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# Associations of Passive Drinking with Perceived Health Status, Mental Health, and Family Wellbeing in Hong Kong Chinese Adolescents: A Cross-Sectional Study

Siu Long Chau <sup>1</sup>, Yongda Wu <sup>1</sup>, Man Ping Wang <sup>1\*</sup> and Sai Yin Ho <sup>2</sup>

<sup>1</sup> School of Nursing, University of Hong Kong, Hong Kong, China

<sup>2</sup> School of Public Health, University of Hong Kong, Hong Kong, China

\* Correspondence author: Wang Man Ping, PhD, MPH, RN, FAAN, School of Nursing, the University of Hong Kong, 3 Sassoon Road, Pokfulam, Hong Kong. Telephone: +852-3917-6636; Email: mpwang@hku.hk

**Abstract:** Background: **Passive** drinking is prevalent in adolescents worldwide, but its prevalence and harm are understudied. Methods: **Secondary** students (n=5840, grades 7-12) from 23 selected schools in Hong Kong participated in the survey from 2015-16. Students reported the harm of passive drinking, perceived health status, Patient Health Questionnaire-2, Perceived Stress Scale-4, perceived happiness, family health, happiness, and harmony in the questionnaire. The associations were analyzed using multivariable logistic regression (odds ratio, OR) and linear regression (unstandardized coefficient, b), adjusted for confounders. Results: **29.1%** (95% CI 27.8 to 30.5%) of students experienced passive drinking in the past 30-day. Past 30-day parental passive drinking was associated with a higher level of depressive symptoms (AOR 1.63, 95% CI 1.26 to 2.10), stress (adjusted b 0.76, 0.42 to 1.10), and lower level of perceived happiness (adjusted b -0.52, -0.72 to -0.33). Past 30-day parental passive drinking was associated with a lower level of family health (adjusted b -1.39, 95% CI -1.66 to -1.11), family happiness (adjusted b -1.36, -1.64 to -1.08), and family harmony (adjusted b -1.40, -1.70 to -1.10). Conclusion: Passive drinking was associated with poorer mental health, family wellbeing, and lower level of happiness among Hong Kong Chinese adolescents.

**Keywords:** Passive drinking; perceived health status; mental health; family wellbeing; adolescents; Hong Kong Chinese

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## Introduction

Adolescence is one of the most critical periods in life, and it is vulnerable to harmful health behaviors, including excessive alcohol use, smoking, and illicit substance use [1]. Alcohol misuse affects not only the drinkers themselves but also the people around them. Passive drinking (PD) is defined as the impacts of alcohol on people around the drinkers, for example, sleep interruption, child neglect, and verbal abuse [2,3]. It can also contribute to serious harm to the victims, including physical violence, sexual assaults, and unwanted sexual intercourse [3]. In a representative sample of 17,154 Australian adolescents, the most common harm of PD was psychological harm (38.9%),

followed by physical neglect (38%), physical assaults (27%), and sexual abuse (12.3%) [2]. Evidence suggested that adolescents were the most vulnerable group affected by others' drinking, and the prevalence of PD has increased globally from 12% to 16% in a decade [4,5,6]. In 2012, approximately 11,000 New Zealand children's hospitalizations were caused by alcohol-related injuries, and their main causes of alcohol-attributable death were road traffic accidents and child abuse by drinking parents [7,8]. The World Health Organization (WHO) estimated that around one million adolescents are adversely affected by PD annually worldwide, and the harmful effects persist in adulthood if no intervention is taken [5].

Several studies examined the effects of PD on children's development and wellbeing. Studies found that parental drinking was strongly associated with children's mental health problems, including depression and anxiety [9]. In Hong Kong (HK), a local study showed that exposure to parental pro-drinking practices was common in Chinese adolescents [10]. Of 1,700 HK secondary students, 51.0% saw their parents drink at home, and 23% were asked by their parents to open drinking bottles [10]. Children with drinking parents were more likely to have psychological distress because of the higher risk of suffering from verbal abuse and physical violence at home [11]. Parents with drinking problems also caused stigmatization to their children, which further increased victims' psychological distress [12]. In addition, verbal or physical abuse from drinking parents disrupted family harmony at home, which affected children's mental and physical health development [13-16].

Most of these studies were based in European and North American countries, and information on PD in Asian regions was scarce. Using a large representative sample of Hong Kong Chinese adolescents, we investigated the overall prevalence of PD. We also identified the association of PD with perceived health status, mental health, perceived happiness, and family wellbeing in this population.

## Methods

### *Study design*

In this cross-sectional study, we randomly sampled one local school from every 18 districts and one international school from every five regions (Hong Kong Island, Kowloon East, Kowloon West, New Territories East, and New Territories West) using a sampling frame provided by the Education Bureau covering all schools in Hong Kong. Twenty-three schools (of 349 invited, 6.6%) participated, refusal was mainly due to time and administrative issues. Two classes from each of the six grades (Grade 7-12) were randomly selected in the participating schools. Invitation letters were sent to parents to explain the purpose of the survey. Parents who refused to participate were asked to return the blank questionnaire by their children during the survey. Students' participation was voluntary, even with parental consent. A self-administered anonymous questionnaire was used to collect data from students, which took 20 to 30 minutes to complete. Teachers were reminded not to influence students' answers in the classroom. The completed questionnaire was inserted into a small opaque envelope; all envelopes were put into an opaque bag and sealed immediately after completion. Postage-paid envelopes containing a blank questionnaire were prepared for absentees on the day of the

survey; they were asked to return the completed questionnaire to the research team directly by post. Students who completed the questionnaire (n=5840) were analyzed. Ethical approval was granted by the Institutional Review Board of the University of Hong Kong/Hospital Authority Hong Kong West Cluster (UW 14-509).

#### *Measurements*

Socio-demographic characteristics (sex, age, place of birth, and perceived family affluence) and drinking behaviors (age of first drinking, drinking frequency, drinking quantity, and binge drinking frequency) were collected in the questionnaire. Students also reported the harm of passive drinking, perceived health status, mental health (Patient Health Questionnaire-2 and Perceived Stress Scale-4), perceived happiness, and family wellbeing in the questionnaire.

Current passive drinking was defined as experiencing the harm of passive drinking in the past 30-day, and ever passive drinking was defined as experiencing its harm in one's lifetime. Passive drinking was assessed by 16-item: noise, study/sleep interruption, felt troubled by littering, exposure to vomit or urination, felt neglected, emotionally hurt, felt unsafe, took care of a drunk person, verbal insult or harassment, physical assault, sexual harassment, unwanted intercourse, properties damaged, accidents, financial loss, and others.

Physical health was assessed by self-perceived health status. "Very well" and "well" responses were categorized as good health. "Fair," "bad," and "very bad" responses were categorized as poor or fair health. Mental health was assessed by Patient Health Questionnaire-2 (PHQ-2) and Perceived Stress Scale-4 (PSS-4). PHQ-2 score of 3 or higher was categorized as more likely to have depressive symptoms [17]. The total score of PSS-4 ranged from 0 to 16; a higher score indicated a higher stress level [18].

Perceived happiness was assessed by the Subjective Happiness Scale (SHS) with a total score ranging from 1 to 7; a higher score indicated a higher happiness level [19]. Family wellbeing is a scale combined with scales of family health, family happiness, and family harmony. Each score ranged from 0 to 10; higher scores indicated better family wellbeing [20].

#### *Statistical analysis*

A total of 283 students (4.6%) with missing answers for over half of the questionnaire were excluded. Students who provided inconsistent answers were also excluded, leaving 5840 students for analysis. All descriptive data and prevalence of passive drinking were weighted by sex and age distribution of students in Hong Kong based on EDB 2014-15 student enrollment statistics. The associations of ever and past 30-day passive drinking with perceived health status, PHQ-2, PSS-4, SHS, and family wellbeing were analyzed using multivariable logistic regression (adjusted odds ratio, AOR) and multiple linear regression (adjusted unstandardized coefficient, b), controlling for sex, age, perceived family affluence, and current drinking status. Stata 15.1 was used for all analyses. A two-tailed P-value less than 5% was considered statistically significant.

## **Results**

Table 1 shows that 51.5% of participants were male, 64.0% were aged less than 16 years, 69.9% were born in HK, and 55.8% perceived their family affluence as average. 46.5% had underage drinking, 23.5% drank at least monthly, 14.4% drank more than 1 unit of alcohol on a drinking day, and 17.7% had binge drinking.

**Table 1.** Socio-demographic characteristics and drinking behaviors of 5840 participants <sup>a</sup>.

	n <sup>b</sup> .	% (95% C.I.)
Sex		
Male	3239	51.5 (50.0, 53.0)
Female	2601	48.5 (47.0, 50.0)
Age		
11-15	3513	64.0 (62.6, 65.3)
16-20	2327	36.0 (34.7, 37.4)
Place of birth		
Hong Kong	4002	69.9 (68.5, 71.2)
Mainland China	1397	22.4 (21.3, 23.6)
Others	408	7.7 (6.8, 8.7)
Perceived family affluence		
Below average	1473	25.4 (24.1, 26.7)
Average	3153	55.8 (54.3, 57.3)
Above average	1048	18.8 (17.6, 20.0)
Age of first drinking 1 unit of alcohol <sup>c</sup>		
Never	2741	53.4 (51.9, 54.9)
7-11	1529	25.9 (24.7, 27.2)
12 or above	1092	20.6 (19.4, 21.9)
Drinking frequency		
Never	2972	53.2 (51.7, 54.6)
Yearly or less	1388	23.3 (22.1, 24.6)
Monthly or less	780	12.4 (11.5, 13.2)
1-3 times per month	529	8.3 (7.7, 9.1)
1-6 times per week	110	1.7 (1.4, 2.1)
Everyday	47	1.1 (0.6, 1.7)
Usual drinking quantity in a drinking day <sup>c</sup>		
0	2777	53.5 (52.0, 55.0)
Less than 0.5 unit	809	14.6 (13.7, 15.7)
0.5-1 unit	998	17.4 (16.3, 18.5)
2-4 units	556	9.5 (8.7, 10.4)
5 or more units	278	4.9 (4.3, 5.7)
Drinking ≥ 5 units of alcohol on one occasion <sup>c</sup>		
Never	4752	82.2 (81.1, 83.4)
Less than yearly	612	10.3 (9.4, 11.2)
Yearly	262	4.0 (3.6, 4.6)
Monthly	143	2.4 (2.0, 2.9)
Weekly	27	0.5 (0.3, 1.0)
Daily	25	0.5 (0.3, 1.0)

<sup>a</sup>. Prevalence was weighted by the sex and age distribution of students in Hong Kong.

<sup>b</sup>. Observation (n) is not 5840 due to nonresponse.

<sup>c</sup>. 1 unit equals 10ml of pure alcohol.

Table 2 shows the overall prevalence of ever (40.8%, 95% CI 39.4 to 42.2%) and past 30-day (29.1%, 27.8 to 30.5%) PD. The most prevalent past 30-day PD was noise (14.1%, 95% CI 13.0 to 15.2%). 12.8% (11.9 to 13.8%) felt troubled by littering, 9.5% (8.7 to 10.4%) felt neglected, and 9.3% (8.5 to 10.3%) experienced verbal insult or harassment. 1.4% (1.1 to 1.9%) experienced

sexual harassment, and 0.6% (0.4 to 0.8%) experienced unwanted intercourse in the past 30-day.

Table 3 shows that ever-siblings PD and ever-peer PD were significantly associated with a lower level of perceived happiness in general (siblings: adjusted b -0.78, 95% CI -1.45 to -0.10; peer: adjusted b -0.34, -0.64 to -0.05). Ever-relative PD was significantly associated with higher odds of depressive symptoms (AOR 2.18, 95% CI 1.15 to 4.12) and lower level of perceived happiness compared with peers (adjusted b -0.66, 95% CI -1.16 to -0.15). PD in the past 30-day was significantly associated with higher odds of depressive symptoms (relative: AOR 1.94, 95% CI 1.23 to 3.04; parental: AOR 1.63, 1.26 to 2.10; others: AOR 1.43, 1.20 to 1.69; siblings: AOR 1.50, 1.07 to 2.11; peers: AOR 1.40, 1.16 to 1.70), higher stress level (parental: adjusted b 0.76, 95% CI 0.42 to 1.10; others: adjusted b 0.35, 0.13 to 0.57; peers: adjusted b 0.30, 0.05 to 0.54), lower level of perceived happiness in general (relative: adjusted b -0.73, 95% CI -1.07 to -0.38; parental: adjusted b -0.52, -0.72 to -0.33; siblings: adjusted b -0.30, -0.56 to -0.04; peer: adjusted b -0.27, -0.41 to -0.12; others: adjusted b -0.19, -0.32 to -0.06) and lower level of perceived happiness compared with peers (relative: adjusted b -0.40, 95% CI -0.76 to -0.05; parental: adjusted b -0.37, -0.57 to -0.17; peers: adjusted b -0.24, -0.39 to -0.10).

Table 4 shows that ever-parental PD was significantly associated with lower family health (adjusted b -0.56, 95% CI -0.98 to -0.14), family happiness (adjusted b -0.52, 95% CI -0.95 to -0.08), family harmony (adjusted b -0.57, 95% CI -1.03 to -0.12), and poorer family wellbeing (adjusted b -1.66, 95% CI -2.90 to -0.42). Ever-sibling PD was significantly associated with lower family health (adjusted b -1.34, -2.30 to -0.39), family happiness (adjusted b -1.23, -2.21 to -0.24), and poorer family wellbeing (adjusted b -3.58, -6.39 to -0.77). Past 30-day parental PD was significantly associated with lower family health (adjusted b -1.39, -1.66 to -1.11), family happiness (adjusted b -1.36, -1.64 to -1.08), family harmony (adjusted b -1.40, -1.70 to -1.10), and poorer family wellbeing (adjusted b -4.19, -5.00 to -3.38).

Table 2. Prevalence of passive drinking of 5840 participants <sup>a</sup>.

Passive drinking	Ever		Past 30-day	
	n	% (95% C.I.)	n	% (95% C.I.)
Overall	2397	40.8 (39.4, 42.2)	1691	29.1 (27.8, 30.5)
Noise	1338	23.2 (22.0, 24.5)	795	14.1 (13.0, 15.2)
Study/sleep interrupted	1112	19.2 (18.1, 20.4)	751	12.8 (11.9, 13.8)
Felt troubled by littering	545	9.2 (8.4, 10.0)	319	5.4 (4.8, 6.1)
Exposed to vomit or urination	572	9.7 (8.9, 10.6)	224	3.9 (3.3, 4.5)
Felt neglected	818	14.2 (13.2, 15.3)	548	9.5 (8.7, 10.4)
Emotionally hurt	808	13.5 (12.6, 14.4)	488	8.2 (7.5, 9.0)
Felt unsafe	741	12.8 (11.9, 13.8)	408	7.1 (6.4, 7.8)
Took care of a drunk person	705	11.9 (11.0, 12.9)	266	4.6 (4.0, 5.3)
Verbal insult or harassment	851	15.0 (13.9, 16.1)	529	9.3 (8.5, 10.3)
Pushed, hit, or assaulted	464	8.5 (7.7, 9.5)	268	5.0 (4.3, 5.8)
Sexual harassment	167	3.0 (2.5, 3.6)	80	1.4 (1.1, 1.9)
Unwanted intercourse	83	1.5 (1.1, 1.9)	38	0.6 (0.4, 0.8)
Properties damaged	266	4.9 (4.2, 5.7)	141	2.8 (2.2, 3.5)
Accidents	110	2.0 (1.6, 2.6)	43	0.8 (0.5, 1.2)
Financial loss	232	3.9 (3.4, 4.5)	127	2.1 (1.7, 2.5)
Others	149	2.6 (2.1, 3.2)	65	1.2 (0.9, 1.7)

<sup>a</sup>. Prevalence was weighted by the sex and age distribution of students in Hong Kong.

Table 3. Associations of causes of ever and past 30-day passive drinking with perceived health status, mental health status, and perceived happiness in 5840 participants

Causes of ever/past 30-day PD <sup>a</sup>	Perceived health status <sup>b</sup> (Fair or poor)	Patient Health Questionnaire-2 <sup>c</sup> (≥ 3)	Perceived Stress Scale-4 <sup>d</sup>	Perceived happiness in general <sup>e</sup>	Perceived happiness compared with peers <sup>e</sup>
	Adjusted b (95% C.I.) <sup>f</sup>				
No PD (n=5455)	1	1	0	0	0
Parental ever PD (n=113)	1.09 (0.70, 1.69)	0.90 (0.59, 1.39)	0.52 (-0.001, 1.04)	-0.11 (-0.41, 0.19)	-0.24 (-0.54, 0.07)
Parental PD in past 30-day (n=272)	1.26 (0.96, 1.66)	1.63 (1.26, 2.10) ***	0.76 (0.42, 1.10) ***	-0.52 (-0.72, -0.33) ***	-0.37 (-0.57, -0.17) ***
<u>P trend</u>	0.09	<0.01	<0.001	<0.001	<0.001
No PD (n=5665)	1	1	0	0	0
Siblings ever PD (n=21)	1.28 (0.47, 3.49)	0.57 (0.19, 1.71)	-0.04 (-1.21, 1.13)	-0.78 (-1.45, -0.10) *	-0.60 (-1.29, 0.08)
Sibling PD in past 30-day (n=154)	0.90 (0.62, 1.33)	1.50 (1.07, 2.11) *	0.08 (-0.36, 0.52)	-0.30 (-0.56, -0.04) *	-0.17 (-0.43, 0.09)
<u>P trend</u>	0.67	<0.05	0.74	<0.01	0.12
No PD (n=5717)	1	1	0	0	0
Relatives ever PD (n=40)	1.57 (0.80, 3.09)	2.18 (1.15, 4.12) *	0.74 (-0.11, 1.60)	-0.48 (-0.97, 0.02)	-0.66 (-1.16, -0.15) *
Relatives PD in past 30-day (n=83)	1.07 (0.64, 1.77)	1.94 (1.23, 3.04) **	0.25 (-0.35, 0.86)	-0.73 (-1.07, -0.38) ***	-0.40 (-0.76, -0.05) *
<u>P trend</u>	0.51	<0.01	0.18	<0.001	<0.01
No PD (n=5181)	1	1	0	0	0
Peers ever PD (n=114)	0.97 (0.63, 1.50)	0.99 (0.65, 1.50)	0.37 (-0.14, 0.89)	-0.34 (-0.64, -0.05) *	-0.16 (-0.47, 0.14)
Peers PD in past 30-day (n=545)	0.83 (0.67, 1.03)	1.40 (1.16, 1.70) ***	0.30 (0.05, 0.54) *	-0.27 (-0.41, -0.12) ***	-0.24 (-0.39, -0.10) **
<u>P trend</u>	0.09	<0.01	<0.05	<0.001	<0.01
No PD (n=4962)	1	1	0	0	0
Others ever PD (n=176)	0.83 (0.57, 1.21)	1.11 (0.79, 1.56)	0.17 (-0.25, 0.59)	0.05 (-0.19, 0.30)	0.002 (-0.25, 0.25)
Others PD in past 30-day (n=702)	1.12 (0.93, 1.34)	1.43 (1.20, 1.69) ***	0.35 (0.13, 0.57) **	-0.19 (-0.32, -0.06) **	-0.09 (-0.22, 0.03)
<u>P trend</u>	0.33	<0.001	<0.01	<0.01	0.17

a. PD stands for passive drinking. Participants were mutually exclusive.

b. Reference group: Perceived health status rated as good, very good, and excellent.

c. Reference group: Score 0-2. A score ≥ 3 suggests the participants may have depression.

d. Total score: 0-16. A higher score suggests more perceived stress.

e. Total score: 1-7. A higher score suggests greater perceived happiness.

f. Adjusted for sex, age, perceived family affluence, and current drinking status.

\* P<0.05; \*\* P<0.01; \*\*\* P<0.001.

**Table 4.** Associations of ever and past 30-day family caused passive drinking with family health, happiness, harmony, and wellbeing of 5840 participants.

Causes of ever/past 30-day PD <sup>a</sup>	Family health <sup>b</sup>	Family happiness <sup>b</sup>	Family harmony <sup>b</sup>	Family wellbeing <sup>c</sup>
	Adjusted b (95% C.I.) <sup>d</sup>			
No PD (n=5455)	0	0	0	0
Parental ever PD (n=113)	-0.56 (-0.98, -0.14) **	-0.52 (-0.95, - 0.08) **	-0.57 (-1.03, -0.12) **	-1.66 (-2.90, -0.42) *
Parental PD in past 30-day (n=272)	-1.39 (-1.66, -1.11) ***	-1.36 (-1.64, -1.08) ***	-1.40 (-1.70, -1.10) ***	-4.19 (-5.00, -3.38) ***
<u>P trend</u>	<b>&lt;0.001</b>	<b>&lt;0.001</b>	<b>&lt;0.001</b>	<b>&lt;0.001</b>
No PD (n=5665)	0	0	0	0
Siblings ever PD (n=21)	-1.34 (-2.30, -0.39) **	-1.23 (-2.21, - 0.24) *	-1.00 (-2.03, 0.03)	-3.58 (-6.39, - 0.77) *
Siblings PD in past 30-day (n=154)	-0.18 (-0.54, 0.18)	-0.31 (-0.68, 0.07)	-0.28 (-0.67, 0.12)	-0.75 (-1.83, 0.32)
<u>P trend</u>	0.14	<b>&lt;0.05</b>	0.09	0.07

a. PD stands for passive drinking. Participants were mutually exclusive.

b. Total score: 0-10. A higher score suggests more perceived health, happiness, and harmony.

c. Combined scores of family health, happiness, and harmony. Total score: 0-30. A higher score indicated better family wellbeing.

d. Adjusted for sex, age, and current drinking status.

\* P<0.05; \*\* P<0.01; \*\*\* P<0.001.

## Discussion

This is the first large-scale study to examine the prevalence of PD and its association with perceived health status, mental health, perceived happiness, and family wellbeing from a large representative sample of Hong Kong Chinese adolescents. We observed that the prevalence of current PD (29.1%) was lower than in Australia (33%) but was higher than in some Pacific and Asian countries, such as New Zealand (22%) and Vietnam (13.9%) [5]. The non-bodily harm of PD was more common than the bodily harm, and the results were consistent with studies from western countries (e.g., Finland, Ireland, and Scotland) [21]. The most common harm was psychological harm (e.g., verbal abuse), followed by severe harm, including physical violence and sexual assaults [2,21]. Our study found that about one-third of adolescents were affected by the harm of PD, and interventions are warranted to educate adolescents to avoid those harms.

Some studies examined the associations of PD with adolescent health development, including behavioral and mental health problems [22,23]. Consistent with previous studies [22,23], our findings showed that adolescents who experienced current PD had higher odds of depressive symptoms, stress, and lower happiness levels. Studies suggested that adolescents' development was shaped by the external environment, and their mental health was strongly affected by others' drinking, especially by peers and family members with alcohol misuse problems [24]. Adolescents with peers or parents diagnosed with alcohol misuse problems had a higher risk of developing mood disorders due to the experience of different types of abuse (e.g., domestic violence, sexual assaults, and bullying) [22]. These traumatized events were associated with poor mental health [22]. Our findings highlighted that PD was a significant factor in poorer mental health development among adolescents.

We extend the understanding of PD to family wellbeing. We found that adolescents who experienced PD from parents and siblings were associated with lower family health, happiness, and harmony. Pouring alcohol for seniors and drinking in front of children at home were considered a social norm in Chinese culture and adopted by most Hong Kong parents [23]. Nevertheless, studies found drinking parents were more likely to engage in verbal aggression and have unresolved family conflicts at home [25]. Parents drinking in front of their children had a higher risk of physical assault and sexual abuse on family members and was associated with poorer family relations [13,14]. An intact family environment with role models was essential to children's normal physical and mental health development [14]. More educations are needed to advocate the harm of PD to adolescents.

This study has some limitations. First, data collected were self-reported, but we encouraged candid reporting by providing an opaque envelope to seal the completed questionnaires. Second, the representativeness of the study may be affected as not all forms in some schools participated in the survey, but we calculated the sex and age-weighted prevalence based on the years' enrollment statistics. Third, the analysis was based on cross-sectional data, and reverse causality could not be ruled out. A longitudinal study is needed further to explore the temporal relations in the observed associations.

## Conclusions

One-third of Hong Kong Chinese adolescents experienced PD in the past 30-day, including physical assaults, sexual harassment, and unwanted sexual intercourse. Adolescents who currently experienced PD from parents and peers were associated with a higher level of depressive symptoms, stress, and a lower level of perceived happiness. PD caused by parents and siblings was also associated with poorer family wellbeing. Our study provided implications that PD was common among Hong Kong Chinese adolescents, and interventions are needed to educate them to avoid those harm.

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**Informed Consent Statement:** Informed consent was obtained from all participants involved in the study. Written informed consent has been obtained from the participants to publish this paper.

**Data Availability Statement:** The dataset generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

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**Conflicts of Interest:** The authors declare there is no conflict of interests.

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