Prevalence and factors associated with suboptimal hand and oral hygiene behavior among adolescents in Central America

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ABSTRACT

INTRODUCTION The aim of the study was to assess the prevalence and associated factors of hand hygiene (HH) and oral hygiene (OH) behavior in adolescents in Central America.

METHODS In total, 15807 school-aged adolescents (mean age=14.4 years, SD=1.4) were analyzed using secondary data from the cross-sectional Global School-based Student Health Survey (GSHS) conducted in six Central American countries (El Salvador, Belize, Costa Rica, Guatemala, Honduras, and Panama) between 2009 and 2018. HH and OH were assessed by questionnaire. Adjusted logistic regression was used to determine the associations with suboptimal ('not always') HH (SHH) and suboptimal (<2 times/day) OH (SOH).

RESULTS The proportion of SHH before meals was 44.5% (the highest in Panama 69.0%), SHH after toilet use was 21.5% (the highest in Panama 33.3%), SHH with soap was 51.0% (the highest in Honduras 83.1%), and SOH (<2 times tooth brushing/day) was 11.3% (the highest in Panama 13.0%). Male sex (AOR=1.10; 95% CI: 1.03–1.35, SHH after toilet use), health risk behavior, including history of alcohol intoxication (AOR=1.54; 95% CI: 1.32–1.81 for SHH before meals, AOR=1.49; 95% CI: 1.23–1.99 for SHH after toilet use, and AOR=1.35; 95% CI: 1.17–1.57 for SHH with soap), inadequate fruit intake (AOR=1.53; 95% CI: 1.33–1.76 for SHH before meals and AOR=1.57; 95% CI: 1.34–1.84 for SHH after toilet use), inadequate vegetable intake (AOR=1.24; 95% CI: 1.05–1.47 for SHH before meals), and sedentary behavior (AOR=1.45; 95% CI: 1.28–1.64 for SHH before meals and AOR=1.23; 95% CI: 1.11–1.37 for SHH with soap), and poor mental health, including having no close friends (AOR=1.53; 95% CI: 1.20–1.96 for SHH before meals, and AOR=1.51; 95% CI: 1.22–1.99 for SHH after toilet use), and suicidal ideation (AOR= 1.22; 95% CI: 1.01–1.47 for SHH after toilet use, and AOR=1.27; 95% CI: 1.11–1.45 for SHH with soap) were associated with SHH. Male sex (AOR=1.80; 95% CI: 1.55–2.10), having no close friends (AOR=1.98; 95% CI: 1.50–2.60), and suicidal ideation (AOR=1.32; 95% CI: 1.05–1.68) increased the odds and soft drink intake (AOR=0.75; 95% CI: 0.64–0.88) decreased the odds of SOH.

CONCLUSIONS This study presents SHH and SOH behavior practices. Several factors, including sociodemographics, health risk behaviors, and poor mental health, were identified that were associated with SHH and SOH behaviors, which can help in designing school OH and HH health promotion.

INTRODUCTION

Hand hygiene (HH) with soap can 'avert 0.5–1.4 million deaths every year'[1,2]. Oral hygiene (OH) (tooth brushing ≥2 times/day) is a main means to tackle oral health problems[3]. Notwithstanding the potentially significant influence of HH and OH behavior, the proportion of such behaviors among adolescents is low[4-6]. Most countries in the region of Latin America and the Caribbean report no basic coverage data for hygiene/handwashing services[7]. Among adolescents in Central American countries, there are scant national data on HH and OH behaviour[5,8-11].

In a study among adolescents (n=495) in central

Guatemala, 99% practiced hand washing with soap and water, 95% washed their hands after going to the bathroom, 70% brushed their teeth 3 times a day using toothpaste mostly as the method of oral hygiene[12]. Among secondary students (n=135) in the Penonome district in Panama, 94.8% of students implement incorrect oral hygiene practices in terms of frequency of daily brushing, lack of flossing, use of mouthwash, etc.[13]. In Nicaragua, the proportion of school students washing their hands with soap ranged from 22% in low-density rural areas to 42% in urban areas[14]. In a study among schoolchildren in Latin America from 2006–2011, 2% to 7% reported rarely/never HH (after toilet use) (including 2.1% in girls and 4.7% in boys in Guatemala in 2010), and 2% to 9% reported less than once a day tooth brushing (including 3.0% in girls and 5.3% in boys in Guatemala in 2010)[5].

In a survey among middle-school students in three Caribbean countries[15], nine African countries[16] and six Southeast Asian countries[4], the prevalence of suboptimal HH (SHH) before meals was 68.2%, 62.2%, and 44.8%, respectively, SHH after toilet use was 28.4%, 58.4%, and 31.9%, respectively, SHH with soap was 52.7%, 35.0%, and 55.8%, respectively, and the prevalence of suboptimal OH (SOH) (<2 times/day brushing teeth) was 16.9%, 22.7%, and 17.1%, respectively.

As previously reviewed[4,15], factors that increase the odds of SHH and SOH among young people include male sex, lower wealth status, health risk behaviors, poor mental health, and lack of parental support. There is a lack of data on the prevalence and associated factors of HH and OH among adolescents in Central America. Consequently, the study aimed to evaluate the prevalence and associated factors of poor HH and OH among adolescents in Central America (Belize, El Salvador, Guatemala, Honduras, Costa Rica, and Panama).

METHODS

Sample and procedures

Cross-sectional nationally representative secondary survey data of the Global School-based Student Health Survey (GSHS) from six Central American countries (Belize in 2011, n=2112; Costa Rica in 2009, n=2679; El Salvador in 2013, n=1915; Guatemala in 2015, n=4372; Honduras in 2012, n=1779; and Panama in 2018, n=2948) were analysed[17]. After parents, teachers, and students gave their informed consent, a self-administered anonymous questionnaire was given to the students who were chosen to participate in the two-stage (schools and classes) sampling design. The GSHS survey was examined and approved by the institutional review board or ethics committee of each participating nation.

Measures

Hand hygiene

Hand hygiene included the item: 'During the past 30 days, how often did you wash your hands before eating/after using the toilet or latrine/use soap?'. Responses ranged from 1=never to 5=always (coded 1–4 as 1, and 5 as 0) and SHH defined as any response that was not 'always'.

Oral hygiene

Oral hygiene included the item: 'During the past 30 days, how many times per day did you usually clean or brush your teeth?'. Responses ranged from 1=I did not clean or brush my teeth during the past 30 days to 6=four or more times per day (coded 1–3 as 1, and 4–6 as 0) and SOH defined as teeth brushing <2 times/day.

Sociodemographic characteristics

Sociodemographic data consisted of age, sex, country, and hunger (mostly or always went hungry in the past 30 days) used as a proxy for socioeconomic status.

Health risk behaviors

Health risk behaviors assessed included a history of alcohol intoxication (lifetime ≥1 or 2 times), consumption of fruits (<2 servings/day), vegetables (<3 servings/day), soft drinks (≥1/day), sedentary behavior during leisure time (≥3 hours/day), and physical inactivity (<5 days at least 60 minutes per day/week).

Poor mental health

Poor mental health included four items: no close friends, loneliness (mostly/always in the past 12 months), anxiety (mostly/always worried about something that you could not sleep at night in the past 12 months), and suicidal ideation in the past 12 months (yes/no).

Statistical analysis

Statistical analyses were conducted with STATA software version 15 (Stata Corporation, College Station, Texas, USA). Adjusted logistic regression analyses were applied to estimate associations with SHH (meals/toilet use/soap) and SOH by presenting AORs (adjusted odds ratios) and 95% CIs (confidence intervals). Variables significant in univariable analyses were subsequently included in the multivariable models, adjusted for sociodemographic, health risk behavior and poor mental health variables. Taylor linearization procedures were applied to account for the multi-stage sampling design and sample weighting. A $p<0.05$ significance, and data that were missing were removed.

RESULTS

Participants description

Participants were 15807 teenagers in school (mean age=14.4 years, SD=1.4) from six Central American nations, with 1779 students in Honduras and 4374 students in Guatemala. The prevalence of SHH before meals was 44.5% (the highest in Panama 69.0%), SHH after toilet use was 21.5% (the highest in Panama 33.3%), SHH with soap was 51.0% (the highest

in Honduras 83.1%), and SOH was 11.3% (the highest in Panama 13.0%) (Table 1).

Associations with SHH before meals and after toilet use

In the adjusted logistic regression analysis, compared to students from Belize, students from Costa Rica (AOR=2.44; 95% CI: 2.04–2.92) and Panama (AOR=2.42; 95% CI: 2.00–2.93) had higher odds and students from Guatemala (AOR=0.51; 95% CI: 0.37–0.70) had lower odds of SHH before meals, and compared to students from Belize, students from Costa Rica (AOR=1.60; 95% CI: 1.33–1.93), El Salvador (AOR=1.56; 95% CI: 1.22–1.99), Honduras (AOR=1.64; 95% CI: 1.34–2.00), and Panama (AOR=2.55; 95% CI: 2.01–3.22) had higher odds of SHH after toilet use. Older age (AOR=1.17; 95% CI: 1.01–1.35) was associated with SHH before meals and male sex (AOR=1.18; 95% CI: 1.03–1.35) was associated with SHH after toilet use.

Regarding health risk behavior, history of intoxication

Table 1. Characteristics of the sample and hygiene behavior among 15807 school-going adolescents in Central America, 2009–2019

Characteristics	Sample	Reporting 'not always' hand hygiene			Oral hygiene
		Before meals	After toilet use	With soap	Tooth brushing <2 times/day
	n (%)	%	%	%	%
All	15807	44.5	21.5	51.0	11.3
Country (study year; survey response rate)					
Belize (2011; 88%)	2112 (13.4)	42.1	13.7	50.4	10.0
Costa Rica (2009; 72%)	2679 (16.9)	66.2	21.2	46.6	7.1
El Salvador (2013; 88%)	1915 (12.1)	42.3	20.1	43.0	11.2
Guatemala (2015; 82%)	4374 (27.7)	31.8	19.4	35.7	11.8
Honduras (2012; 79%)	1779 (11.3)	44.0	21.1	83.1	12.5
Panama (2018; 71%)	2948 (18.6)	69.0	33.3	58.1	13.0
Gender					
Female	8052 (51.5)	44.1	19.8	50.8	8.6
Male	7561 (48.5)	44.5	22.3	51.0	13.6
Age (years)					
≤14	8494 (54.2)	42.0	19.5	49.8	11.4
≥15	7164 (45.8)	48.2	24.0	52.8	11.1
Went hungry					
Never/rarely/sometimes	15148 (96.9)	44.7	21.2	51.1	10.9
Mostly/always	489 (3.1)	39.4	25.5	52.7	21.1
Health risk behavior					
History of alcohol intoxication	2765 (17.8)	59.2	31.5	58.0	14.5
Fruits (<2 servings/day)	11418 (72.7)	46.4	23.2	50.8	12.0
Vegetables (<3 servings/day)	13378 (85.7)	45.3	21.8	51.2	11.1
Soft drink intake	6822 (43.4)	47.1	21.3	58.7	9.7
Sedentary behavior	5844 (38.2)	54.7	24.5	56.2	11.6
Physical inactivity	11436 (74.1)	45.2	21.6	51.8	11.1
Poor mental health					
No close friends	1132 (7.3)	53.7	30.5	57.2	21.7
Lonely	1725 (11.1)	51.5	27.0	57.8	16.1
Anxiety	1299 (8.3)	49.1	27.3	50.6	15.5
Suicidal ideation	2599 (16.9)	49.8	26.8	58.7	14.7

(AOR=1.54; 95% CI: 1.32–1.81), inadequate fruit intake (AOR=1.53; 95% CI: 1.15–1.51), inadequate vegetable consumption (AOR= 1.24; 95% CI: 1.05–1.47), and sedentary behavior (AOR=1.45; 95% CI: 1.28–1.64) were positively associated with SHH before meals, and history of intoxication (AOR=1.49; 95% CI: 1.23–1.99), and inadequate fruit intake (AOR=1.57; 95% CI: 1.34–1.84) were positively associated with SHH after toilet use. In terms of poor mental health, having no close friends (AOR=1.53; 95% CI: 1.20–1.96) was positively associated with SHH before meals, and having no close friends (AOR=1.51; 95% CI: 1.22–1.99), and suicidal ideation (AOR=1.22; 95% CI: 1.01–1.47) were positively associated with SHH after toilet use (Table 2).

Associations with SHH with soap and SOH

In adjusted logistic regression analysis, compared to students from Belize, students from Honduras (AOR=5.14; 95% CI: 3.86–6.35) and Panama (AOR=1.29; 95% CI: 1.03–1.62) had higher odds and students from Guatemala (AOR=0.57; 95% CI: 0.45–0.71) and El Salvador (AOR=0.75; 95% CI: 0.59–0.94) had lower odds of SHH with soap, and compared to students from Belize, students from Costa Rica (AOR=0.65, 95% CI: 0.50–0.83) had lower odds of SOH. Regarding health risk behavior, history of intoxication (AOR=1.35; 95% CI:

Table 2. Associations with poor hand hygiene (HH) before meals and poor HH after toilet use among adolescents in Central America, 2009–2019 (N=15807)

Variables	Poor HH before meals		Poor HH after toilet use	
	OR (95% CI)	AOR (95% CI)	OR (95% CI)	AOR (95% CI)
Country				
Belize ®	1	1	1	1
Costa Rica	2.69 (2.31–3.12)***	2.44 (2.04–2.92)***	1.70 (1.43–2.02)***	1.60 (1.33–1.93)***
El Salvador	1.01 (0.80–1.26)	0.99 (0.80–1.24)	1.59 (1.25–2.03)***	1.56 (1.22–1.99)***
Guatemala	0.64 (0.50–0.83)***	0.51 (0.37–0.70)***	1.52 (1.23–1.88)***	1.19 (0.90–1.58)
Honduras	1.08 (0.95–1.22)	1.07 (0.91–1.25)	1.69 (1.39–2.04)***	1.64 (1.34–2.00)***
Panama	3.05 (2.53–3.68)***	2.42 (2.00–2.93)***	3.14 (2.52–3.93)***	2.55 (2.01–3.22)***
Gender				
Female ®	1		1	1
Male	1.03 (0.91–1.16)		1.16 (1.03–1.31)*	1.18 (1.03–1.35)*
Age (years)				
≤14 ®	1	1	1	1
≥15	1.29 (1.10–1.51)**	1.17 (1.01–1.35)*	1.30 (1.12–1.51)***	1.13 (0.99–1.28)
Went hungry				
Never/rarely/sometimes ®	1		1	
Mostly/always	0.80 (0.57–1.14)		1.27 (0.96–1.68)	
Health risk behavior				
History of alcohol intoxication	2.01 (1.75–2.30)***	1.54 (1.32–1.81)***	1.90 (1.59–2.26)***	1.49 (1.23–1.99)***
Fruits (<2 servings/day)	1.32 (1.15–1.51)***	1.53 (1.33–1.76)***	1.52 (1.31–1.76)***	1.57 (1.34–1.84)***
Vegetables (<3 servings/day)	1.26 (1.10–1.44)***	1.24 (1.05–1.47)*	1.29 (1.06–1.58)*	1.20 (0.94–1.54)
Soft drink intake	1.20 (1.03–1.39)*	0.98 (0.85–1.14)	0.99 (0.85–1.15)	
Sedentary behavior	1.79 (1.56–2.06)***	1.45 (1.28–1.64)***	1.32 (1.15–1.51)***	1.14 (0.99–1.31)
Physical inactivity	1.12 (1.00–1.26)*	1.04 (0.93–1.16)	1.07 (0.93–1.22)	
Poor mental health				
No close friends	1.50 (1.18–1.30)***	1.53 (1.20–1.96)***	1.69 (1.39–2.06)***	1.51 (1.22–1.99)***
Lonely	1.37 (1.15–1.52)***	1.12 (0.86–1.46)	1.42 (1.22–1.65)***	1.20 (0.99–1.45)
Anxiety	1.21 (0.98–1.50)	0.91 (0.69–1.19)	1.41 (1.21–1.75)***	1.07 (0.85–1.36)
Suicidal ideation	1.30 (1.10–1.54)**	1.19 (0.99–1.42)	1.47 (1.24–1.75)***	1.22 (1.01–1.47)*

AOR: adjusted odds ratio; adjusted for all variables in the table. ® Reference categories. ***p<0.001, **p<0.01, *p<0.05.

Table 3. Associations with poor hand hygiene (HH) with soap and poor oral hygiene (OH) among adolescents in Central America, 2009–2019 (N=15807)

Variables	Poor HH with soap		Poor OH	
	OR (95% CI)	AOR (95% CI)	OR (95% CI)	AOR (95% CI)
Country				
Belize ®	1	1	1	1
Costa Rica	0.86 (0.70–1.05)	0.87 (0.70–1.08)	0.68 (0.56–0.83)***	0.65 (0.50–0.83)***
El Salvador	0.74 (0.59–0.92)**	0.75 (0.59–0.94)*	1.14 (0.88–1.46)	1.07 (0.79–1.46)
Guatemala	0.55 (0.45–0.67)***	0.57 (0.45–0.71)***	1.20 (0.85–1.71)	0.85 (0.58–1.25)
Honduras	4.83 (3.67–6.35)***	5.14 (3.86–6.84)***	1.28 (1.04–1.58)*	1.26 (1.00–1.59)
Panama	1.36 (1.12–1.66)**	1.29 (1.03–1.62)*	1.34 (1.12–1.60)**	1.13 (0.89–1.43)
Gender				
Female ®	1		1	1
Male	1.01 (0.87–1.17)		1.67 (1.2–1.96)***	1.80 (1.55–2.10)***
Age in years				
≤14 ®	1		1	
≥15	1.13 (0.97–1.31)		0.97 (0.83–1.13)	
Went hungry				
Never/rarely/sometimes ®	1		1	1
Mostly/always	1.07 (0.76 –1.51)		2.18 (1.11–4.27)*	1.71 (0.85–3.48)
Health risk behavior				
History of alcohol intoxication	1.40 (1.22–1.60)***	1.35 (1.17–1.57)***	1.44 (1.18–1.77)***	1.18 (0.90–1.53)
Fruits (<2 servings/day)	0.97 (0.83–1.13)		1.34 (1.04–1.74)*	1.35 (0.99–1.83)
Vegetables (<3 servings/day)	0.95 (0.82–1.10)		1.05 (0.76–1.45)	
Soft drink intake	1.73 (1.51–1.97)***	0.99 (0.88–1.12)	0.76 (0.60–0.95)*	0.75 (0.64–0.88)***
Sedentary behavior	1.33 (1.18–1.50)***	1.23 (1.11–1.37)***	1.09 (0.90–1.32)	
Physical inactivity	1.13 (1.02–1.25)		0.96 (0.73–1.26)	
Poor mental health				
No close friends	1.30 (1.09–1.56)**	1.26 (1.00–1.59)*	2.40 (1.86–3.11)***	1.98 (1.50–2.60)***
Lonely	1.36 (1.15–1.62)***	1.18 (0.99–1.39)	1.61 (1.29–1.02)***	1.28 (0.98–1.68)
Anxiety	0.97 (0.77–1.23)		1.51 (1.13–2.02)**	1.15 (0.82–1.62)
Suicidal ideation	1.45 (1.27–1.67)***	1.27 (1.11–1.45)***	1.54 (1.27–1.86)***	1.32 (1.05–1.68)*

AOR: adjusted odds ratio; adjusted for all variables in the table. ® Reference categories. ***p<0.001, **p<0.01, *p<0.05.

1.17–1.57) and sedentary behavior (AOR=1.23; 95% CI: 1.11–1.37) were positively associated with SHH with soap, while soft drink intake (AOR=0.75; 95% CI: 0.64–0.88) was negatively associated with SOH. In terms of poor mental health, having no close friends (AOR=1.26; 95% CI: 1.00–1.59) and suicidal ideation (AOR=1.27; 95% CI: 1.11–1.96) were positively associated with SHH with soap. Having no close friends (AOR=1.98; 95% CI: 1.50–2.60) and suicidal ideation (AOR=1.32; 95% CI: 1.05–1.68) were positively associated with SOH (Table 3).

DISCUSSION

The results of this study provide vital insights in HH and OH behavior among adolescents in Central America. The proportion of SHH prior to meals (44.5%) was lower than in three Caribbean nations (68.2%)[15], similar to in six countries in Southeast Asia (44.8%)[4], and higher than in nine African countries (37.8%)[16], and three countries in Oceania (30% to 35%)[18]. SHH after toilet use (21.5%) was lower than in Caribbean countries (28.4%)[15], South-East Asia (31.9%)[4], and in Africa (41.6%)[15]. SHH with soap (51.0%) was similar

to the three Caribbean countries (52.7%)[15] and was lower than in South-East Asia (55.8%)[4] and in Africa (65.0%)[16]. The prevalence of SOH (11.3%) appears lower than in three Caribbean countries (16.9%), in South-East Asian countries (17.1%)[4], Africa (22.7%)[16], and Oceania (22%–38%)[18].

Among the six Central American countries, Panama had the highest prevalence of SHH before meals (69.0%), SHH after toilet use (33.3%) and SOH (13.0%), and Honduras had the highest proportion of SHH with soap (83.1%), followed by Panama (58.1%), and Belize (50.4%). The coverage of basic sanitation services in schools in 2016 was in Costa Rica 75%, in Honduras and Panama 82%, and the coverage of basic hygiene services in schools in 2016 was in Honduras 12% and Costa Rica 70%[19]. Furthermore, in Honduras in 2019, 86.2% of household members have a space for handwashing where soap and water or detergent are present[20]. The proportion of people with basic handwashing facilities including soap and water, rural (% of rural population) was: Belize in 2011, 86.5% (in 2020, 88.7%); Costa Rica in 2009, 82.8% (in 2020, 83.3%); El Salvador in 2013, 86.3% (in 2018, 86.3%); Guatemala in 2015, 69.9% (in 2019, 69.9%); and in Honduras in 2012, 80.3% (in 2016, 80.3%)[21]. The prevalence of SHH with soap was the highest in Honduras (83.1%), while the coverage of basic hygiene services in schools in 2016 in Honduras was low (12%)[19], but 86.2% of household members have a space for handwashing where soap or detergent are present[20]. Following these results, school health promotion programs, including personal hygiene, should be particularly strengthened in Panama and Honduras[22].

Consistent with previous studies[4,23,24], we found that the prevalence of SHH after toilet use and SOH was significantly higher among boys than among girls, but there were no significant sex differences in terms of SHH before meals and with soap. Unlike some former research[18,25,26], we did not find an association between food insecurity (proxy of low economic status) and SOH and/or SHH indicators. This may be because, the prevalence of food insecurity was low (3.1%) in this study. However, in unadjusted analysis, food insecurity was associated with SOH, which may be explained by students from poorer households having lower access to a tooth brush[15].

Furthermore, older adolescents had an increased odds of SHH before meals in this study. In line with former research[4,18,27,28], we found that health risk behaviors (history of alcohol intoxication, inadequate fruit intake, inadequate vegetable intake, and sedentary behavior) increased the odds of SHH (meals/toilet use, and/or soap) but not with SOH. This finding confirms a clustering of various health risk behaviors with SHH. Furthermore, poor mental health (having no close friends and suicidal ideation) increased the odds of SHH (meals/toilet use, and/or soap) and SOH. The association between mental health and HH and OH among adolescents appears to have been found in both high-income and low- and middle-income countries[28]. It is possible that via different health risk behaviors, such as substance use, fruit and vegetable intake and physical activity, both mental health and hygiene behavior are affected[28,29]. School health promotion should integrate health behavior and mental health into programs on handwashing with soap and brushing teeth with toothpaste, in Central American countries[1,30-32]. Furthermore, several factors were identified, including sociodemographics, health risk behaviors, and poor mental health that were found to be associated with SHH and/or SOH behavior, which may help in designing school OH and HH health promotion.

Limitations

The surveys used were cross-sectional, thus limiting the attributions of causal association. Data were collected by self-report, which may have introduced recall bias. Some variables, such as protective factors (peer and parent support) and risk factors (tobacco use, school truancy, and bullying victimization) were not assessed in all six countries analyzed here, and were therefore excluded, meaning that residual confounding cannot be ruled out. Longitudinal studies are needed to determine the direction of the associations found with HH and OH.

CONCLUSIONS

This study, using middle-school surveys in six Central American countries, found a high prevalence of SHH before meals (44.5%), and SHH with soap (51.0%), and a lower prevalence of SHH after toilet use (21.5%), and SOH (11.3%). Several factors were identified, including sociodemographics (residing in Panama and Honduras, and male sex), health risk behaviors (history of alcohol intoxication, inadequate fruit intake, inadequate vegetable intake, and sedentary behavior), and poor mental health (having no close friends and suicidal ideation), that were found associated with SHH and/or SOH behavior, which may help in designing school OH and HH health promotion.

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DATA AVAILABILITY
The data on which this article is based are available at the World Health Organization NCD Microdata Repository, at https://extranet.who.int/ncdsmicrodata/index.php/catalog/GSHS

AUTHORS' CONTRIBUTIONS
S.P. and K.P. conceived and designed the research, performed statistical analysis, drafted the manuscript and made critical revisions of the manuscript for key intellectual content. Both authors read and agreed to the final version of the manuscript.

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