, $p < 0.001$). Additional factors that significantly influence the co-occurring health risk behaviors includes: having secondary level of fathers' education (OR = 2.63; 95% CI = 1.689–4.099, $p < 0.001$), having secondary level of mothers' education (OR = 1.843; 95% CI = 1.124–3.022, $p = 0.015$), living apart form family (OR = 2.225; 95% CI = 1.376–3.598, $p = 0.001$), poor academic performance (OR = 2.06; 95% CI = 1.264–3.362, $p = 0.004$), and reporting truancy (OR = 1.81; 95% CI = 1.201–2.720, $p = 0.005$).

Table 3

Logistic regression analysis of factors influencing participants' co-occurring health behaviors

Characteristics	B	S.E	OR	95% CI	p-value
Sex					
Male	0.233	0.184	1.26	(0.88–1.81)	0.204
Female	Ref.				
Academic level					
High school	Ref.				
College	1.009	0.185	2.74	(1.90–3.94)	< 0.001
Father's education level					
Primary	0.575	0.306	1.77	(0.97–3.23)	0.060
Secondary	0.967	0.226	2.63	(1.68–4.09)	< 0.001
Higher secondary	0.329	0.245	1.38	(0.85–2.24)	0.180
Graduate or higher	Ref.				
Father's occupation					
Farmer	0.182	0.567	1.20	(0.39–3.64)	0.748
Government/private	-0.498	0.480	0.60	(0.23–1.55)	0.300
Business	-0.149	0.475	0.86	(0.33–2.18)	0.753
No work	Ref.				
Mother's education level					
Primary	0.490	0.291	1.63	(0.92–2.88)	0.092
Secondary	0.611	0.252	1.84	(1.12–3.02)	0.015
Higher secondary	0.462	0.272	1.58	(0.93–2.70)	0.089
Graduate or higher	Ref.				
Mother's occupation					
Housewife	0.327	0.270	1.38	(0.81–2.35)	0.226
Employed	Ref.				
Monthly family income (BDT)					
< 30,000	0.259	0.276	1.29	(0.75–2.22)	0.347

Note. B = Regression coefficient; S.E. = Standard Error; OR = Odds Ratio (OR); CI = Confidence Interval.

Characteristics	B	S.E	OR	95% CI	p-value
300,00 - <50,000	0.185	0.318	1.20	(0.64–2.24)	0.560
50,000 - <1,00,000	0.498	0.291	1.64	(0.93–2.90)	0.087
≥ 1,00,000	Ref.				
Living with whom					
With family	Ref.				
Apart from family	0.800	0.245	2.22	(1.37–3.59)	0.001
Academic performance					
Poor	0.724	0.249	2.06	(1.26–3.36)	0.004
Medium	0.410	0.247	1.50	(0.92–2.44)	0.097
Good	Ref.				
Truancy					
No	Ref.				
Yes	0.592	0.209	1.80	(1.20–2.72)	0.005
<i>Note. B = Regression coefficient; S.E. =Standard Error; OR = Odds Ratio (OR); CI = Confidence Interval.</i>					

[Table 3 right here]

Discussion

Adolescence is a transition period and during this period, people may engage in behaviors that are harmful to their health. In this study, 0.3% of study participants reported no health risk behavior. The study further showed that nearly 26% of participants reported five or more health risk behaviors occurring at a time. According to a study of Brazilian high school students (14–19 years old), about 10% of participants did not engage in any health risk behaviors, while 58.5% reported they were exposed to at least two risk behaviors at the same time (Brito, Hardman & De Barros, 2015). The Australian Child and Adolescent Survey on Mental Health and Wellbeing reported that about 32.0% of adolescents (13–17 years old) in Australia had one or more of behaviors (Mewton et al., 2019). According to studies, adolescents engage in health-risk behaviors as a result of peer pressure and curiosity (Mewton et al., 2019; Spengler et al., 2014). The findings of this study suggest to take appropriate steps to promote healthy behaviors among this vulnerable group. Parental monitoring is effective in reducing the risk behavior practices among adolescents (Yu et al., 2006). A number of studies have showed that parental monitoring can help reduce risk behaviors practices among adolescents (Hindelang et al., 2001; Kipping et al., 2012; Yu et al., 2006).

The findings of this study revealed that college students were more likely than high school students to have co-occurring health risk behaviors. College students are more aged than high school students and previous research has found that as individuals age, they are more likely to engage in risky behaviors (Leão et al., 2017; Hale & Viner, 2016). Among the reasons for older adolescents were more likely to engage multiple health risk behaviors, it can highlight curiosity, freedom, being close to peers and friends, participating in festive celebrations and going to friends' houses (de Moura et al., 2018; Garrido, Weiler & Taussig, 2018).

This study further revealed significant association between father's education level and participant's co-occurring of health risk behaviors. It is expected that educated parents would be more conscious of their sons/ daughters and thus will track them so that they would not be able to take health risk behaviors. Educated parents can also encourage them to develop healthier behaviors. In this study, participants who lived apart from their families were more likely than those who lived with their families to have co-occurring health risk behaviors. It could be due to a lack of parental supervision.

Engagement in health risk behaviors results in poor academic outcomes. Adolescents who participate in less risk behaviors achieve more success later in life, and those who practice healthy behaviors earlier in life can continue to do so throughout their lives (Bradley & Greene, 2013). Several studies have found association between academic performance (letter grades, exam scores, or other indicators of student achievement) and health risk behaviors (Busch et al., 2014; Rasberry et al., 2017; Wald et al., 2014). The findings of this study revealed a significant link between academic performance and co-occurring health risk behavior, as well as a link between truancy and co-occurring health risk behavior, implying that teachers and public health educators will benefit from each other's academic and health improvement goals. Collaboration between teachers and public health educators could help students achieve better educational and health outcomes.

Limitations

This study has several limitations that should be taken into account when comparing the results or generalizing the findings to other fields. The study is cross-sectional and does not allow the causality of any of the factors involved to be established. The participants came from urban areas and were students at selected high schools and colleges in the city of Dhaka. They may not be representative of those from other urban centers, non-urban areas or adolescents who do not attend school or college. The study used an anonymous, self-directed questionnaire, and compared to face-to-face interviews, self-reporting has limitations, including multiple biases (e.g., social desirability, memory recall, etc.). In addition, another important risk behavior, sexual risk behaviors cannot be investigated in the present study due to the social taboo and objections of the respected authorities.

Conclusions

It can be concluded that a sizable proportion of adolescents reported co-occurring health risk behaviors in Dhaka city of Bangladesh. The findings emphasize the need for effective interventions to prevent risk

behavior practices among adolescents. Efforts should be made to to create awareness among adolescents, parents and teachers about risk behavior practices by public health bodies. This needs to be implemented in order to bring the prevalence of risk behaviors down to an acceptable level.

Declarations

Funding

We received no specific grant from any funding source for conducting this study.

Ethical approval

This study involving human participants followed the 1964 Helsinki declaration and its later amendments. The Biosafety, Biosecurity, and Ethical Clearance Committee of Faculty of Biological Sciences, Jahangirnagar University, Savar, Dhaka-1342, Bangladesh approved the study protocol [BBEC, JU/M2019 (12)3].

Informed consent

All participants gave their informed consent to participate in the study.

Consent for publication

Not applicable

Conflicts of interest

The authors declare no conflict of interest.

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References

1. Al-haifi, A. A., Almajed, H. T., Al-hazaa, H. M., Musaiger, A. O., Arab, M. A., & Hasan, R. A. (2016). *Relative Contribution of Obesity, Sedentary Behaviors and Dietary Habits to Sleep Duration Among Kuwaiti Adolescents*. *8*(1), 107–117. <https://doi.org/10.5539/gjhs.v8n1p107>
2. Bradley, B. J., & Greene, A. C. (2013). Do health and education agencies in the United States share responsibility for academic achievement and health? A review of 25 years of evidence about the relationship of adolescents' academic achievement and health behaviors. *Journal of Adolescent Health, 52*(5), 523–532. <https://doi.org/10.1016/j.jadohealth.2013.01.008>

3. Brito, A. L. D. S., Hardman, C. M., & De Barros, M. V. G. (2015). Prevalence and factors associated with the co-occurrence of health risk behaviors in adolescents. *Revista Paulista de Pediatria*, *33*(4), 423–430. <https://doi.org/10.1016/j.rppede.2015.08.011>
4. Busch, V., Loyen, A., Lodder, M., Schrijvers, A. J. P., van Yperen, T. A., & de Leeuw, J. R. J. (2014). The effects of adolescent health-related behavior on academic performance: A systematic review of the longitudinal evidence. *Review of Educational Research*, *84*(2), 245–274. <https://doi.org/10.3102/0034654313518441>
5. De Moura, L. R., Torres, L. M., Cadete, M. M. M., & de Freitas Cunha, C. (2018). Factors associated with health risk behaviors among Brazilian adolescents. *Revista Da Escola de Enfermagem Da USP*, *52*, e03304–e03304.
6. El-ammari, A., Kazdouh, H. El, Bouftini, S., Fakir, S. El, & Achhab, Y. El. (2019). Social-ecological influences on unhealthy dietary behaviours among Moroccan adolescents: a mixed-methods study. *Public Health Nutrition*, *7*, 1–13. <https://doi.org/10.1017/S1368980019003641>
7. Ezzati, M., & Riboli, E. (2013). Behavioral and dietary risk factors for noncommunicable diseases. *New England Journal of Medicine*, *369*(10), 954–964. <https://doi.org/10.1056/NEJMra1203528>
8. Ford, E. S., Zhao, G., Tsai, J., & Li, C. (2011). Low-risk lifestyle behaviors and all-cause mortality: findings from the National Health and Nutrition Examination Survey III Mortality Study. *American Journal of Public Health*, *101*(10), 1922–1929. <https://doi.org/10.2105/AJPH.2011.300167>
9. Garrido, E. F., Weiler, L. M., & Taussig, H. N. (2018). Adverse childhood experiences and health-risk behaviors in vulnerable early adolescents. *The Journal of Early Adolescence*, *38*(5), 661–680.
10. Hale, D. R., & Viner, R. M. (2016). The correlates and course of multiple health risk behaviour in adolescence. *BMC Public Health*, 1–12. <https://doi.org/10.1186/s12889-016-3120-z>
11. Hindelang, R. L., Dwyer, W. O., & Leeming, F. C. (2001). Adolescent risk-taking behavior: A review of the role of parental involvement. *Current Problems in Pediatrics*, *31*(3), 67–83.
12. Islam, S. M. S., Mainuddin, A. K. M., & Chowdhury, K. N. (2016). Prevalence of tobacco use and its contributing factors among adolescents in Bangladesh. *Heart India*, *4*(3), 85.
13. Khan, A., Burton, N. W., & Trost, S. G. (2017). Patterns and correlates of physical activity in adolescents in Dhaka city, Bangladesh. *Public Health*, *145*, 75–82. <https://doi.org/10.1016/j.puhe.2016.12.011>
14. Khan, Asaduzzaman, & Burton, N. W. (2016). Screen-based behaviours of adolescents in Bangladesh. *Journal of Physical Activity & Health*, *13*(11), 1156–1163. <https://doi.org/http://dx.doi.org/10.1123/jpah.2015-0514>
15. Kipping, R. R., Campbell, R. M., MacArthur, G. J., Gunnell, D. J., & Hickman, M. (2012). Multiple risk behaviour in adolescence. *Journal of Public Health*, *34*(suppl_1), i1–i2. <https://doi.org/10.1093/pubmed/fdr122>
16. Leão, A. S., Michelle, N., Soares, M., Cristina, E., Gonçalves, D. A., Augusto, D., Silva, S., Jerônimo, R., & Thomazzi, S. M. (2017). *Simultaneous Health Risk Behaviors in Adolescents Associated with Higher Economic Class in the Northeast of Brazil*. 2017, 1–8. <https://doi.org/10.1155/2017/3587567>

17. McPherson, K. E., Kerr, S., Morgan, A., McGee, E., Cheater, F. M., McLean, J., & Egan, J. (2013). The association between family and community social capital and health risk behaviours in young people: An integrative review. *BMC Public Health*, *13*(1), 1–13. <https://doi.org/10.1186/1471-2458-13-971>
18. Mewton, L., Champion, K., Kay-Lambkin, F., Sunderland, M., Thornton, L., & Teesson, M. (2019). Lifestyle risk indices in adolescence and their relationships to adolescent disease burden: Findings from an Australian national survey. *BMC Public Health*, *19*(1), 1–10. <https://doi.org/10.1186/s12889-019-6396-y>
19. Min, C., Kim, H.-J., Park, I.-S., Park, B., Kim, J.-H., Sim, S., & Choi, H. G. (2018). The association between sleep duration, sleep quality, and food consumption in adolescents: A cross-sectional study using the Korea Youth Risk Behavior Web-based Survey. *BMJ Open*, *8*(7). <https://doi.org/10.1136/bmjopen-2018-02284>
20. Rasberry, C. N., Tiu, G. F., Kann, L., McManus, T., Michael, S. L., Merlo, C. L., Lee, S. M., Bohm, M. K., Annor, F., & Ethier, K. A. (2017). Health-related behaviors and academic achievement among high school students—United States, 2015. *MMWR. Morbidity and Mortality Weekly Report*, *66*(35), 921–927.
21. Selivanova, A., & Cramm, J. M. (2014). The relationship between healthy behaviors and health outcomes among older adults in Russia. *BMC Public Health*, *14*. <https://doi.org/10.1186/1471-2458-14-1183>
22. Spengler, S., Mess, F., Schmocker, E., & Woll, A. (2014). Longitudinal associations of health-related behavior patterns in adolescence with change of weight status and self-rated health over a period of 6 years: Results of the MoMo longitudinal study. *BMC Pediatrics*, *14*(1), 1–11. <https://doi.org/10.1186/1471-2431-14-242>
23. Steptoe, A. (2000). Health behavior and stress. *Encyclopedia of Stress*, *2*, 322–326. <https://doi.org/10.1016/B978-012373947-6.00186-0>
24. Sychareun, V., Thomsen, S., & Faxelid, E. (2011). Concurrent multiple health risk behaviors among adolescents in Luangnamtha province, Lao PDR. *BMC Public Health*, *11*, 1–10. <https://doi.org/10.1186/1471-2458-11-36>
25. Wald, A., Muennig, P. A., O’Connell, K. A., & Garber, C. E. (2014). Associations between healthy lifestyle behaviors and academic performance in US undergraduates: a secondary analysis of the American College Health Association’s National College Health Assessment II. *American Journal of Health Promotion*, *28*(5), 298–305.
26. World Health Organization (WHO). (2018a). *Adolescents: health risks and solutions*. <https://www.who.int/news-room/fact-sheets/detail/adolescents-health-risks-and-solutions>
27. World Health Organization (WHO). (2018b). *Physical activity*. https://www.who.int/health-topics/physical-activity#tab=tab_1
28. Worldometer. (2020). *Bangladesh Population*. <https://www.worldometers.info/world-population/bangladesh-population/>

29. Yu, S., Clemens, R., Yang, H., Li, X., Stanton, B., Deveaux, L., Lunn, S., Cottrell, L., & Harris, C. (2006). Youth and parental perceptions of parental monitoring and parent-adolescent communication, youth depression, and youth risk behaviors. *Social Behavior and Personality: An International Journal*, 34(10), 1297–1310.
30. Ziaei, R., Shahi, H., Dastgiri, S., Mohammadi, R., & Viitasara, E. (2020). Fruit and vegetable intake and its correlates among high-school adolescents in Iran: A cross-sectional study. *Journal of Public Health: From Theory to Practice*, 28, 711–718. <https://doi.org/doi.org/10.1007/s10389-019-01084-2>

Figures

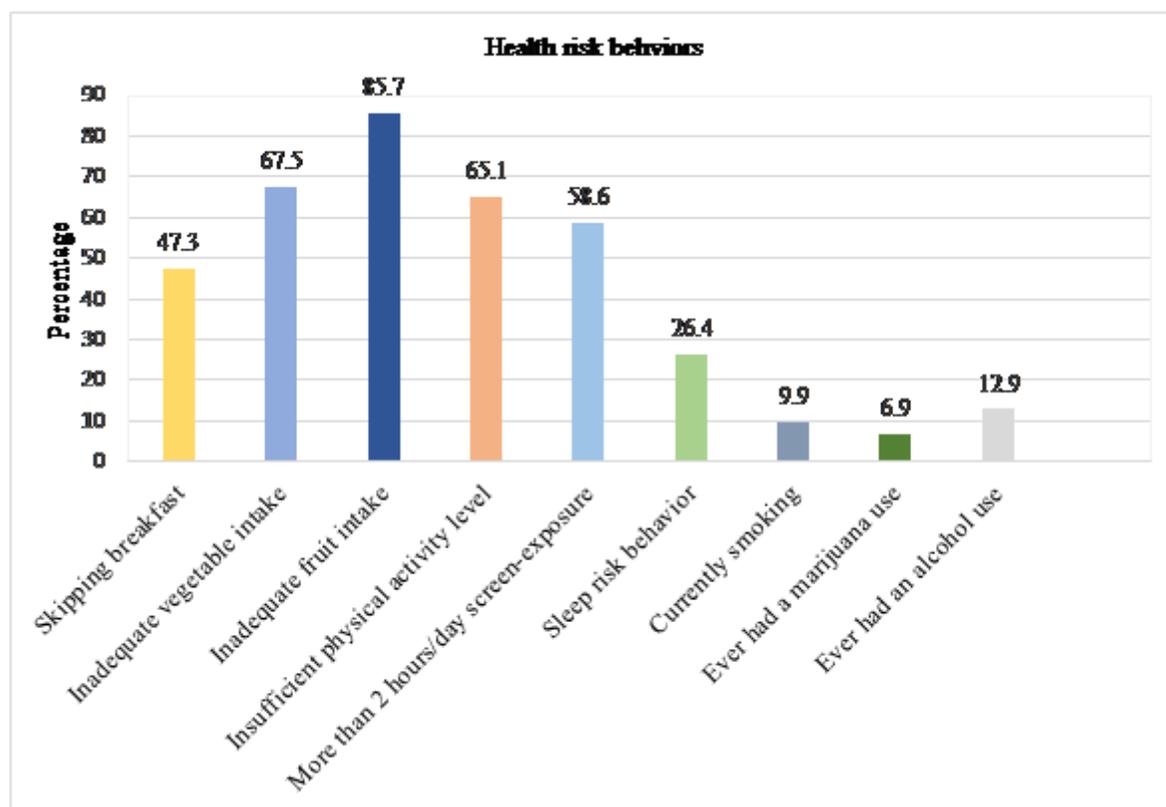


Figure 1

Prevalence of health risk behaviors among study participants

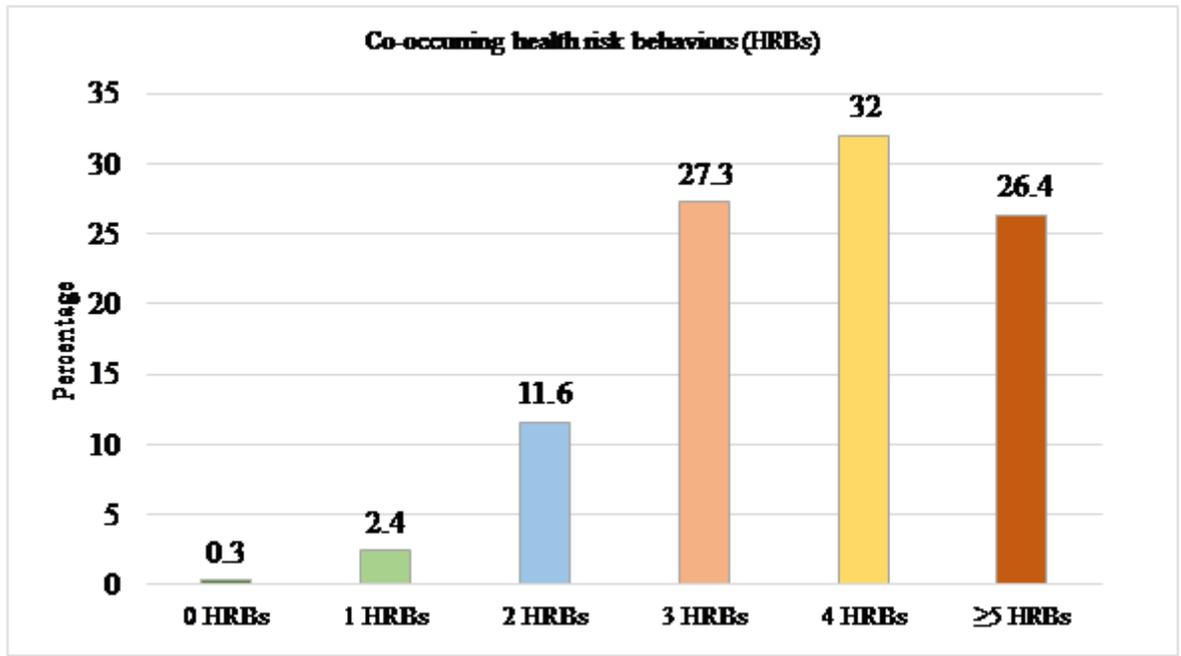


Figure 2

Co-occurring health risk behaviors among study participants