


BMJ Open Cross-sectional study on tobacco advertising, promotion and sponsorship (TAPS) and violations of tobacco sale regulations in Myanmar: do these factors affect current tobacco use among Myanmar high school students?

Su Myat Cho,¹ Yu Mon Saw ,^{1,2} Nyi Nyi Latt,³ Thu Nandar Saw,⁴ Hein Htet,^{1,5} Moe Khaing,^{1,6} Thet Mon Than,^{1,6} Ei Mon Win,⁷ Zaw Zaw Aung,⁷ Tetsuyoshi Kariya,¹ Eiko Yamamoto,¹ Nobuyuki Hamajima¹

To cite: Cho SM, Saw YM, Latt NN, *et al*. Cross-sectional study on tobacco advertising, promotion and sponsorship (TAPS) and violations of tobacco sale regulations in Myanmar: do these factors affect current tobacco use among Myanmar high school students? *BMJ Open* 2020;**10**:e031933. doi:10.1136/bmjopen-2019-031933

► Prepublication history for this paper is available online. To view these files, please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2019-031933>).

Received 27 May 2019
Revised 03 December 2019
Accepted 11 December 2019



© Author(s) (or their employer(s)) 2020. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

For numbered affiliations see end of article.

Correspondence to

Dr Yu Mon Saw;
sawyumon@med.nagoya-u.ac.jp

ABSTRACT

Objectives To examine the associations of current tobacco use with tobacco advertising, promotion and sponsorship (TAPS), and illicit tobacco sales exposures among Myanmar high school students.

Design A quantitative, cross-sectional study.

Setting Seven high schools from both urban and rural areas of four states and regions in Myanmar.

Participants In total, 1174 high school students (482 males and 692 females) were interviewed using a self-administered questionnaire.

Main outcome measure Current tobacco use of participants, defined as using any kind of smoked or smokeless tobacco product at least one occasion within the past 30 days.

Results The prevalence of TAPS exposure was 90.9% among high school students in Myanmar. Current tobacco use was positively associated with being over 14 years old (adjusted OR (AOR) 9.81; 95% CI 4.54 to 21.19), being male (AOR 28.06; 95% CI 13.29 to 59.25), exposure to any kind of TAPS (AOR 6.59; 95% CI 2.33 to 18.64), having seen any smoked tobacco product for sale inside or within 100 feet of the school premises (AOR 4.17; 95% CI 1.65 to 10.58), having seen the sale or gifting of any smoked tobacco product to minors (AOR 6.46; 95% CI 2.18 to 19.12) and having seen the sale or distribution of any smoked tobacco product by minors (AOR 2.42; 95% CI 1.42 to 4.10). Having ever received health education about tobacco use (AOR 0.45; 95% CI 0.27 to 0.78), or having a higher perception score of tobacco use (AOR 0.17; 95% CI 0.10 to 0.30) were negatively associated with current tobacco use.

Conclusions There was an alarming prevalence of TAPS exposure among Myanmar high school students. TAPS exposure and violations of tobacco sale regulations were strong risk factors for current tobacco use among Myanmar high school students, while health education about tobacco products was reported as an effective protective factor. Specific smokeless tobacco sale regulations for minors are needed immediately in Myanmar.

Strengths and limitations of this study

- This study is the first in Myanmar to report the associations of current tobacco use with tobacco advertising, promotion and sponsorship (TAPS), and illicit tobacco sales exposures among high school students.
- The findings of this study cannot be generalised for the whole nation. It was conducted among 1174 students from two states and two regions out of a total of seven states, seven regions and one territory in Myanmar.
- This study could not confirm the causal relationships of current tobacco use among high school students because of the cross-sectional nature of our study.
- Due to the limitations of the cross-sectional study design, this study calls for further TAPS-related interventional and longitudinal studies to explore Myanmar adolescents' tobacco use behaviours.

INTRODUCTION

'Tobacco use', defined as the use of any type of smoked or smokeless tobacco,¹ is regarded as an important public health concern worldwide. Globally, it was estimated that 24 million (7.0%) adolescents aged between 13 and 15 years had smoked cigarettes in the past 30 days and 13.4 million (3.6%) had used smokeless tobacco products in the past 30 days during 2017.¹ In the USA, it was reported that 4 million high school students were current tobacco users in 2018.² In Southeast Asia, the prevalence of adolescents' tobacco use in the past 30 days was 5.7% and that of smokeless tobacco use was 7.2% over the period of 2007 to 2017.¹ A recent multinational study reported that, between

2009 and 2013, adolescent smokeless tobacco use in the WHO South-East Asia Region (SEAR) was at its highest in Bhutan (23.2%), followed by Nepal (16.2%), Timor-Leste (14.2%), Myanmar (9.8%), India (9.0%), Sri Lanka (8.5%), the Maldives (6.2%), Bangladesh (5.9%) and Thailand (5.7%).³ Thus, Myanmar ranked the fourth-highest for adolescent smokeless tobacco use among these nine countries. Myanmar is one of the countries with high prevalence of tobacco use among young population in the WHO-SEAR countries.⁴ Cigarette smoking among schoolchildren is much higher in Myanmar compared with other SEAR countries, that is, Bangladesh, India, Maldives, Nepal and Sri Lanka.⁵ The use of smokeless tobacco product is also highly prevalent in Myanmar as compared with other countries.⁶

Tobacco use is responsible for five million deaths every year globally, a figure that is expected to rise to 10 million per year by 2030.⁷ In 2004, it was estimated that 600 000 people had died from the effects of secondhand smoke, accounting for roughly 1% of global mortality.⁸ Adolescents are highly vulnerable to addiction to the nicotine in tobacco. A recent study has shown that the earlier people become dependent on nicotine, the more likely they are to become addicted to smoking in adulthood.⁹ Moreover, nicotine consumption may negatively impact brain development during adolescence.¹⁰ Studies have shown that adolescent smoking is associated with poor academic performance¹¹ and attention and cognitive deficits.¹² Smokeless tobacco use is as dangerous as smoked forms of tobacco because it contains nicotine, carcinogens and other toxic chemicals.¹³ Smokeless tobacco use has deleterious effects to oral health including the staining and discolouration of teeth, leukoplakia, erythroplakia and oral cancer.¹⁴ A recent systematic review from India reported a positive association between smokeless tobacco use and various cancers (oral, oesophageal, and pancreatic) in the South-East Asian Region and Eastern Mediterranean Region.¹⁵ Moreover, another recent systematic review in the USA found an increased risk of heart disease and stroke among smokeless tobacco users.¹⁶

Studies have shown that tobacco and smokeless tobacco use is highly prevalent among Myanmar high school students. Since 2001, the Global Youth Tobacco Survey (GYTS) has been conducted every 3 to 5 years in Myanmar to monitor tobacco use among high school students. The findings from the 2016 GYTS conducted among high school students pointed out that the prevalence of the current use of smoked tobacco products and the prevalence of the current use of smokeless tobacco products was 10.6% and 5.7%, respectively.¹⁷ In parallel with the GYTS, Myanmar has been conducting the nationwide Global School-based Student Health Survey (GSHS) to monitor the understanding of health risk behaviours among high school students. The 2016 survey also reported that the prevalence of current tobacco smoking and current smokeless tobacco use among high school students was 7.2% and 8.5%, respectively.¹⁸ Another study conducted among high school students in 2015 in Nay

Pyi Taw, Myanmar, reported that 34.7% were smokers and 28.3% were smokeless tobacco users.¹⁹ Therefore, the use of smoked and smokeless tobacco among high school students in Myanmar is an important public health issue as well as a social one. Moreover, all these studies also pointed out that most high school students began using tobacco before the age of 14 years. However, in Myanmar, parents tend to show less concern about their children becoming smokeless tobacco users (especially chewing betel quid with tobacco) because there is a widespread misconception that the use of smokeless tobacco is not as harmful as the use of cigarettes.¹³ It is important to monitor the initiation and pattern of tobacco use among adolescents and youths, especially among high school students.

More than a decade ago, Myanmar signed the WHO Framework Convention on Tobacco Control (FCTC) and enacted the first Tobacco Control Law in 2006, regulating tobacco advertising, promotion and sponsorship (TAPS) and tobacco sales to minors.¹⁷ Subsequently, the restrictions on smoking in all indoor public places, the introduction of graphic health warnings on tobacco product packaging and the raising of tobacco product taxes were all promulgated. Despite this, the prevalence of current tobacco use among Myanmar high school students has not changed significantly over the past 15 years.¹⁷

A comparison of the 2007 and the 2016 GSHS also revealed that the prevalence of cigarette smoking among high school students had increased significantly, from 2.0% to 6.7%.¹⁸ Although the Tobacco Control Law has banned tobacco sales to minors, adolescent smokers can still buy cigarettes from large stores, retail shops or street vendors very easily.¹⁷ These alarming findings indicate the failure of efforts to control tobacco consumption among young people in Myanmar.

Although the Tobacco Control Law in Myanmar prohibits TAPS activities by the tobacco industry, TAPS activities are still common. Most tobacco companies distribute tobacco products and personal goods with tobacco product labels either free of charge or as gifts. According to the 2016 Myanmar GYTS conducted among high school students, 8.7% of boys and 3.6% of girls reported that tobacco companies had offered free tobacco products, and 7.3% of boys and 4.2% of girls reported owning something with tobacco branding or a tobacco logo.¹⁷ Furthermore, 83.4% of the students reported noticing someone using tobacco products on television or in videos and movies.¹⁷

Researchers from other parts of the world have reported that TAPS exposure can affect adolescent smoking behaviours.^{20–23} A positive association between exposure to cigarette advertisements and initiating smoking has been reported among Indonesian students.²⁰ A longitudinal study conducted in Germany also pointed out that, with every additional 10 tobacco advertisements, the adjusted relative risk for established smoking and daily smoking was raised by 38% and 30%, respectively.²⁴ Adolescent students, in a phase of life where curiosity is at

its peak, are vulnerable to adopting smoked or smokeless tobacco use.^{13 25}

At present, research in Myanmar is limited where concerns the patterns of high school students' tobacco use and their connection to TAPS exposure. Our previous study,²⁶ conducted among the same participants, revealed the low awareness of the Tobacco Control Law among Myanmar high school students, but we did not examine how TAPS exposure and violations of tobacco sales regulations might affect Myanmar high school students' tobacco use. The present study aims to investigate (1) the prevalence of TAPS and illicit tobacco sale exposures and (2) their associations with current tobacco use among Myanmar high school students.

MATERIALS AND METHODS

Study population

A cross-sectional study was conducted among grade 10 and 11 high school students from seven high schools in Shan State, Mon State, Bago Region and Magway Region in Myanmar. A simple random sampling technique using a drawing method was applied to select the study areas and schools. The details of the sampling procedure have been described elsewhere.²⁶ In total, 1339 high school students answered a self-administrated questionnaire. Of these, 165 were excluded due to missing or incomplete responses to TAPS exposure questions. In sum, the total number of participants was 1174 (482 males and 692 females) and the response rate was 87.7%.

Data collection

Data were collected by using a pretested, anonymous, paper and pencil self-administered questionnaire. The questionnaire in the Myanmar language contained 40 questions, covering nine components: (1) background information, (2) experience with tobacco products, (3) exposure to secondhand smoking, (4) perception of smoked and smokeless tobacco products, (5) sale of tobacco, (6) health warnings and information, (7) tobacco advertisement, promotion and sponsorship, (8) smoke-free areas and (9) the Tobacco Control Law and its enforcement.

Study measures

Dependent variable

The outcome variable was 'current tobacco use' among high school students. It was defined as the use of any kind of smoked or smokeless tobacco product on at least one occasion within the 30 days preceding the survey.

Independent variables

After controlling socio-demographic characteristics, smoking exposure at home and school, receiving health education about tobacco use and the perception of tobacco use as covariates, the independent variables in this study were participants' exposure to any kind of TAPS and illicit tobacco sale exposures. 'Exposure to any kind

of TAPS' was defined using the following variables: (1) having seen or heard tobacco advertisements or sponsorship in any form, (2) having seen any goods displaying the label of any tobacco product being used in promotion and (3) having seen any toy, comestible or wares made in the form of any tobacco product. If a student had had at least one TAPS exposure, the response was counted as a 'Yes', and if they had never experienced exposure, their response was counted as a 'No'.

For illicit tobacco sale exposures, we measured four different types of tobacco sales to students contravening several of the tobacco sale regulations prohibited by Myanmar Tobacco Control Law. These four variables were: (1) having seen any smoked tobacco product for sale inside or within 100 feet of the school premises within the last 12 months, (2) having seen the sale or gifting of any smoked tobacco product to minors within the last 12 months, (3) having seen the sale or distribution of any smoked tobacco product by minors within the last 12 months and (4) having seen the sale of cigarettes singly or in packs containing less than 20 within the last 12 months.

Study analysis

The data were coded, entered and analysed using the Statistical Package for Social Science (SPSS) software programme V.24.0 (IBM SPSS Inc). Categorical data were analysed by χ^2 tests for hypothesis testing. For multivariable logistic regression, all the variables were re-coded on a dichotomous scale. All analyses were two-tailed, setting $p < 0.05$ as the significance value.

Public and patient involvement statement

Patients and members of the public were not involved in the design of this study. The study findings will be disseminated within Ministries.

RESULTS

Table 1 shows the characteristics of the study participants by gender. Most of the participants (84.7%) were younger than or equal to 15 years of age. More than two-thirds of the students (68.5% of males and 67.1% of females) were grade 10 students. Of those who took part, 25.3% of male and 1.3% of female students were current users of smoked or smokeless tobacco at the time of the survey. Male students had more exposure to parental smoking (6.0%), sibling smoking (11.4%) and peer smoking (9.3%) than did female students. Nearly two-thirds of females (66.0%) reported receiving health education about tobacco use, compared with 52.7% of males. Regarding the perception score of tobacco use, measured with eight items, the mean score of seven was set as the cut-off point. Overall, 68.7% of males and 83.2% of females scored more than 7.

Table 2 presents different kinds of TAPS exposures and its associations with current tobacco use among the study participants. In total, 90.9% had TAPS exposure in any form. The findings indicate that 71.7% had seen or heard of tobacco advertisement and sponsorship in any form,

**Table 1** Characteristics of study participants (n=1174)

Characteristics	Male (n=482)		Female (n=692)		Total (n=1174)	
	N	%	N	%	N	%
Age						
≤14 years	195	40.5	307	44.4	502	42.8
15 years	199	41.3	293	42.3	492	41.9
16 years	61	12.7	91	13.2	152	12.9
17 years	21	4.4	1	0.1	22	1.9
≥18 years	6	1.2	0	0.0	6	0.5
Grade						
10	330	68.5	464	67.1	794	67.6
11	152	31.5	228	32.9	380	32.4
Current tobacco use						
No	360	74.7	683	98.7	1043	88.8
Yes	122	25.3	9	1.3	131	11.2
Parent smoking						
No	453	94.0	662	95.7	1115	95.0
Yes	29	6.0	30	4.3	59	5.0
Sibling smoking						
No	427	88.6	652	94.2	1079	91.9
Yes	55	11.4	40	5.8	95	8.1
Peer smoking						
No	437	90.7	641	92.6	1078	91.8
Yes	45	9.3	51	7.4	96	8.2
Ever received health education about tobacco use						
No	228	47.3	235	34.0	463	39.4
Yes	254	52.7	457	66.0	711	60.6
Perception score of tobacco use*						
≤7	151	31.3	116	16.8	267	22.7
>7	331	68.7	576	83.2	907	77.3

*Regarding the perception score of tobacco use, measured with eight items, the mean score of seven was set as the cut-off point.

and 68.1% had seen goods displaying the label of any tobacco product being used in promotions. One out of three students had seen toys, comestibles or wares made in the form of any tobacco product. More than one-third of the participants (35.3%) had seen or heard tobacco advertisements in sponsorship or support of sports, funfairs, exhibitions or other social activities.

Table 3 describes illicit tobacco sale exposures and their associations with current tobacco use among the study participants. Within the last 12 months, more than 80% had been exposed to the sale of any smoked tobacco product inside or within 100 feet of the school premises, the sale or gifting of any smoked tobacco product to minors or the sale of cigarettes singly or in packs of less than 20. Nearly 56% had seen the sale or distribution of any smoked tobacco product by minors.

Table 4 presents the unadjusted OR (UOR), adjusted OR (AOR) and 95% CIs of current tobacco use among Myanmar high school students. In the binary logistic regression, being a grade 11 student (UOR 3.24; 95% CI 2.24 to 4.70), and having seen the sale of cigarettes, either singly or in packs of less than 20 (UOR 7.45; 95% CI 2.34 to 23.70) were associated with current tobacco use.

From the multiple logistic regression, current tobacco use was found to be positively associated with being over 14 years old (AOR 9.81; 95% CI 4.54 to 21.19), being male (AOR 28.06; 95% CI 13.29 to 59.25), being exposed to any kind of TAPS (AOR 6.59; 95% CI 2.33 to 18.64), having seen any smoked tobacco product for sale inside or within 100 feet of the school premises within the last 12 months (AOR 4.17; 95% CI 1.65 to 10.58), having seen the sale or gifting of any smoked tobacco product

Table 2 Different kinds of TAPS† exposures among study participants (n=1174)

TAPS†	Use‡		No use§		Total	
	(n=131)		(n=1043)		(n=1174)	
	N	%	N	%	N	%
Ever seen or heard tobacco advertising and sponsorship in any form**						
No	25	19.1	307	29.4	332	28.3
Yes	106	80.9	736	70.6	842	71.7
Ever seen tobacco advertising signboards (vinyl, LED, stickers, etc)						
No	128	97.7	994	95.3	1122	95.6
Yes	3	2.3	49	4.7	52	4.4
Ever seen tobacco advertising drawing or painting (on vehicles, on walls, on boards, etc)						
No	118	90.1	925	88.7	1043	88.8
Yes	13	9.9	118	11.3	131	11.2
Ever seen tobacco advertising in journals, magazines, newspapers and pamphlets						
No	125	95.4	998	95.7	1123	95.7
Yes	6	4.6	45	4.3	51	4.3
Ever seen broadcasting of tobacco advertisements (television, radio, internet, social network like Facebook, etc)						
No	120	91.6	982	94.2	1102	93.9
Yes	11	8.4	61	5.8	72	6.1
Ever seen or heard about the distribution of tobacco products free of charge or as gifts						
No	124	94.7	953	91.4	1077	91.7
Yes	7	5.3	90	8.6	97	8.3
Ever seen or heard distributions of personal goods with tobacco product labels free of charge or as gifts***						
No	64	48.9	702	67.3	766	65.2
Yes	67	51.1	341	32.7	408	34.8
Ever seen or heard about tobacco advertising with lucky draw, exchange of old cigarette pack with new ones, bonus to sellers, car stickers, etc*						
No	125	95.4	1025	98.3	1150	98.0
Yes	6	4.6	18	1.7	24	2.0
Ever seen any goods with the label of any tobacco product being used in promotions (clothes, hats, lighters, key chains, tissue boxes, stationeries, kitchen utensils, etc)						
No	34	26.0	340	32.6	374	31.9
Yes	97	74.0	703	67.4	800	68.1
Ever seen any toy, comestible or wares made in the form of any tobacco product (toys, chewing gums, sweet sticks, key chains, lighters, balloons, etc)						
No	88	67.2	702	67.3	790	67.3
Yes	43	32.8	341	32.7	384	32.7
Ever heard about the announcements of tobacco advertisement at fairs and festivals*						
No	128	97.7	1040	99.7	1168	99.5
Yes	3	2.3	3	0.3	6	0.5
Ever seen or heard about the tobacco advertising as sponsorship or support to sports, funfairs, exhibitions or any social activities**						
No	70	53.4	689	66.1	759	64.7
Yes	61	46.6	354	33.9	415	35.3
Exposure to any kind of TAPS†						
No	8	6.1	99	9.5	107	9.1
Yes	123	93.9	944	90.5	1067	90.9

*p<0.05, **p<0.01, ***p<0.001.

†Tobacco advertisement, promotion and sponsorship.

‡Current tobacco use.

§No current tobacco use.
LED, light-emitting diode.

Table 3 Illicit tobacco sale exposures among study participants (n=1174)

Illicit Tobacco Sale	Use†		No use‡		Total	
	(n=131)		(n=1043)		(n=1174)	
	N	%	N	%	N	%
Had seen any smoked tobacco product for sale inside or within 100 feet of the school premises within the last 12 months**						
No	9	6.9	176	16.9	185	15.8
Yes	122	93.1	867	83.1	989	84.2
Had seen the sale or gifting of any smoked tobacco product to minors§ within the last 12 months***						
No	4	3.1	202	19.4	206	17.5
Yes	127	96.9	841	80.6	968	82.5
Had seen the sale or distribution of any smoked tobacco product by minors§ within the last 12 months**						
No	44	33.6	477	45.7	521	44.4
Yes	87	66.4	566	54.3	653	55.6
Had seen the sale of cigarettes singly or in packs less than 20 cigarettes within the last 12 months***						
No	3	2.3	155	14.9	158	13.5
Yes	128	97.7	888	85.1	1016	86.5

*p<0.05, **p<0.01, ***p<0.001.

†Current tobacco use.

‡No current tobacco use.

§Under 18 years old.

to minors within the last 12 months (AOR 6.46; 95% CI 2.18 to 19.12) and having seen the sale or distribution of any smoked tobacco product by minors within the last 12 months (AOR 2.42; 95% CI 1.42 to 4.10). Having ever received health education about tobacco use (AOR 0.45; 95% CI 0.27 to 0.78), and having a higher perception score with regards to tobacco use (AOR 0.17; 95% CI 0.10 to 0.30) were negatively associated with current tobacco use (table 3).

DISCUSSION

To the best of our knowledge, this is the first study to report the associations of current tobacco use with TAPS and illicit tobacco sale exposures among high school students in Myanmar. The majority of the study participants reported having been exposed to TAPS and illicit tobacco sales. TAPS exposure and illicit tobacco sale exposures increase the odds of current tobacco use among high school students.

In this study, a high prevalence of TAPS exposure (91%) was reported among high school students in Myanmar, a country that has completely banned all forms of direct or indirect TAPS, including Corporate Social Responsibility (CSR) activities by the tobacco industry.²⁷ Myanmar has a well-established Tobacco Control Law named the 'Control of Smoking and Consumption of Tobacco Product Law', which has been enacted since 2006.²⁷ However, the monitoring, reporting and punishment of TAPS activities prohibited by the law are not common in Myanmar. Other studies conducted in Myanmar also pointed out that the awareness of the tobacco control law among

high school students was low and that the lack of tobacco control law enforcement was in a critical state.^{19 26} It is not rare to see sponsored events and CSR activities executed by tobacco companies, violating the TAPS regulations and reframing tobacco products' image among Myanmar youths.^{19 26} The global tobacco industry has been focusing on expanding its market in developing countries that have low tobacco taxes, partial TAPS bans and weak law enforcement of TAPS regulations, rather than in developed countries with high tobacco taxes, comprehensive and complete TAPS bans and the strict implementation of TAPS regulations.²⁸⁻³¹

The weakness of tobacco control law enforcement in Myanmar creates opportunities for tobacco companies and retailers to violate it. Nigerian researchers have reported that exposure to events sponsored by the tobacco industry was associated with current cigarette use and demonstrated the importance of the tobacco control law and its enforcement in reducing tobacco use. Our findings highlighted the urgent need to enforce this law in Myanmar to reduce TAPS exposure among adolescents in order to decrease tobacco use. It also encourages Myanmar policymakers to formulate specific TAPS regulations addressing newly developed smoking and smokeless tobacco products and complete comprehensive TAPS bans, including cross-border TAPS. Local authorities need to monitor TAPS among Myanmar youths strictly and to punish the tobacco companies, stores and retailers violating TAPS regulations.

High school students exposed to TAPS in any form were six times more likely to be current tobacco users

Table 4 OR and 95% CI of current tobacco use among study participants (n=1174)

Characteristics	Use†	No use‡	Unadjusted		Adjusted§	
	(n=131)	(n=1043)	OR	95% CI	OR	95% CI
Age						
≤14 years	14 (10.7)	488 (46.8)	1	Reference	1	Reference
>14 years	117 (89.3)	555 (53.2)	7.35	(4.17 to 12.96)***	9.81	(4.54 to 21.19)***
Gender						
Female	9 (6.9)	683 (65.5)	1	Reference	1	Reference
Male	122 (93.1)	360 (34.5)	25.72	(12.91 to 51.22)***	28.06	(13.29 to 59.25)***
Grade						
10	56 (42.7)	738 (70.8)	1	Reference	1	Reference
11	75 (57.3)	305 (29.2)	3.24	(2.24 to 4.70)***	1.52	(0.85 to 2.73)
Parent smoking						
No	128 (97.7)	987 (94.6)	1	Reference	1	Reference
Yes	3 (2.3)	56 (5.4)	0.41	(0.13 to 1.34)	0.31	(0.08 to 1.29)
Sibling smoking						
No	118 (90.1)	961 (92.1)	1	Reference	1	Reference
Yes	13 (9.9)	82 (7.9)	1.29	(0.70 to 2.39)	1.06	(0.47 to 2.37)
Peer smoking						
No	119 (90.8)	959 (91.9)	1	Reference	1	Reference
Yes	12 (9.2)	84 (8.1)	1.15	(0.61 to 2.17)	0.41	(0.17 to 0.95)*
Exposure to any kind of TAPS†						
No	8 (6.1)	99 (9.5)	1	Reference	1	Reference
Yes	123 (93.9)	944 (90.5)	1.61	(0.77 to 3.40)	6.59	(2.33 to 18.64)***
Had seen any smoked tobacco product for sale inside or within 100 feet of the school premises within the last 12 months						
No	9 (6.9)	176 (16.9)	1	Reference	1	Reference
Yes	122 (93.1)	867 (83.1)	2.75	(1.37 to 5.52)**	4.17	(1.65 to 10.58)**
Had seen the sale or gifting of any smoked tobacco product to minors† within the last 12 months						
No	4 (3.1)	202 (19.4)	1	Reference	1	Reference
Yes	127 (96.9)	841 (80.6)	7.63	(2.79 to 20.88)***	6.46	(2.18 to 19.12)***
Had seen the sale or distribution of any smoked tobacco product by minors¶ within the last 12 months						
No	44 (33.6)	477 (45.7)	1	Reference	1	Reference
Yes	87 (66.4)	566 (54.3)	1.67	(1.14 to 2.44)**	2.42	(1.42 to 4.10)**
Had seen the sale of cigarettes singly or in packs less than 20 cigarettes within the last 12 months						
No	3 (2.3)	155 (14.9)	1	Reference	1	Reference
Yes	128 (97.7)	888 (85.1)	7.45	(2.34 to 23.70)***	3.32	(0.93 to 11.85)
Ever received health education about tobacco use						
No	70 (53.4)	393 (37.7)	1	Reference	1	Reference
Yes	61 (46.6)	650 (62.3)	0.53	(0.37 to 0.76)***	0.45	(0.27 to 0.78)**
Perception of tobacco use††						
≤7	80 (61.1)	187 (17.9)	1	Reference	1	Reference
>7	51 (38.9)	856 (82.1)	0.14	(0.10 to 0.21)***	0.17	(0.10 to 0.30)***

*p<0.05, **p<0.01, ***p<0.001.

†Current tobacco use.

‡No current tobacco use.

§Adjusted for age, gender, grade, parent smoking, sibling smoking, peer smoking, ever received health education about tobacco use and perception of tobacco use.

¶Under 18 years old.

††Regarding the perception score of tobacco use, measured with eight items, the mean score of seven was set as the cut-off point.

TAPS, tobacco advertising, promotion and sponsorship.

than those without any TAPS exposure. A recent study from Myanmar has reported that only half of the high school students had heard about the Tobacco Control Law, and none of the study participants had ever heard of any reporting of or punishment for any violation of the Tobacco Control Law that bans TAPS activities and tobacco sales among minors.²⁶ Our study suggests that Myanmar high school students should be properly informed not only about the dangers of TAPS exposure but also about the country's Tobacco Control Law and its punishments.

In this study, the prevalence of current tobacco use among Myanmar high school students was 11.2%, which is higher than the national figure of 9.8% reported in the 2016 WHO GSHS for students between 13 and 17 years old in Myanmar.¹⁸ Our study also reported that male high school students were more likely to be current tobacco users than their female peers were. A subnational-level study also reported a considerably high prevalence of smoked (34.7%) and smokeless tobacco use (28.3%) among high school students.¹⁹ The findings suggest Myanmar policymakers to consider both smoked and smokeless tobacco use among adolescents as a public health priority and to put more effort into implementing control measures.

In Myanmar, it has been reported that there were only three full-time staff assigned to national tobacco control, meaning they were each responsible for 208000 smokers.³² The country also has an insufficient government budget for tobacco control and there is no health promotion funding mechanism in place for the use of tobacco taxes.³² To tackle the current situation in Myanmar, the effective implementation of tobacco control measures is needed to reduce current tobacco use, and human and financial resources for national tobacco control should be improved.

Increasing tobacco tax, as recommended for implementation of Article 6 of the WHO FCTC, functions as a cost-effective demand-reducing measure in global tobacco control.³² However, cigarettes in Myanmar are relatively cheap, indicating that the country's tobacco tax policies need to be re-evaluated. Among the Association of Southeast Asian Nations (ASEAN), the price of the most popular local cigarette brand in Myanmar is the second lowest (0.6 US\$/20-stick pack), and that of the most popular foreign brand in Myanmar is the fourth highest (2.11 US\$/20-stick pack).³² This indicates a gap in tax differences between local and foreign brands of cigarettes. The price at which youths in Myanmar are deterred from smoking is reportedly 11 US\$/20-stick pack, the lowest among the ASEAN.³² Therefore, the Myanmar government should reevaluate tobacco tax levels and adjust tax policies to decrease tobacco use and TAPS exposures.

In this study, students who had seen any smoked tobacco product for sale inside or within 100 feet of the school premises during the last 12 months were four times more likely to be current tobacco users than their

peers were. It is illegal to sell any kind of smoked tobacco products inside or within 100 feet of school premises in Myanmar.²⁷ This finding implies that the lack of monitoring and reporting of illicit tobacco sales inside or near school premises exerts an influence on current tobacco use among Myanmar high school students. In addition, these illicit tobacco sales provide easy access to tobacco for students as well as for school personnel, triggering secondhand smoking exposure and student curiosity about tobacco use. Therefore, school personnel, students and parents should monitor and report any illicit tobacco sales to local authorities and actions should be taken according to the rules and regulations.

However, there is no specific regulation on smokeless tobacco sales and distributions to and by minors in Myanmar, the sale or gifting of any smoked tobacco product to minors and the sale or distribution of any smoked tobacco product by minors are illegal.²⁷ Nonetheless, 82.5% of participants in this study reported that they had seen someone selling or gifting of any smoked tobacco product to a minor within the last 12 months, and 55.6% of the participants reported having witnessed the sale or distribution of any smoked tobacco product by minors within the last 12 months. The study also revealed that having seen these two illicit tobacco activities within the last 12 months was significantly associated with current tobacco use among the study participants. A study of adolescents in the USA has also reported an association between smokeless tobacco use and smoking.³³ In order to reduce current tobacco use among Myanmar high school students, this study recommends the urgent need of specific smokeless tobacco regulations concerning sales made to and by minors in Myanmar, and strict law enforcement on sales and distributions all smoked and smokeless tobacco to and by minors in the country.

Another common violation of the Tobacco Control Law in Myanmar is the sale of cigarettes singly or in packs of less than 20. Despite the significant price difference³² both foreign and local brands become affordable for smokers when they are sold singly or in packs of less than 20. Such sales are contrary to the demand-reducing tobacco control measures of the national policy and negatively affect the tobacco use of all age groups, especially adolescents.

In addition, other smoked and smokeless tobacco products, such as cheroots, cigars, pipes, betel quids, etc, can be purchased singly or in small quantities in Myanmar. To reduce tobacco use in all age groups, our study recommends that the 2006 Tobacco Control Law be updated to address the sale and purchase of all forms of smoked and smokeless tobacco products in small quantities, along with strict law enforcement, especially among minors.

The findings of this study imply that effective health education and high perception of tobacco use can be effective factors in combating the current tobacco use among Myanmar high school students. In this study, students who had received health education about tobacco use and those with a higher perception score of

tobacco use were less likely to be current tobacco users than their counterparts. Nearly two-thirds of the participants had received health education about tobacco use, and nearly 80% had a higher perception score. Health education programmes and tobacco control measures targeting the young should address the newly developed and popular tobacco products like electronic cigarettes, shisha, pipes, menthol and fruit-flavoured cigarettes, etc. Youths' awareness of not only the harms of tobacco products but also the country's Tobacco Control Law should be promoted.

The study findings also revealed that 10.7% of current tobacco users were 14 years old or less. Another Myanmar researcher has reported that the average age for first tobacco use is 14 years.¹⁹ Therefore, tobacco control intervention measures should be introduced to Myanmar high school students before the age of 14. Awareness of the Tobacco Control Law remains quite low in Myanmar.^{19 26} Furthermore, the provision of health education via youth-friendly media, such as the internet, mobile applications and social networking services, may attract more attention from high school students.

In contrast to other studies,^{19 26} parental smoking, sibling smoking and peer smoking were not found to be associated with current tobacco use in this study. This may be because only the smoking status of parents, siblings and peers of the participants was assessed in this study and most of the study participants did not have exposure to parents, siblings or peers who smoked. Having high knowledge and perception about tobacco use may also have prevented them from using tobacco.¹⁹

Despite being the very first study in Myanmar to report the associations between current tobacco use, TAPS, and illicit tobacco sale exposure among Myanmar high school students, the present study did not explore the associations of first-time or daily tobacco use, and TAPS or illicit tobacco sales among Myanmar high school students. This study was conducted among 1174 high school students from two states and two regions out of a total of seven states, seven regions and one territory of Myanmar, and its findings cannot be generalised for the whole nation. Due to the limitations of the cross-sectional nature of our study, we recommend further interventional or longitudinal studies of TAPS and sales exposure for a better understanding of adolescent tobacco use in Myanmar.

CONCLUSIONS

This study reported high prevalences of TAPS and illicit tobacco sales exposures among Myanmar high school students. Current tobacco use among Myanmar high school students was statistically associated with overall TAPS exposure. Violations of tobacco sales regulations were reported to be strong risk factors for current smoked and smokeless tobacco use among Myanmar high school students. Our findings highlight that Myanmar's Tobacco Control Law enforcement is in an alarming state and requires urgent improvement. Sales and purchase of not

only cigarettes but also all forms of smoked and smokeless tobacco products in small quantities should be regulated. Specific smokeless tobacco sale regulations for minors are urgently needed in the country.

Author affiliations

¹Department of Healthcare Administration, Nagoya University Graduate School of Medicine, Nagoya, Japan

²Nagoya University Asian Satellite Campuses Institute, Nagoya, Japan

³Aung Myin Myint Mo Hospital, Gyobingauk, Myanmar

⁴Department of Community and Global Health, Graduate School of Medicine, The University of Tokyo, Tokyo, Japan

⁵Department of Preventive and Social Medicine, University of Medicine, Mandalay, Myanmar

⁶Department of Medical Services, Ministry of Health and Sports, Nay Pyi Taw, Myanmar

⁷Department of Public Health, Ministry of Health and Sports, Nay Pyi Taw, Myanmar

Acknowledgements The authors would like to thank Ministry of Health and Sports and Ministry of Education in Myanmar for granting a permission to collect the data at high schools. We also would like to thank the local authorities in the survey areas, the staff from participating schools, last but not least, all the high school students those who participated voluntarily in this study.

Contributors YMS and NNL conceptualised the study and designed the study. NNL and TNS contributed to data collection and data acquisition. YMS, TNS, HH and SMC performed data analyses and data interpretations. YMS, HH and SMC wrote the first draft of the manuscript. MK, TMT, EMW, TK, EY and ZZA contributed to data acquisition. NH contributed to the study design, data interpretation and revising the manuscript. YMS, TNS, SMC, and NH revised and edited the manuscript. All authors had full access to the data, and take responsibility to the accuracy of data analysis. All authors approved the final manuscript and agreed to submit it for publication and take accountability.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient consent for publication Not required.

Ethics approval This study was ethically approved by the Department of Medical Services, Ministry of Health and Sports, Myanmar (Letter No. 617 of Planning/Research issued on 26 August 2015), and the Ministry of Education, Myanmar (Letter No. 12125 of Information/Research issued on 19 October 2015), as well as the ethical review committee of Nagoya University School of Medicine (No. 6518 issued on 31 August 2015). To conduct this school-based survey, permissions from Ministry of Education, Regional Offices of Basic Education, Ministry of Health and Sports, local educational steering committees and authorities, the schools' authorities, the headmasters of participated schools and local Parents-Teacher Associations were obtained. The survey procedure was approved by Ministry of Education and Ministry of Health and Sports. After thoroughly explaining the study's objectives, contents of the survey questionnaire and rights of the study participants, the written-informed consents from local educational steering committees and authorities, the schools' authorities, the headmasters of participated schools, local Parents-Teacher Associations and parents were obtained. One week prior to the survey, the information sheet and the written-informed consents stating the study's objectives, the survey's procedure and the contents of the questionnaires and the rights of the study participants were sent to parents. Researchers also explained the study's objectives, contents of the survey questionnaire, the voluntary nature and procedure of the survey and the rights of the participants to collaborators, students and teachers before conducting the survey. All data collection and analytical processes remain anonymous for privacy and confidentiality. The locations, names and numbers of the eligible participants of the schools involved were not documented.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement No additional data are available.

Open access This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made

indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

ORCID iD

Yu Mon Saw <http://orcid.org/0000-0002-5038-0043>

REFERENCES

- World Health Organization. Who global report on trends in prevalence of tobacco smoking 2000–2025. Available: <https://www.who.int/tobacco/publications/surveillance/trends-tobacco-smoking-second-edition/en/> [Accessed 5 May 2019].
- Gentzke AS, Creamer M, Cullen KA, *et al*. *Vital Signs: Tobacco Product Use Among Middle and High School Students - United States, 2011–2018*. *MMWR Morb Mortal Wkly Rep* 2019;68:157–64.
- Sinha DN, Palipudi KM, Jones CK, *et al*. Levels and trends of smokeless tobacco use among youth in countries of the world Health organization south-east Asia region. *Indian J Cancer* 2014;51.
- World Health Organization., Regional Office for South-East Asia. Monitoring tobacco control among youth in countries of the south-east Asia region: 2014. World Health organization, 2015. Available: <https://apps.who.int/iris/handle/10665/155159> [Accessed 24 Nov 2019].
- Tun NA, Chittin T, Agarwal N, *et al*. Tobacco use among young adolescents in Myanmar: findings from global youth tobacco survey. *Indian J Public Health* 2017;61:S54–9.
- World Health Organization, Regional Office for South-East Asia. Expert group meeting on smokeless tobacco control and cessation: new Delhi, India, 16–17 August 2011, 2012. Available: <https://apps.who.int/iris/handle/10665/205054> [Accessed 24 Nov 2019].
- World Health Organization. Who global report: mortality attributable to tobacco. Available: https://www.who.int/tobacco/publications/surveillance/rep_mortality_attributable/en/ [Accessed 27 Apr 2019].
- Öberg M, Jaakkola MS, Woodward A, *et al*. *Worldwide burden of disease from exposure to second-hand smoke: a retrospective analysis of data from 192 countries*. *The Lancet* 2011;377:139–46.
- Selya AS, Dierker L, Rose JS, *et al*. Early-emerging nicotine dependence has lasting and time-varying effects on adolescent smoking behavior. *Prev Sci* 2016;17:743–50.
- Centers for Disease Control and Prevention. The health consequences of smoking- 50 years of progress: a report of the surgeon General. Available: <https://www.surgeongeneral.gov/library/reports/50-years-of-progress/full-report.pdf> [Accessed 29 Apr 2019].
- Robert P-O, Kuipers MAG, Rathmann K, *et al*. Academic performance and adolescent smoking in 6 European cities: the role of friendship ties. *Int J Adolesc Youth* 2019;24:125–35.
- Treur JL, Willemsen G, Bartels M, *et al*. Smoking during adolescence as a risk factor for attention problems. *Biol Psychiatry* 2015;78:656–63.
- Kyaing NN, Sein T, Sein AA, *et al*. Smokeless tobacco use in Myanmar. *Indian J Cancer* 2012;49:347–51.
- Muthukrishnan A, Warnakulasuriya S. Oral health consequences of smokeless tobacco use. *Indian J Med Res* 2018;148:35–40.
- Gupta S, Gupta R, Sinha DN, *et al*. Relationship between type of smokeless tobacco & risk of cancer: A systematic review. *Indian J Med Res* 2018;148:56–76.
- Rostron BL, Chang JT, Anic GM, *et al*. Smokeless tobacco use and circulatory disease risk: a systematic review and meta-analysis. *Open Heart* 2018;5:e000846.
- World Health Organization. Report of fifth global youth tobacco survey (GYTS) Myanmar, 2016. Available: <https://apps.who.int/iris/handle/10665/274351> [Accessed 2 May 2019].
- World Health Organization. Report of second global school-based student health survey in Myanmar, 2016. Available: <http://www.who.int/iris/handle/10665/274350> [Accessed 2 May 2019].
- Htin Aung Myint MN, Yamamoto E, Ko MH, *et al*. Knowledge, attitude, and usage pattern of tobacco among high school students in Nay Pyi Taw, Myanmar. *Nagoya J Med Sci* 2019;81:65–79.
- Prabandari YS, Dewi A. How do Indonesian youth perceive cigarette advertising? A cross-sectional study among Indonesian high school students. *Glob Health Action* 2016;9:30914.
- Chido-Amajuoyi OG, Mantey DS, Clendennen SL, *et al*. Association of tobacco advertising, promotion and sponsorship (TAPS) exposure and cigarette use among Nigerian adolescents: implications for current practices, products and policies. *BMJ Glob Health* 2017;2:e000357.
- Braverman MT, Aarø LE. Adolescent smoking and exposure to tobacco marketing under a tobacco advertising ban: findings from 2 Norwegian national samples. *Am J Public Health* 2004;94:1230–8.
- Soneji S, Ambrose BK, Lee W, *et al*. Direct-To-Consumer tobacco marketing and its association with tobacco use among adolescents and young adults. *J Adolesc Health* 2014;55:209–15.
- Morgenstern M, Sargent JD, Isensee B, *et al*. From never to daily smoking in 30 months: the predictive value of tobacco and non-tobacco advertising exposure. *BMJ Open* 2013;3:e002907.
- Akl EA, Jawad M, Lam WY, *et al*. Motives, beliefs and attitudes towards waterpipe tobacco smoking: a systematic review. *Harm Reduct J* 2013;10:12.
- Nyi Latt N, Saw YM, Myat Cho S, *et al*. Tobacco control law awareness, enforcement, and compliance among high school students in Myanmar. *Nagoya J Med Sci* 2018;80:379–89.
- Ministry of Health. The control of smoking and consumption of tobacco product law. Available: <https://seatca.org/dmdocuments/Myanmar%20-%20TC%20Law.pdf> [Accessed 17 May 2019].
- Gilmore AB, Fooks G, Drope J, *et al*. Exposing and addressing tobacco industry conduct in low-income and middle-income countries. *The Lancet* 2015;385:1029–43.
- Gostin LO. Fda regulation of tobacco: politics, law, and the public's health. *JAMA* 2009;302:1459–60.
- Jamison N, Tynan M, MacNeil A, *et al*. Federal and state cigarette excise taxes - United States, 1995–2009. *MMWR Morb Mortal Wkly Rep* 2009;58:524–7.
- Chaloupka FJ, Yurekli A, Fong GT. Tobacco taxes as a tobacco control strategy. *Tob Control* 2012;21:172–80.
- Southeast Asia Tobacco Control Alliance. *The tobacco control atlas: ASEAN region*. 4th Edition, 2019. <https://seatca.org/dmdocuments/Tobacco%20Control%20Atlas%20ASEAN%20Region%204th%20Ed%20Feb%202019.pdf>
- Wiener RC. Association of smokeless tobacco use and smoking in adolescents in the United States: an analysis of data from the youth risk behavior surveillance system survey, 2011. *J Am Dent Assoc* 2013;144:930–8.